Ecological Risk Assessment for the Hanover/Whitewater Creeks Investigation Unit Chino Mine Investigation Area, Grant County, New Mexico

October 2015

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LIST OF ACRONYMS

95% UCL	95th Upper Confidence Limit
amsl	Above Mean Sea Level
AOC	Administrative Order on Consent
AWQC	Acute Water Quality Criterion
AWWQRP	Arid West Water Quality Research Project
BAF	Bioaccumulation Factor
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
BRI	Background Remedial Investigation
BW/day	Body Weight per Day
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CMC	Chino Mines Company
COPCs	Chemicals of Potential Concern
CSM	Conceptual Site Model
DEL	*de minimus* Effects Level
EcoSSL	Ecological Soil Screening Level
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ERI	Ecological Remedial Investigation
HQ	Hazard Quotient
H/WCIU	Hanover and Whitewater Creeks Investigation Unit
IUs	Investigation Units
LOAEL	Lowest-Observed-Adverse-Effects Level
LOEC	Lowest-Observed-Effect Concentrations
µm	Micron
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
NCSS	Number Cruncher Statistical Systems
NMWQC	New Mexico Water Quality Criteria
NOAEL	No-Observed-Adverse-Effects Level

LIST OF ACRONYMS (Continued)

NOEC	No-Observed-Effect Concentrations
NMED	New Mexico Environment Department
pCu^{2+}	Negative Logarithm of the Cupric Ion Concentration
PEC	Probable Effects Concentration
PEL	Probable Effects Level
pH	Negative Logarithm of the Hydrogen Ion Concentration
RAC	Remedial Action Criteria
RBC	Risk-Based Concentration
RI/FS	Remedial Investigation/Feasibility Study
SLERA	Screening-Level Ecological Risk Assessment
SPLP	Synthetic Precipitation Leaching Procedure
SSL	Soil Screening Level
S/TSIU	Smelter and Tailings Soils Investigation Unit
STT	Sediment Toxicity Threshold
TEC	Threshold Effect Concentration
TM	Technical Memorandum
TP	Tailings Pond
TRV	Toxicity Reference Value
TSMD	Tri-States Mining District
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
WQC	Water Quality Criterion

1.0 INTRODUCTION AND PURPOSE

This document presents the results of the Ecological Risk Assessment (ERA) for the Hanover and Whitewater Creeks Investigation Unit (H/WCIU) at the Chino Mine Investigation Area, Grant County, New Mexico (the Site). The Site, located approximately 12 miles southeast of Silver City, includes open pit copper mining facilities, rock stockpiles, leach stockpiles, mineral processing facilities, and tailings impoundments (Figure 1.0-1). Chino Mines Company (CMC) controls approximately 116,000 acres around the mining and mineral processing facilities.

In December 1994, CMC and the New Mexico Environment Department (NMED) entered into an Administrative Order on Consent (AOC) to conduct environmental investigations at the Chino Mine Site and surrounding area as appropriate. The AOC requires that a Remedial Investigation/Feasibility Study (RI/FS), including human and ecological risk assessments, be completed for each of the following Investigation Units (IUs):

- Lampbright Draw;
- Hanover Creek;
- Whitewater Creek;
- Smelter;
- Hurley Soils; and
- Tailing Impacted Soils.

For practical and logistical reasons, the Hanover Creek and Whitewater Creek IUs, and the Smelter and Tailings Soils IUs (S/TSIU) have been combined for performing the RI/FS. To date, the RI/FS is complete for only the Hurley Soils IU.

CMC and NMED agreed to conduct a baseline ERA (BERA) for the combined IUs based on suggestions that an ERA could be more effectively conducted on a Sitewide basis. An Ecological IU was designated for this purpose and added to the AOC in December 1995 (NMED 1995). The Ecological IU encompasses areas of the other IUs that may contain ecological resources and may be affected by contaminant releases (NMED 1995).

The Sitewide BERA focused on areas of the Site that may have been affected by historical releases of contaminants from mining and milling operations. In accordance with the AOC, current operational sources that are regulated under state or federal permits would not be considered in the risk assessment process, but areas affected by historical releases occurring from the sources prior to permitting are to be addressed if data from the RIs indicate contamination.

The Sitewide BERA, completed in December 2005 (NewFields 2005), was conducted in accordance with United States Environmental Protection Agency (USEPA) guidance for ERAs at Superfund (Comprehensive Environmental Response, Compensation and Liability Act of 1980 [CERCLA]) sites (USEPA 1992, 1997). While the Chino Mine Site is not a Superfund site, the intent of the AOC is to produce CERCLA-like investigations and remedies. General guidance on conducting ERAs (USEPA 1998) was used in planning and development of the risk characterization approach for the BERA and in the terminology used in the Sitewide BERA Report (NewFields 2005).

Because the RI had not been completed when the BERA was designed and conducted, the nature and extent of contamination in the IUs had not been fully characterized. Therefore, the BERA design focused on identifying chemicals of potential concern (COPCs) for ecological receptors, characterizing stressor-response relationships for key COPCs, and developing risk-based tools for further evaluating ecological risk in individual IUs as more complete nature and extent characterization became available from the RI. As described in Section 1 of the Sitewide BERA Report (NewFields 2005), and detailed in Technical Memorandum No. 1 (TM-1) (Schafer 1999a), the Chino ERA study design was based on assessing risk along a gradient of contamination, indicated by soil copper concentrations and pH described in the RI Background Report (CMC 1995). The tools provided in the Sitewide BERA were intended to facilitate implementation of the ERAs for each IU as additional RI data became available. The IU-specific ERA for the H/WCIU focuses on the risk characterization in terms of Sitewide contribution to risk, to help focus risk management decisions within this IU.

The H/WCIU is assumed, in this document, to include all areas within Hanover and Whitewater Creeks extending from the northern AOC boundary at Highway 152 (Figure 1.0-1) downstream to the southern extent of sampling approximately eight miles south of Tailings Pond #7 (TP-7). Also included in this risk assessment are portions of Whitewater Creek from the southern AOC boundary to the San Vicente Arroyo and a small area east of Whitewater Creek where it appears that the creek broke out of its channel and deposited sediment in a side channel. The H/WCIU does not include areas that are part of the Hurley Soils IU, S/TSIU, Lampbright IU or the operational areas of the Site.

1.1 Summary of Problem Formulation

A full problem formulation discussion, including a history of releases and overall ecology of the AOC area, is presented in the Sitewide BERA Report (NewFields 2005). The initial problem formulation used to develop the overall study design for the Chino ERA is presented in TM-1 (Schafer 1999a). A detailed discussion of the IU and history is provided in the Hanover and Whitewater Creeks Phase I RI Report (Golder 2000).

The potential chemical stressors at the Site consist primarily of metals, associated inorganics (e.g., sulfate), and acidic pH. The Sitewide BERA identified potentially complete exposure pathways that were used to evaluate the risk of direct effects on ecosystem components from chemical stressors associated with the Site. The Sitewide BERA also included indirect effects such as a loss of nesting sites or prey base.

1.1.1 Site Description

Major topographic features in the AOC investigation area include the Cobre Mountains and the San Vicente Basin. Erosion of the plateau surface in the Cobre Mountains southeast of Bayard has resulted in a series of even-crested, southward-sloping ridges that gradually become low hills. The topographic high within the AOC investigation area is approximately 7,700 feet above mean sea level (amsl).

The San Vicente basin is a broad lowland that extends northward from the Mimbres Valley. The basin terminates against the Big Burro and Little Burro Mountains on the west, Silver City and the Pinos Altos ranges on the north, and the Cobre Mountains on the east. The slope of the terrain is from these mountains toward the San Vicente Arroyo. The San Vicente Basin is characterized by several dry, sandy washes and gullies. Elevations in this area of broad plains range from about 5,700 feet near Hurley to 4,500 feet at the confluence of Whitewater Creek with the San Vicente Arroyo.

The geology of the H/WCIU is described in detail in the Hanover and Whitewater Creeks Phase I RI Report (Golder 2000). The soils and sediments in the H/WCIU are largely derived from mineralized sources present in the headwater portions of the watershed. Golder (2004) conducted a background sediment investigation in order to determine pre-mining metals concentration in H/WCIU soils/sediments derived from the various upgradient mineralized materials. By observing vertical soil profiles, Golder (2004) provided indications of natural background levels derived from copper-rich materials in the Santa Rita Stock and the Hanover-Fierro Stock.

Hanover and Whitewater Creeks flow through areas of alligator juniper and oak woodland vegetation communities in the northern portions of the drainage. Both creeks also flow through residential and historical mining areas in the upstream portions of their drainages. South of Bayard, Whitewater Creek flows through primarily mesquite/mixed-grama shrubland and fluvial forests. From the south end of the mine facilities to the San Vicente Arroyo, the vegetation community grades into a mixed grama herbaceous community. Smaller creeks that drain the higher south-facing slopes east of Whitewater Creek generally flow through mountain mahogany shrubland in the higher elevations (above about 6,000 feet amsl) in the northern sections of the IU downward into the mesquite/mixed grama habitats in the lower elevations of the Site (Figure 1.1-1).

The lateral extent of the H/WCIU was based on the fluvial geomorphological features associated with the current and historic flowpaths of Hanover Creek and Whitewater Creek. Vegetated (or potentially vegetated) fluvial overbanks and terraces identified by Golder (2000) were included in the analysis of exposure to terrestrial receptors including the vegetation and faunal receptors. Active channel sediments and point bars were not included in the risk analysis for wildlife and vegetation because these areas lack stable vegetation that would be used by wildlife in ways that would result in important exposure pathways such as ingestion.

Aquatic habitats in the H/WCIU are generally limited due to a lack of persistent sources of water. Temporary pools develop from precipitation events or seasonally elevated discharges of shallow groundwater and provide temporary habitat for amphibians and aquatic invertebrates that may utilize the pools for reproduction. In some locations, such as Bayard Canyon and the James Canyon impoundment, more permanent pools exist due to persistent groundwater seeps or local springs.

1.1.2 Overall Conceptual Site Model and Study Design

Conceptual Site Models (CSMs) have been used to describe the Chino Mine Site in several documents (CMC 1995; Schafer 1999a, 1999b; Golder 2000). The potentially complete exposure pathways and associated potential effects used to guide the design and analysis of the H/WCIU ERA are shown in the Chino Mines ERA CSM (Figure 1.1-2), which is essentially unchanged from the CSM used in the Sitewide BERA.

For riparian areas, the primary contaminant sources and release mechanisms are fluvial transport and to a lesser extent, smelter emissions and windblown tailings (Figure 1.1-2). Prevailing winds tend to be from the northwest (CMC 1995). Therefore, soils in areas south and east of the smelter and the tailings impoundments are likely to be most affected by dryfall from these aerial sources. The entire system is likely to be affected as a result of fluvial transport of materials from mining areas to the north and air/wind deposited materials adjacent to and downstream of the smelter and tailings impoundments. Although the drainages east of Whitewater Creek may have been directly affected by dryfall, they may also have been affected by the downgradient erosional transport of impacted soils and tailings into the drainages. Through this mechanism, COPCs could concentrate in fine materials deposited on soils along the drainages, as well as in sediments in the active channel.

As noted above, when the BERA commenced, Phase I RIs had not been completed for any of the IUs. Therefore, the nature and extent of contamination had not been fully characterized. As a result, the overall goals of the analysis were to determine whether Site conditions represent a risk to ecological receptors and, if so, to develop risk criteria that can be used to assess the potential for risk in areas that had not yet been characterized through the RI process.

The overall technical approach to sampling and risk analysis was based on a modified "gradient" approach (USEPA 1997) in which a suite of analyses was performed at sites selected to represent the range of observed copper concentrations and pH. Copper was identified as a key COPC based on results of the Screening-Level Ecological Risk Assessment (SLERA) and the Phase I Ecological Remedial Investigation (ERI) (WCC 1997). The general objective was to identify a combination of COPC concentrations, pH, and other environmental factors that are protective of assessment endpoints, and then to apply these findings to future data on nature and extent of contamination.

A total of 34 sampling locations were originally identified for the BERA, including locations generally along a west-east gradient of copper concentrations and pH observed east of the former smelter location, and other locations along the Hanover and Whitewater Creek corridor, as well as other parts of the Site that represented various copper and pH conditions. A reference area was identified in a portion of the San Vicente Arroyo approximately 6 miles southwest of Hurley. The reference area was not intended as an ideal reference area in the traditional sense. Rather, it was intended to represent a condition in the gradient approach in which copper was relatively low and soil pH was high, compared to the study area. Synoptic sampling of surface and subsurface soil, vegetation, invertebrates, and small mammals was conducted at each location. Phytotoxicity testing was conducted on soils from each of the 34 BERA locations.

In January 2008, a ‘white rain’ event occurred at the Site. Precipitation laden with a white milky substance, later identified as calcium carbonate, fell randomly with varying degrees of distribution over the entire Chino Mine Site, including H/WCIU, and resulted in increased pH in soils within both the S/TSIU and H/WCIU (CMC 2010). The long-term permanence of the ‘white rain’ is unknown and is currently being studied. No agreements to any potential conclusions of the ‘white rain’ study have been completed at the time of this report. The potential effects of this event are discussed in more detail in the pertinent sections of this document.

1.1.3 Assessment Endpoints

Assessment endpoints are explicit expressions of the ecological resources that risk managers wish to protect for a given site (USEPA 1992, 1997, 1998). The BERA problem formulation identified a set of assessment endpoints based on ecological relevance, potentially complete exposure pathways, taxonomic groups that may be sensitive to chemical stressors and are potentially exposed, and site management goals (Schafer 1999a).

The assessment endpoints are accompanied by “risk questions” described by USEPA (1997) as the questions the ERA will attempt to answer regarding whether or not assessment endpoints could be adversely affected by exposure to COPCs. The risk questions form the basis for identifying the specific analyses to be conducted and the data needed to perform the analysis. In some cases, risk questions may be stated as risk hypotheses (USEPA 1998), which are then used to identify the data collection and analysis to be performed. Evaluation of risk hypotheses is not necessarily equivalent to formal statistical tests of null hypotheses (USEPA 1998).

The assessment endpoints and risk questions used to guide the development of the Sitewide BERA are presented in Table 1.1-1. The assessment endpoints can be broken down into three main categories with subcategories as follows:

Terrestrial Vegetation as Wildlife Habitat

- Ephemeral drainages
- Upland sites

Terrestrial Wildlife

- Herbivorous, insectivorous, and omnivorous birds
- Raptors
- Herbivorous, granivorous, and omnivorous small mammals
- Ruminants
- Mammalian predators

Aquatic Receptors

- Amphibians
- Aquatic invertebrates and fish community.

1.1.4 Sitewide BERA Conclusions

As noted above, the Sitewide BERA study design was based on assessing risk along a gradient of contamination, indicated by soil copper concentrations and pH described in the RI Background Report (CMC 1995) and along the riparian areas of Hanover and Whitewater Creeks. The Sitewide BERA assessed potential risks to each of the assessment endpoints at the CMC Site. Some potential for risk was identified for several receptors evaluated. The conclusions reached in the Sitewide BERA regarding potential risks are summarized below.

<u>Contaminant Distribution with Respect to Exposure Potential</u>

1) Metal concentrations have apparently increased, and soil pH has decreased as a result of mining operations in some areas of the Site; metal concentrations are most elevated in surface soils.

2) Due to depressed pH, the bioavailable fraction of metals has increased, and metal exposure has also apparently increased.

3) A wide range of exposure conditions exist at the Site, corresponding to both elevated metal concentrations and depressed pH.

4) A wide range of exposure conditions exist in a demonstrable gradient with distance from the smelter and tailings impoundments (especially southeast of the smelter and the old Lake One area).

Vegetation

Overall trends identified from results of the Sitewide BERA analysis indicated that:

1) Trends in upland vegetation community structure and composition were observed between study and reference area locations, and among study area locations; locations closest to the sources and containing the highest concentrations tended to have lower richness and cover than areas farther away from the sources;

2) Ephemeral drainage communities tended to have richness and cover similar to that of the upland reference areas. However, communities may not be comparable because of the wide range of conditions among ephemeral drainages; and

3) Phytotoxicity testing indicated that soils from areas of the Site closest to the mine facilities were more toxic than reference area soils and more toxic than study area locations more distant from the mine and mineral processing facilities.

Use of the term ephemeral as it applies to terrestrial habitat in drainage corridors does not imply classification of the stream segments by the State of New Mexico for purposes of assigning distinct protections under the New Mexico Water Quality Act (see 20.6.4.97-99 NMAC). Where aquatic habitat or surface water quality standards are discussed, these stream segments are referred to as ‘non-perennial.’

The stressor response analysis presented in the Sitewide BERA evaluated whether or not the potential exposure to terrestrial plants from Site soils was correlated with the effects on community structure and (laboratory-tested) phytotoxicity. The analysis indicated that cupric ion activity (expressed as the negative logarithm of cupric ion activity [pCu^{2+}]), a measure of available copper, was the best overall predictor of field and laboratory vegetation response variables. Several measurement endpoints including community species richness, total canopy cover, stem weight and length (laboratory studies), and root weight and length (laboratory studies), were more highly correlated with pCu^{2+} than with any other measure of metal concentration (Table 1.1-2). Other measures including seedling emergence, survival and the number of rhizobium containing root nodules (alfalfa) were more highly correlated to water-soluble copper, but in all cases pCu^{2+} was one of the most highly correlated values for those measures as well. Bioavailable copper was identified as the risk driver for potential effects to terrestrial vegetation in the Sitewide BERA.

The Sitewide BERA concluded that elevated copper and other metals, combined with depressed pH, have led to higher risk of phytotoxicity for some areas of the Chino Mine site, particularly those areas closest to the smelter and tailings impoundments such as ERA-01, ERA-02, ERA-03, and ERA-07 within the S/TSIU. The effects are highly dependent on soil pH; some locations within the S/TSIU (ERA-11, ERA-12, ERA-13, ERA-14, and ERA-15) had elevated copper concentrations, but relatively high pH, and exhibited little or no evidence of phytotoxicity in field measurements and/or laboratory exposure studies.

The Sitewide BERA also indicated that other COPCs could contribute to toxicity under low soil pH conditions, including cadmium, lead and zinc, which are elevated at several riparian areas in the upstream portion of the H/WCIU primarily associated with historic mining operations. Additionally, non-Site COPCs such as aluminum and manganese could also be toxic when present at natural concentrations in soils where pH is less than 5.0. Physical conditions and historic land use (i.e., cattle grazing) also affect vegetation at the Site and could be responsible for some of the variability observed in the plant communities, and could also affect overall wildlife habitat quality.

The pCu^{2+} was highly predictable from soil pH and total copper concentration. The models derived in the Sitewide BERA are presented in Table 1.1-3 along with the R-squared values from the regression analyses used to create the models. To help guide the vegetation risk characterization, pCu^{2+} levels corresponding to a range of effects were identified based on graphical analysis. The level of cupric ion activity is expressed as the negative logarithm of the activity (i.e., pCu^{2+}), similar to the way in which hydrogen ion activity is expressed as pH. Therefore, higher pCu^{2+} values indicate *lower* activity, and lower pCu^{2+} values indicate *higher* activity. Higher activity is generally associated with greater risk of toxicity.

Two benchmarks for vegetation risk were identified: a *de minimus* (i.e., negligible) effects level (DEL; $pCu^{2+} > 6$ to 7) above which no ecologically significant adverse effects are expected, and a probable effects level (PEL; $pCu^{2+} \leq 5$) below which the detection of adverse effects is considered probable. Adverse effects are possible for pCu^{2+} values between the DEL and PEL, but the ecological significance of such effects is less certain. The DEL and PEL are used in the H/WCIU ERA to characterize potential risks to the terrestrial plant community.

Terrestrial Wildlife

A detailed assessment of risks for all terrestrial wildlife receptors was provided in the Sitewide BERA. The conclusions drawn indicate that risks to wildlife receptors appear to be relatively restricted to the most contaminated areas of the Site immediately east of the smelter and northernmost tailings impoundments (within the S/TSIU) and at some locations along the Hanover and Whitewater Creek corridor (within the H/WCIU). Risks to ground-feeding birds appeared to be of potentially greatest concern based on risk from copper intake from ingested soils and food as well as cumulative risk from intake of other COPCs. Risk to small mammals was of second-greatest concern, but was substantially less than that estimated for ground-feeding birds. Individuals of larger and more mobile receptors such as ruminants, mammalian predators, and raptors appeared to be at relatively low risk. Overall, the Sitewide BERA indicated that local populations inhabiting the AOC or within sub-areas of the AOC could be affected in localized areas. No effects to regional populations of wildlife were predicted primarily because of the extensive areas adjacent to the Site that provide similar habitat.

The Sitewide BERA provided a range of soil screening levels (SSLs) for use in assessing copper risk to the small ground-feeding bird receptor. These values were utilized in the draft H/WCIU ERA document (NewFields 2008). Data collected subsequent to 2008 and negotiations conducted between NMED, USEPA, and CMC resulted in revisions to the benchmarks. The revised benchmarks were used in this assessment and are discussed in more detail in Section 3.

Risk estimates specific to H/WCIU are provided for all COPCs evaluated in the receptor-specific detailed analysis portion of the Sitewide BERA. Based on the revised benchmark effort, exposure models for the small ground-feeding bird have also been modified from the BERA in order to assess exposure to non-copper COPCs. For all other receptors and COPCs, the exposure models and toxicity reference values (TRVs) used in the Sitewide BERA are unchanged in this risk assessment.

Aquatic Life

Only surface water and sediment data were available for use in the Sitewide BERA. The report generally concluded that potential risks from cadmium, copper, lead, and zinc were predicted along the Whitewater Creek corridor and in Bolton Draw. However, it was noted that the habitat in these areas was highly limited, indicating that aquatic populations are also likely limited by the quality of aquatic habitat available.

Additional data were collected as part of the Phase I H/WCIU RI in order to address deficiencies in the spatial coverage of surface water and sediment data within Hanover Creek, Whitewater Creek, and several of the tributaries associated with Whitewater Creek. These data are used in this report to further characterize the potential for aquatic risk within the H/WCIU.

1.1.5 COPCs Evaluated in the H/WCIU ERA

The Sitewide BERA identified a list of COPCs that were assessed for each of the three main categories of assessment endpoints. These chemicals were identified as COPCs in the Sitewide BERA via the SLERA process that conservatively compared upper-bound concentrations to risk-based toxicity values. The COPCs evaluated in the Sitewide BERA are listed below and constitute the list of COPCs that were also evaluated in the H/WCIU ERA:

Terrestrial Vegetation as Wildlife Habitat

- Copper
- Hydrogen ion activity (pH), as a factor modifying copper toxicity

Terrestrial Wildlife

- Cadmium
- Chromium
- Copper
- Lead
- Molybdenum
- Selenium
- Zinc

Aquatic Receptors

- Cadmium
- Copper
- Lead
- Zinc

1.1.6 Data Used in the H/WCIU ERA

Data specific to the H/WCIU were collected or reviewed as part of the RI Background Report (CMC 1995), Hanover and Whitewater Creeks Phase I RI Report (Golder 2000), Ecological RI (Arcadis JSA 2001), sediment background investigation (Golder 2004), and recent data collected specifically to fill data gaps related to the H/WCIU ERA (Golder 2002, 2003, 2007, 2008). The most recent RI dataset (Golder 2008) was collected based on data needs identified for characterizing the nature and extent of contamination for the ERA. The primary ERA data needs were identified to (1) fill spatial data gaps for soil/sediment in the H/WCIU, particularly in overbank deposits in Hanover Creek, (2) obtain tissue samples (seeds, foliage, and invertebrate) in H/WCIU overbank areas, and (3) obtain additional water samples from streams and tanks (i.e., stock ponds). The ERA risk analysis includes all historical data evaluated in the BERA, and the data collected as part of the H/WCIU RI.

Data from shallow soil (0 to 6 inches below ground surface [bgs]), shallow sediment (0 to 6 inches bgs), surface water, above-ground foliage, seed head, and terrestrial invertebrate samples collected from a number of investigations were used to prepare the H/WCIU ERA, as shown on Figures 1.1-3 through 1.1-13. (Refer to Section 3, Figures 3.2-1 through 3.2-7 for maps with foliage, seed head, and invertebrate sampling locations.)

The following bullets provide an overview of the samples used in the H/WCIU ERA. Samples were collected from various investigations within the IU between 1995 and 2008. Unless otherwise noted, soil and sediment samples were collected from the 0 to 6 inch bgs depth interval and sieved to include the less than 2000 micron (µm) size fraction. The soils data from the less than 2000 µm size fraction were applicable for use in the ERA and are consistent with methodologies used in the Sitewide BERA. The smaller size fraction sampled for the human health soil samples as part of the Phase I RI represent the size fraction that would be most likely to adhere to human skin. While dermal exposure to wildlife receptors may be a pathway of exposure, it is generally considered to be of lower concern than ingestion pathways evaluated quantitatively in the Sitewide BERA. Soil samples from the larger size fraction are more likely to represent soils that wildlife receptors may be exposed to when grazing, browsing, or burrowing. At each summer rainfall pool location, samples were collected for (1) evaluation of the total metals fraction and (2) evaluation of the dissolved metals fraction after filtration at 0.45 µm.

- Background Remedial Investigation Report (BRI) (CMC 1995)

  Sediment samples were collected from active channel areas, tributaries, and tin can operations. Soil samples were collected from overbank deposits and composite soil samples were collected from yards in residential areas.

- Phase I RI (Golder 2000)

  Sediment samples were collected from active channels and tributaries. Soil samples were collected from channel bars, overbank deposits, and terraces. Analytical results were obtained for soil/sediment in the less than 250 µm and 250-2000 µm size fractions. A mass-weighted average was calculated for the less than 2000 µm fraction using the results from the other two fractions. Eleven summer rainfall pool samples were also collected as part of the Phase I RI.

  Eleven samples (seven sediment and four soil) were collected following a tailings spill event in November 1999 from the same locations where the Phase I RI samples had been collected. These samples were collected and analyzed following the same procedures as the Phase I RI samples, and the data were used in place of the pre-tailings spill samples (Golder 2000).

- Ecological RI (Arcadis JSA 2001)

  Nine soil samples were collected from overbank deposits in ephemeral drainages within the H/WCIU for use in the ERA.

- Technical Memorandum: Investigation of the Side Channel on Lower Whitewater Creek (Golder 2002)

  Channel transect composite sediment samples were collected from the Side Channel in November/December 2001. A subset of three sediment samples were subject to a modified Synthetic Precipitation Leaching Procedure (SPLP) and water soluble metals data were generated.

- Technical Memorandum: Supplemental Investigation of Lower Whitewater Creek (Golder 2003)

  Channel transect composite samples were collected from Lower Whitewater Creek in June 2003. Several soil samples were collected from upland and overbank areas. A total of 16 sediment samples were collected from active channel areas. A subset of nine samples was subjected to a modified SPLP and water soluble metals data were generated.

- Sediment Background Investigation (Golder 2004)

  Sediment samples were collected to determine background concentrations of Site COPCs.

- Technical Memorandum: Summer Rainfall Pool Sampling (Golder 2007)

  Samples were collected from summer rainfall pools throughout the H/WCIU in September 2006.

- Technical Memorandum: Data to Support Ecological Risk Assessment (Golder 2008)

  In September 2007, soil samples were collected from overbank deposits and vegetated channel bars, and channel transect composite sediment samples were collected from active channel areas. A subset of six active channel sediment samples were subject to a modified SPLP and water soluble metals data were generated. Eight additional summer rainfall pool samples were also collected.

  NewFields collected composite biota samples from locations in the H/WCIU in September and October 2007. Above-ground foliage, seed head, and terrestrial invertebrate samples were collected. In addition, NewFields collected five sediment grab samples from a visually impacted area of Lower Whitewater Creek.

- Terrestrial Invertebrate and Copper Bioavailability Study; Smelter/Tailings Soils Investigation Unit (Arcadis 2010)

  CMC submitted a technical memorandum addressing concerns related to changes in uptake of copper into invertebrate tissues in the S/TSIU related to an atmospheric deposition of calcium carbonate (the ‘white rain’ event) which took place in January 2008 over the entire Site. The effect of the rain was an increase in soil pH over a wide area. The pH increase coupled with several additional technical issues related to the calculation of the copper SSL prompted CMC to collect co-located soil and terrestrial invertebrate samples at 17 locations (14 of them original BERA sampling locations). CMC proposed a revised SSL for copper. The data collected for this task were not directly used in this report; however, the resulting changes to the bioaccumulation model and revised SSLs are used.

The local sources of contamination, transport pathways, and physical features differ along the H/WCIU, therefore, all discussions of data within the H/WCIU are presented by physical reaches as identified by Golder (2000, 2004). Because the physical reaches were not originally identified based on ecological exposure, several have been combined and several additional assessment areas have been defined.

Data were grouped as follows:

- Physical Reach 1 – Hanover Creek;
- Physical Reach 2 – Whitewater Creek upstream of Hanover Creek from Groundhog Mine to Bayard;
- Bayard Canyon – Within Bayard Canyon;
- Physical Reach 3 – Whitewater Creek from Bayard to Hurley;
- Physical Reaches 4 and 5 – Whitewater Creek from Hurley downstream to former TP-1;
- Physical Reaches 6 and 7 – Whitewater Creek from former TP-1 to TP-7;
- Physical Reaches 8 and 9 – Whitewater Creek from TP-7 to downstream of Highway 180;
- Side Channel – Whitewater Creek side channel area south of TP-7; and
- Lower Whitewater Creek – Whitewater Creek south of Highway 180 to near the San Vicente Arroyo.

All available soil/sediment and surface water sample locations are shown in Figures 1.1-3 through 1.1-13. The data resulting from the H/WCIU sampling are presented in Appendix A (Tables A-1 through A-6). As noted above, data from the ERI (within the boundaries of the H/WCIU) are also included in this assessment, as well as samples from the Sediment Background Investigation (Golder 2004).

Remediation of the former Groundhog Mine and its associated tailings have been conducted as interim remedial actions between 2003 and 2005. In 2011, stockpile material from the Groundhog Mine site was removed down to bedrock and hauled to the West Stockpile. The ERA sampling location ERA-32 and the surrounding area that ERA-32 represented were removed as part of the remediation. The area has been reclaimed and revegetated. The data reflecting these interim remedial actions was used as part of this assessment in place of the data from the former ERA-32 location. The ERA-32 data was replaced with the 95UCL of the post-remediation confirmation sampling as provided in the Groundhog Completion Report (Golder 2009) and in the Groundhog Completion Report Addendum (Golder 2011). All discussion of potential risks at ERA-32 reflects the risk following completion of the remediation in that area.

Physical Reach 5 has been dramatically altered in terms of channel configuration, watershed area, and potential ecological habitat to the point that the remnant channel sections that still persist function more as stormwater runoff channels. In addition, they are hydrologically disconnected from former seasonal flows within Whitewater Creek and subject only to highly ephemeral flows from the inactive tailings impoundments. Due to the extent of diversions, the expected potential ecological habitat in Physical Reach 5 has been reduced significantly, and would be more appropriately managed under the S/TSIU if not covered by a Discharge Permit.

The pertinent sampling locations within Physical Reach 5 are shown in Figure 1.1-6. Samples ERA-23, ERA-26, and U03-ER005 should be considered within the S/TSIU, while samples U03-5032, U03-5033, U03-1500B, U03-5034, and U03-3500 are within the pre-diversion Whitewater Creek channel and will not be considered further in this assessment. Finally, samples U03-5500, U03-5501, U03-5502, and U03-5503 were collected within the James Canyon reservoir which is considered by NMED as an operational area under Discharge Permit 214 and similarly will not be considered further in this assessment. As a result, risks from Physical Reach 5 are not discussed further in this document.

1.2 Organization of the H/WCIU ERA Report

This H/WCIU ERA relies heavily on detailed problem formulation presentations provided in the Sitewide BERA and TM-1, while focusing on the results of the H/WCIU RI sampling and the re-assessment of ecological risk in light of the greater resolution provided by the additional data. Risk analysis is grouped by assessment endpoint as follows:

- Section 2: Risk Analysis for Vegetation in the H/WCIU;
- Section 3: Risk Analysis for Terrestrial Wildlife in the H/WCIU;
- Section 4: Risk Analysis for Aquatic Receptors in the H/WCIU;
- Section 5: Uncertainties; and
- Section 6: Conclusions and Recommendations.

2.0 RISK ANALYSIS FOR VEGETATION IN THE H/WCIU

This section presents the H/WCIU risk analysis for the terrestrial vegetation assessment endpoint. As discussed in the Sitewide BERA, the primary contaminant sources in the H/WCIU are from fluvial transport of COPCs from source areas associated with historical mining operations, and dryfall directly from smelter emissions and windblown tailings (Figure 1.1-2).

The ephemeral drainage locations sampled as part of the ERI (Arcadis JSA 2001) were all in areas classified as fluvial forest shrubland alliance. However, the vegetation alliance bordering the ephemeral drainages is varied. Sites in portions of Whitewater Creek within the S/TSIU were largely bordered by mesquite/mixed grama areas, whereas more northern locations (ERA-28, ERA-29, ERA-30, ERA-34) were bordered by alligator-oak woodland or alligator-oak /grama Woodland communities. At most of the locations, trees and tall shrubs of the fluvial forest shrubland alliance were mainly restricted to the drainage bottoms, and the boundaries with adjacent upland communities were not well delineated.

As described in the Sitewide BERA and TM-1, the primary exposure pathway for terrestrial plants to COPCs in H/WCIU soil/sediment is through absorption or direct contact of roots with contaminated soils. The effects of Site conditions on the mobility and bioavailability of COPCs in soils are important considerations in the risk assessment. The geochemical behavior of metals and inorganics following deposition onto soils and sediments greatly affects their mobility, speciation, and bioavailability. Important geochemical reactions occur in soils that strongly affect the speciation of metals and the ease with which they are assimilated by plants. Most important is the pH of the immediate environment, and secondarily is the concentration of dissolved ligands. In acidic pH, most metals occur in solution as the free metal ion (e.g., Cu^{2+} or Pb^{2+}). As pH increases, the free metal ion bonds with dissolved ligands to form charged and uncharged dissolved complexes of varying stability and bioavailability (e.g., $CuSO_4^o$, $CuHCO_3^+$, $CuCO_3^o$, Cu-organic). Stable complexes exhibit substantially lower bioavailability, and hence lower toxicity, than weak complexes or the free metal ion. Depending on the pH, the proportion of metal complexes may comprise a significant portion of the total metal load in a system. Consequently, the total content of metals in soil and water can be less important than the abundance of the speciation and bioavailable fraction present.

Other factors that affect speciation and mobility include the presence of iron, aluminum, and manganese oxyhydroxides, organic carbon content, and clay content. These phases act as strong sorbents that remove metals from solution and render them unavailable to biota. For example, copper forms strong complexes with organic carbon compounds and forms relatively insoluble carbonate or oxide compounds above a pH of 5.5. As such, copper may be largely bioavailable in acidic soils that are low in organic carbon, and unavailable in neutral pH, clayey soils rich in carbonate and organic matter.

In the presence of sufficient soil alkalinity (usually as calcium carbonate) typical of New Mexico soils, metals such as cadmium, lead, and zinc can be removed from solution as carbonate minerals, such as otavite ($CdCO_3$), cerussite ($PbCO_3$), or smithsonite ($ZnCO_3$). Other inorganic constituents such as the metalloids arsenic, selenium, and molybdenum tend to form negatively charged oxyanions in soil solutions (e.g., AsO_4^{2-}, SeO_4^{2-} and MoO_4^{2-}) that are relatively immobile when the pH is less than 7, but become mobile under slightly alkaline pH (pH > 7). Most of the metal COPCs at the Chino Mine Site are very susceptible to adsorption to aluminum, iron, and manganese oxyhydroxide solids ("sesquioxides") in the soil zone. This is an extremely important removal mechanism because sesquioxides are abundant in New Mexico soils, and adsorption to these solids occurs even when COPC levels are below that required for metal precipitation.

Thus, metal bioavailability is dependent upon a complex combination of mineral content and pH of soils in affected areas. However, the overall most important factors for a given soil and contaminant type tend to be the total concentration and the pH. The vegetation risk analysis focused on these variables for assessing potential phytotoxicity and effects on vegetation.

2.1 Assessment Endpoint and Objective

The quality of vegetation within the ephemeral drainages associated with H/WCIU as wildlife habitat is the assessment endpoint addressed in this section (Table 1.1-1). Vegetation is critical as a food source and as physical habitat for wildlife. Various plant species have been shown to be sensitive to metals, including copper, and acidic pH in soils by exhibiting toxic responses when exposed. Metal toxicity to vegetation can alter the plant community composition and structure, which can result in decreased wildlife habitat and range quality. The assessment objective was to assess the risk that increased metal concentrations and depressed pH due to mine and mineral processing activities could adversely affect vegetation at the Site.

2.1.1 Bioavailable Copper

Bioavailable copper (as pCu^{2+}) appeared to be the best predictor of potential phytotoxicity in the Sitewide BERA. The predicted pCu^{2+} in each of the H/WCIU channel bar or overbank sediment samples was calculated using the 2-variable (pH and total copper) model for ephemeral drainages (Table 1.1-3). Predicted pCu^{2+} values are presented in Table 2.1-1.

The predicted pCu^{2+} is higher than 7 in 48 of 101 total H/WCIU surface soil samples (<2000 µm size fraction) collected from bar and overbank locations (excluding active sediment channel samples) throughout the IU. Values of pCu^{2+} greater than 7 indicate a lack of potential toxicity, while values less than 7 indicate increasing potential for toxicity. The predicted pCu^{2+} was within the DEL range (pCu^{2+} 6 to 7) in 14 samples while an additional 6 samples were between the minimum DEL (6) and the PEL (5). The potential for effects in the PEL range is unknown but should be considered to be greater than those soils with pCu^{2+} in the DEL range. Thirty-two samples had pCu^{2+} values predicted to be lower than the PEL. These areas represent the highest risk of adverse effects from copper and depressed pH, and some level of effects to community structure and/or plant growth is expected in these areas. As shown in Figures 2.1-1 through 2.1-8, pCu^{2+} values are predicted to be lowest (i.e., highest risk of toxicity) in Physical Reaches 3 through 8 in Whitewater Creek from Bayard to the southern end of the tailings impoundments, with the exception of Physical Reach 4 which contains only one sample at a predicted pCu^{2+} equal to 7.45.

Whitewater Creek in both the side channel and in several areas of lower Whitewater Creek is not highly channelized and sedimentation occurs over wide areas during flow events. While samples collected from these areas are labeled as active channel sediments, the sediments are likely very infrequently inundated and more closely resemble overbank terrace sediments. Estimated pCu^{2+} values from those sample locations are also provided in Table 2.1-1 and are shaded grey.

As previously discussed in Section 1.1.6, a significant area-wide ‘white rain’ event took place in January 2008. During this event, precipitation laden with a white milky substance, later identified as calcium carbonate, fell over the entire Chino Mine Site, including H/WCIU. The white rain event resulted in increased pH in soils within both the S/TSIU and H/WCIU (CMC 2010). CMC has implemented a pH monitoring plan in the S/TSIU to help assess the permanence of the pH increase. After the fourth year in a five-year study, measured pH values in soils have consistently either risen or remained similar in measured areas (Arcadis 2014).

2.2 Community Metric and Laboratory Phytotoxicity Testing

Results of the community assessment and laboratory phytotoxicity testing were presented in detail in the Sitewide BERA. No additional data for either of these two measures were collected as part of the H/WCIU RI. The results of community and laboratory testing as they relate to the H/WCIU are summarized in this section.

Statistical analyses in the Sitewide BERA indicated significant differences among phytotoxicity test endpoints of perennial ryegrass and alfalfa grown in Site soils compared to both reference area soils and laboratory control soils. There were also significant differences in toxicity endpoints among H/WCIU locations, which were correlated with bioavailable copper concentrations predicted by pCu^{2+} calculations and water-soluble copper (Table 2.1-1 and see BERA Table 2.2-3 for more details). Compared to controls, seedling emergence and survival was significantly reduced for ERA-29 (alfalfa emergence only), but no community effects were observed for this location (Table 2.2-1). No suitable reference areas for the ephemeral areas of H/WCIU were identified for the BERA, and so no quantitative comparisons between offsite and affected areas in the H/WCIU are available.

2.3 Terrestrial Vegetation Conclusions

The overall conclusions regarding risk to the vegetation assessment endpoint remain unchanged from the Sitewide BERA. Copper (and other metals) concentrations are elevated above the background range identified for the H/WCIU corridor (95th upper confidence limit [95% UCL] = 183 milligrams per kilogram [mg/kg]; Golder 2004) in most of the overbank and vegetated bar sampling locations. Soil pH is depressed in many areas, particularly downstream of Bayard. Toxicity testing conducted for the BERA showed phytotoxicity to laboratory test species in areas with elevated copper and/or depressed pH. Multiple areas with pCu^{2+} levels below the PEL lack vegetative cover and if vegetation exists, it is dominated by one or two species (e.g., Lower Whitewater Creek stations U03-11254, U03-11255, U03-11256 shown on Figure 1.1-11). Overbank areas, terraces, and other areas where vegetation is more likely to become established are of most concern in the vegetation risk analysis. Such areas, like the side channel area of lower Whitewater Creek, and significant terrace areas farther downstream, have low pH and/or high copper concentrations. Whitewater Creek sampling locations included areas that lack living vegetation or are lacking typical herbaceous vegetation.

As noted in the BERA, an adequate reference area for the ephemeral drainage vegetation community was not identified, so quantitative impacts based on field measurements were not assessed. However, data from the BERA indicate that phytotoxicity test endpoints, and field measurements of species richness were correlated with pCu^{2+}. The disturbance and land-use history of the various vegetated bars and overbank areas was highly variable, as was the apparent vegetation community. Thus, impacts to the vegetation community from chemical impacts are likely for areas with pCu^{2+} values below the PEL. In addition, locations along Hanover Creek may be subject to vegetation risk from cadmium, zinc, and lead.

To extrapolate results from the Sitewide BERA to locations not included in the ERA analysis, the PEL and DEL levels based on pCu^{2+} were used. Figures 2.1-1 through 2.1-8 show locations with pCu^{2+} levels below the PEL ($pCu^{2+} < 7$) where the risk of vegetation impacts is greatest. A substantial proportion of the locations in Physical Reaches 3 and 6, as well as the Side Channel breakout area and the Lower Whitewater Creek areas (primarily samples collected from the active channel as shown in Table 2.1-1) were associated with soil pCu^{2+} below the PEL. In some of these areas, particularly the Side Channel area and Lower Whitewater Creek, the lack of vegetation cover suggests that wildlife habitat quality could be adversely affected. However, without a reference area and quantitative evaluation of habitat quality at other locations, the loss of wildlife habitat function cannot be quantified. A detailed discussion of the uncertainties in the terrestrial vegetation analysis is provided in the Sitewide BERA. The discussion included in that document is directly applicable to this analysis. However, it is expected that these uncertainties affect the conclusions to a small degree given the high level of predictive ability of the pCu^{2+} model and the correlations between pCu^{2+} and phytotoxic effects.

In terms of the predictive power of pCu^{2+} in estimating effects on vegetation, additional consideration of the pH in test soils was conducted after the completion of the Sitewide BERA. In Figure 2.3-1 (Figure 2.5-1 from the Sitewide BERA), the laboratory test endpoints were plotted against the pCu^{2+} in the soil extracts used in ion-selective electrode measurements. Data are not available for pCu^{2+} in soil extracts from phytotoxicity test initiation and termination. So, pCu^{2+} was calculated based on copper and soil pH, using the pH measured by the phytotoxicity testing lab at test initiation and termination (Figures 2.3-2A and 2.3-2B). When these pCu^{2+} values are plotted against the test endpoints, results look somewhat different than when the extract data were used. When initiation pCu^{2+} values are used, the results could be interpreted as increasing the PEL from 5 to 6, based on the change in performance between tests at about 5.5 and 6. When termination pCu^{2+} values are used, they reveal a gap between pCu^{2+} 5 and 7 because pCu^{2+} results in this range either shift down to below 5 or up to 7. Selection of a PEL from these results is more difficult because of the gap in data between 5 and 7. However, they could indicate a higher PEL than previous estimates. The impact on the DEL is more apparent; the DEL could be shifted from 6-7 to 7-8. The PEL and DEL derived in the BERA were used in this assessment, but it may be necessary to determine if any community-level effects are present in areas with slightly higher pCu^{2+} than originally assumed.

Another important source of uncertainty is related to the use of non-native species in the laboratory toxicity tests. The regression slope and thresholds calculated using the laboratory phytotoxicity tests may change if native species were tested, but the degree and direction of change are unknown. At the time the studies were defined, investigators weighed the advantages and disadvantages of using native/acclimated plants versus standard test species, and the costs of doing both. Standard test species were used at the time of the investigation because their performance in laboratory tests, and responses to toxicants were well understood, and performance in tests using Site soils could be more definitively interpreted. Site plants are adapted to mineralized soils with elevated copper concentrations. However, copper concentrations in much of the H/WCIU corridor are elevated and pH depressed due to mining and mineral processing activities at the Site. Phytotoxic effects are apparent in the areas with highest concentrations and lowest pH, particularly in the downstream areas of Whitewater Creek. The levels of pCu^{2+} that were found to be associated with vegetation effects in the Sitewide BERA are clearly beyond those attributable to background copper concentrations or natural pH of the soil units present.

Finally, the effect of cattle grazing should also be considered in relation to community level effects on vegetation. No data showing the effect of cattle grazing in riparian areas with low pCu^{2+} versus ungrazed riparian areas with low pCu^{2+} are available. Qualitative observations within the Lower Whitewater Creek and Side Channel areas suggest that in the areas with low pCu^{2+} values there are visible differences in vegetation community structure and cover, but there is no apparent reason why grazing would be greater in those areas and would result in visible differences in vegetation. These qualitative observations support the effect of increased free copper on the vegetation community.

Additional community and/or laboratory phytotoxicity data from the H/WCIU could decrease the level of uncertainty in the extrapolation of results from the Sitewide BERA to the H/WCIU ERA. For example, additional data could be collected to verify the predictive ability of the pCu^{2+} model for community metrics at locations within the ephemeral drainages at the Site. In addition, updated soil pH measurements related to the effects of the 'white rain' event could also be collected to determine current soil pCu^{2+}. However, before additional testing is undertaken, it is recommended that the potential impacts on Site risk management decisions be considered to ensure additional data are necessary.

3.0 RISK ANALYSIS FOR TERRESTRIAL WILDLIFE IN THE H/WCIU

This section provides additional risk analysis for terrestrial wildlife to supplement the analyses conducted as part of the Sitewide BERA (NewFields 2005). As noted previously, H/WCIU Phase I RI data (Golder 2000) collected to evaluate the nature and extent of contamination provide data in areas of the H/WCIU that were not available for the Sitewide BERA. In addition, vegetation and invertebrate tissue samples were collected at several RI soil sampling locations to provide better spatial coverage for the exposure analysis provided in the Sitewide BERA.

The Sitewide BERA concluded that potentially unacceptable risk was observed for the small ground-feeding bird receptor, primarily due to elevated copper concentrations in soil, vegetation, and invertebrates. The BERA also indicated risks from several other COPCs to the small mammal receptor in the H/WCIU in areas upgradient of the former smelter location. Unacceptable risks to regional populations of wildlife were not predicted for any receptor, and localized populations of large and mobile receptors (e.g., ruminants and mammalian/avian predators) were predicted to be low.

For these reasons, the risk assessment in this document focuses on the small ground-feeding bird receptor and the small mammal receptor rather than the full suite of receptors that were evaluated in the BERA. Both of these receptors are important because they are significant food chain species as prey items for larger predators, and are good indicators for potential risk because they live in close contact with potentially contaminated soils and feed mainly on species that are potentially the most contaminated food items in the H/WCIU (i.e., terrestrial invertebrates and plants).

The ecotoxicologically-based SSLs generated in the Sitewide BERA were used as the primary tool for evaluating risks for the H/WCIU in the initial draft of this ERA (NewFields 2008). Since then, CMC completed additional sampling of terrestrial invertebrates and conducted Site-specific bioavailability testing on copper to supplement the available data and to evaluate the potential effects of the ’white rain’ event, moisture content, and bioavailability on exposure (Arcadis 2010). Based on a review of the additional data, NMED recalculated the benchmarks for the S/TSIU (NMED 2011). These recalculated benchmarks are also applicable for the H/WCIU. A detailed discussion of the recalculation of the copper benchmarks is provided in Section 3.3 and mirrors the recalculation done for the S/TSIU.

In addition to the screening levels developed in the Sitewide ERA, USEPA EcoSSL values are now included in the assessment (Section 3.4). These values provide additional high quality screening levels for COPCs, other than copper, which did not have SSLs calculated in the Sitewide BERA.

Data on metal concentrations in vegetation and invertebrates are also used to generate exposure analyses for areas not evaluated in the Sitewide BERA, including the Side Channel breakout area and Lower Whitewater Creek areas that were not sampled in the ERA field program.

3.1 Soil Exposure Point Concentrations

For comparison of soils concentrations to benchmarks, statistical values to represent exposure point concentrations (EPCs) were calculated using two software packages. The 95th percentile EPC, as used in the Sitewide BERA, was calculated using Number Cruncher Statistical Systems (NCSS 2007), while a 95% UCL on the mean was calculated using ProUCL (USEPA 2011). Summary statistics were calculated using only data from the H/WCIU surface soils (<2000 µm), overbank sediments, and channel bar sediments for the seven COPCs that were addressed in the detailed risk characterization portion of the Sitewide BERA. Table 3.1-1 presents statistical values both for the entire IU and for each grouping of data by Physical Reach as discussed in Section 1.1.6.

3.2 H/WCIU Biota Tissue Sampling Results

Samples of vegetation, invertebrates, reptiles, birds, and small mammals were collected as part of the ERI and used in the Sitewide BERA to assess risks to wildlife. BERA samples were also collected from a small number of overbank areas and channel bars adjacent to Hanover Creek that were selected to be representative of these geomorphic features in the IU and were included in the modified gradient sampling and risk analysis, but were limited in spatial extent. To supplement the risk analysis for this H/WCIU ERA, vegetation and invertebrate tissue samples were collected from a subset of soil sampling locations in Hanover Creek (Physical Reach 1), Lower Whitewater Creek and in the Side Channel area.

The primary food items for the small ground-feeding bird and the small mammal receptors are assumed to be vegetation (both seeds and foliage) and terrestrial invertebrates. As a result, supplemental tissue sample collection was limited to those three tissue types. These samples were collected to augment the existing tissue database as well as to provide data from several areas within the IU that were not represented in the data collected for the ERI. Tissue data collected in 2007 are shown in Figures 3.2-1 through 3.2-7.

3.3 Copper Risk Analysis

The SSLs provided in the BERA were calculated for the No-Observed-Adverse-Effects Level (NOAEL) and Lowest-Observed-Adverse-Effects Level (LOAEL) TRVs based on Hazard Quotients (HQs) from 1 to 100, and bioavailability assumptions of 10 to 100 percent. The range of SSLs was calculated to provide risk managers with an evaluation of the effects of bioavailability and toxicity levels on potential risk management decisions (see Table 5.2-1 of the Sitewide BERA).

After completion of the Sitewide BERA, an alternative risk-based concentration (RBC) was calculated for the S/TSIU based on data provided by CMC regarding both the exposure model for the small ground-feeding bird and on the uptake of copper into terrestrial invertebrates and the relative bioavailability of copper from soils to the small ground-feeding bird receptor (CMC 2010).

The recalculated RBC is equal to 1,114 mg/kg (Table 3.3-1). In addition, NMED provided CMC with a pre-FS Remedial Action Criterion (pre-FS RAC) for the S/TSIU for copper equal to 1,600 mg/kg. The pre-FS RAC value is included in the analysis below as an additional comparison point for the H/WCIU ERA.

The RBC and pre-FS RAC values were used along with copper concentrations in soils to calculate HQs associated with the H/WCIU data. The 95th percentile EPC for copper in the H/WCIU RI soil samples is equal to 1,300 mg/kg (Table 3.3-2). When compared to the RBC and S/TSIU pre-FS RAC, the corresponding HQs (Table 3.3-2) are 1.2 and 0.8, respectively.

The 95% UCL was not used as an EPC in the Sitewide BERA due to the non-random nature of sampling (NewFields 2005). However, data were collected using a more traditional approach for the H/WCIU Phase I RI which makes the 95% UCL an appropriate EPC for risk assessment purposes. The 95% UCL (calculated with ProUCL, USEPA 2011) equaled 743 mg/kg and resulted in HQs equal to 0.7 and 0.5 for the H/WCIU recalculated RBC, and the S/TSIU RAC, respectively. Table 3.3-1 presents the HQs based on comparisons to RBC and pre-FS RAC for each sampling location. Figures 3.3-1 through 3.3-9 show the relative distribution of copper concentrations in soil to risk based copper benchmarks calculated for the small ground-feeding birds at H/WCIU RI sampling locations (soil samples only).

The 95th percentile soil copper concentrations within the physical reaches or physical reach groupings had HQs greater than or equal to 1.0 using the RBC and pre-FS RAC in Physical Reach 3 (RBC only) and Physical Reach 4 (Table 3.3-2). Copper concentrations were highest at one location within Physical Reach 4 where copper was detected at 2,384 mg/kg and exceeded both benchmarks. However, available data within Physical Reach 4 were limited and insufficient to calculate a 95% UCL (Table 3.1-1).

The RBC and S/TSIU pre-FS RAC are expressed as copper concentrations in soils and can be used to assess risk on the basis of soil data alone. However, data on copper concentrations (and other COPCs) in biota are available for a subset of locations. For these locations, intake of COPCs from food ingestion can be calculated for the receptors and compared to ingestion-based TRVs. HQs were calculated using the model presented in Appendix B. Because all of the invertebrate tissue data collected in H/WCIU were reported on a fresh weight basis, the fresh weight food ingestion rate (0.918 kg/kg body weight per day [BW/day]) was used for the portion of the diet ingested as invertebrates. The dry weight ingestion rate (0.287 kg/kg BW/day) was used for seed and soil exposure estimates.

Table 3.3-3a presents exposure and HQs calculated assuming a diet of 70% invertebrates and 30% seeds, while Table 3.3-3b presents exposure and HQs calculated assuming a diet of 100% invertebrates. Soil concentrations for the 2008 tissue sampling locations were calculated by taking the average copper concentration of the overbank samples (Golder 2008) in each area as the soil EPC. The HQs calculated using tissue data are shown in Figure 3.3-10. Soil copper concentrations in all of the locations presented in Tables 3.3-3a and 3.3-3b are less than both the pre-FS RAC and RBC.

As shown in Tables 3.3-3a and 3.3-3b, LOAEL HQs greater than or equal to 1.0 using Site-specific tissue data were calculated for copper at location B45.8-W in Physical Reach 1, ERA-28 in Physical Reach 3, SC-2 in the Side Channel, and LW-04A and LW-07A in Lower Whitewater Creek.

3.4 Additional COPCs

No unacceptable risks to any receptors from any COPCs other than copper were predicted in the Sitewide BERA. For that reason, no additional SSLs were reported in that document. Table 3.1-1 presents a comparison of the 95th percentile concentrations of each of the seven COPCs (upland soils only) discussed in the detailed risk analysis of the Sitewide BERA to the H/WCIU RI-specific soil samples.

Additional soil samples for the H/WCIU (Golder 2008) became available after the Sitewide BERA had been completed. For the expanded set of H/WCIU soil samples, the 95th percentile concentrations of cadmium, chromium, lead, and zinc were all significantly higher than the 95th percentile concentrations evaluated as part of the Sitewide BERA. This indicates that the risk characterization in the Sitewide BERA may not be an adequate representation of risks for wildlife receptors inhabiting the riparian areas of the H/WCIU.

The H/WCIU 95th percentile and 95% UCL soil concentrations of cadmium, chromium, lead, and zinc were compared to USEPAs Ecological Soil Screening Levels (EcoSSLs) (USEPA 2005) to determine if they exceed the conservative screening-levels made available since the completion of the BERA. The concentrations provided in Table 3.1-1 consistently exceed the lowest EcoSSLs for cadmium (0.36 mg/kg), lead (11 mg/kg) and zinc (46 mg/kg). These COPCs were carried forward in the H/WCIU ERA for further assessment.

95th percentile chromium concentrations shown in Table 3.1-1 were slightly higher than the avian EcoSSL (26 mg/kg) in Physical Reach 2 (26.1 mg/kg) and Physical Reach 3 (28.4 mg/kg) but never exceeded the mammalian EcoSSL (34 mg/kg). 95% UCL concentrations did not exceed the EcoSSL in any physical reach or Sitewide.

As shown in Table A-3, soil concentrations of chromium exceeded only the avian EcoSSL in one sample in Physical Reach 2. The maximum detected concentration of chromium (U03-4314 = 32.4 mg/kg) resulted in an HQ equal to 1.2 based on the avian EcoSSL, and 0.9 based on the mammalian EcoSSL.

Given the low number and magnitude of exceedances of the conservative EcoSSL, chromium was not considered further as a wildlife COPC in the H/WCIU and risks from chromium are considered to be low.

Concentrations of molybdenum and selenium in H/WCIU soils, as a whole or in any physical reach, were not greater than those evaluated in the Sitewide BERA and, therefore, pose no unacceptable risk as concluded in the Sitewide BERA Report (NewFields 2005).

Risks to small ground-feeding birds and small mammals from exposure to cadmium, lead, and zinc are considered further in the following sections.

3.4.1 Cadmium

The 95th percentile and 95% UCL concentrations of cadmium within H/WCIU soils were equal to 5.64 and 2.01 mg/kg respectively, versus the 3.22 mg/kg calculated Sitewide in the BERA. The 95th percentile and 95% UCL soil concentrations in Physical Reaches 1 (7.7/5.76 mg/kg), 2 (4.6/4.2 mg/kg) and 3 (4.62/2.26 mg/kg) were all greater than the 95th percentile for the Sitewide BERA except the 95% UCL in Physical Reach 3. EPCs within all other areas were less than calculated for the Sitewide BERA and, therefore, are predicted to be of similarly low risk for unacceptable effects to the wildlife inhabiting those areas.

Concentrations were highest within Physical Reaches 1 and 2 and are expected to be associated with historic lead/silver/zinc mines and mineral processing activities both upstream of (i.e. background) and within those reaches (e.g., Groundhog Mine and Blackhawk Tailings, shown on Figure 1.0-1).

The relationships between cadmium concentrations in soils and concentrations in food items (foliage, seeds, and invertebrates) were evaluated and are presented in Appendix C. The exposure parameters, exposure estimation methodology, and toxicity reference values are provided in Appendix B. Some of the parameter values that were originally identified in the initial planning stages of the BERA have been changed based on new information that became available since the beginning of the project, and use of Site-specific data to refine estimates.

The best-fit models for estimating cadmium concentrations in biota based on concentrations in soils were identified for each forage/prey type. These models were then used to estimate exposure and risk to the small ground-feeding bird (Table 3.4-1) and the small mammal (Table 3.4-2) at soil sampling locations for which no biological tissue samples were available. HQs were calculated for individual locations to help identify areas of the Site contributing most to risk estimates for each of the physical reaches.

HQs less than 1.0 were calculated at all soil sampling locations and at 95th percentile and 95% UCL soil concentrations for both receptors indicating that risk to wildlife inhabiting the H/WCIU from exposure to cadmium is low.

3.4.2 Lead

Upper bound soil lead concentrations within the H/WCIU (95th percentile = 521.5 mg/kg and 95% UCL = 244.5 mg/kg) greatly exceeded the 95th percentile soil concentration calculated in the Sitewide BERA (40.9 mg/kg; Table 3.1-1). Concentrations were highest within Physical Reaches 1, 2, and 3 as well as in Bayard Canyon, and likely represent influence from upstream (i.e. background) sources and/or from the former Groundhog Mine at which remedial activities have been conducted.

The 95th percentile and 95% UCL concentrations within the three northernmost Physical Reaches were 840.7/504 mg/kg, 1,280/1,303 mg/kg and 389.5/228 mg/kg, respectively (Table 3.1-1). The lead concentrations in the three upland samples from Bayard Canyon were equal to 316 mg/kg, 551 mg/kg, and 1,836 mg/kg, respectively (Table 3.4-3).

As described for cadmium, the relationships between lead concentrations in soils and food items were evaluated (Appendix B) and the best-fit models for estimating concentrations in each food type were identified. These models were then used to estimate exposure and risk to both the small ground-feeding bird (Table 3.4-3) and the small mammal (Table 3.4-4) receptors at each soil sampling location within the H/WCIU. As discussed in the previous section, details of the exposure and risk calculations are provided in Appendix B.

For the small ground-feeding bird receptor, HQs calculated using the NOAEL TRV were greater than or equal to 1.0 at 12 soil sampling locations within the H/WCIU. HQs calculated using the LOAEL TRV were greater than 1.0 at three soil sampling locations: one location in Physical Reach 1 (U02-5003; HQ = 1.6), one location in Physical Reach 2 (ERA-32 area; HQ = 2.0), and one location in Bayard Canyon (U03-3004; HQ = 1.9).

The 95th percentile and 95% UCL soil concentrations in each of the physical reaches was also used to estimate exposure and to calculate HQs for the small ground-feeding bird (Table 3.4-3). NOAEL HQs greater than 1.0 were calculated in Physical Reaches 1, 2, and 3 (95th percentile only); but only Physical Reach 2 had LOAEL HQs greater than 1. An insufficient number of samples were available within Bayard Canyon to calculate a 95th percentile soil concentration.

No HQs greater than 1.0 were calculated for the small mammal receptor.

3.4.3 Zinc

Concentrations of zinc in soils within the H/WCIU exceeded those observed and assessed in the Sitewide BERA (Table 3.1-1). The 95th percentile and 95% UCL of soil zinc concentrations in all H/WCIU samples (2,207/791 mg/kg) were considerably higher than the 95th percentile concentration (92 mg/kg) calculated and assessed in the Sitewide BERA. Similar to lead, zinc concentrations are elevated within Physical Reaches 1, 2, and 3 with 95th percentile and 95% UCL concentrations equal to 3,148/2,238 mg/kg, 986/728 mg/kg and 1,498/849 mg/kg, respectively. These elevated concentrations likely represent influence from upstream (i.e. background) sources and/or from the former Groundhog Mine at which remedial activities have been conducted.

Best-fit models for estimating zinc concentrations in each food type were identified as described for cadmium and lead. These models were then used to estimate exposure and risk to both the small ground-feeding bird (Table 3.4-5) and the small mammal (Table 3.4-6) receptors at each soil sampling location within the H/WCIU. As discussed in the previous section, details of the exposure and risk calculations are provided in Appendix B.

For the small ground-feeding bird receptor, NOAEL HQs greater than 1.0 were calculated in every sample, but no sample had a LOAEL HQ greater than 1.0. Similarly, all NOAEL HQs calculated using the 95th percentiles and 95% UCLs were greater than 1.0, but corresponding LOAEL HQs were all less than 1.0.

For the small mammal receptor, NOAEL HQs greater than 1.0 were calculated at one location in Physical Reach 1 (U02-3100; HQ = 1.3). No location had a LOAEL HQ greater than 1.0. 95th percentile and 95% UCL concentrations all resulted in NOAEL HQs less than or equal to 1.0.

3.4.4 Risk Calculations at Locations with Tissue Data Available

Cadmium, lead, and zinc risks were also estimated using the available tissue data and the same risk model as discussed in the previous section (Tables 3.4-7 and 3.4-8). For those locations lacking seed data (Lower Whitewater Creek and the Side Channel area), foliage tissue concentrations were substituted for seed tissue concentrations. For areas where paired soil and tissue samples were not available, the average soil concentrations from nearby sampling locations were used to represent the soil exposure portion of the HQ calculation. Drinking water was not included in the HQ calculations because it was an insignificant contributor to total exposure in the Sitewide BERA, and was not available in the immediate vicinity of most locations sampled in 2007. It is possible that some individuals could experience prolonged seasonal exposure to certain drinking water sources with high COPC concentrations. This is a potential source of uncertainty, as is it unclear where such exposure would occur.

For cadmium, no HQs greater than 1.0 were calculated for either receptor at locations where tissue data were available.

For lead, NOAEL HQs calculated for the small ground-feeding bird receptor were greater than 1.0 in Physical Reach 1 (two locations), Physical Reach 2 (one location), and in Bayard Canyon (one location) and LOAEL HQs calculated for the small ground-feeding bird receptor were greater than 1.0 in Physical Reach 2 (Table 3.4-7). Risks calculated in Physical Reach 2 may, however, be overstated. Soil data for the ERA-32 area were replaced by post-remediation data; however, no post-remediation data were available for tissues. It could be reasonably expected that tissue concentrations and risk are lower following the remediation in that area than are reflected in the data used in Table 3.4-7. For the small mammal receptor, all HQs calculated for lead were less than 1.0.

For zinc, at locations where tissue data were available, NOAEL HQs for the small ground-feeding bird receptor were calculated at all locations except LW-05-A in Lower Whitewater Creek. However, LOAEL HQs calculated for the small ground-feeding bird were all less than 1.0. All small mammal HQs were less than 1.0.

3.5 Terrestrial Wildlife Conclusions

Soils in overbank areas and vegetated channel bars along the H/WCIU contain widely varying concentrations of metals. Concentrations of cadmium, copper, lead, and zinc exceed screening levels in Physical Reaches 1, 2, 3, 4 and in Bayard Canyon.

For cadmium, no HQs greater than 1.0 were calculated for either receptor using tissue concentrations or soil concentrations, indicating that risk to wildlife inhabiting the H/WCIU from exposure to cadmium is low.

For lead, NOAEL HQs for the small ground-feeding bird receptor in Physical Reaches 1, 2, 3, and in Bayard Canyon were greater than 1.0. The LOAEL HQ for Physical Reach 2 calculated using the 95th percentile and 95% UCLs (1,280/1,303 mg/kg) was also greater than 1.0 (HQ = 1.4). LOAEL HQs calculated using soil data were also greater than 1.0 for the small ground-feeding bird receptor at one location in Physical Reach 1 (U02-5003; HQ = 1.6), one location within Physical Reach 2 (ERA-32 area; HQ = 2.0), and one location in Bayard Canyon (U03-3004; HQ = 1.9). At sampling locations where tissue data were available, only the ERA-32 area had a LOAEL HQ greater than 1.0 for the small ground-feeding bird (HQ = 2.0).

The soil lead concentration at U02-5003 was equal to 1,470 mg/kg and in the ERA-32 area was equal to 1,890 mg/kg. Based on these results the potential for unacceptable risk exists within Physical Reaches 1 and 2, particularly in soils with total lead concentrations exceeding 907 mg/kg based on the RBC calculated using the Bioaccumulation Factor (BAF) models presented in Appendix C to solve for a LOAEL HQ equal to 1.0.

For zinc, NOAEL HQs greater than 1.0 were calculated at every sampling location using both tissue concentrations and soil concentrations indicating that the NOAEL TRV may be too conservative to predict potential risk to the small ground-feeding bird receptor. No LOAEL HQs greater than 1.0 were calculated for either receptor using tissue or soil concentrations.

As discussed in the previous section, risks calculated in Physical Reach 2 using tissue data may be overstated due to the lack of post-remediation tissue data.

Based on these results, the potential for unacceptable levels of risk to the small ground-feeding bird receptor appear to be highest in association with areas where soil zinc concentrations exceed 4,800 mg/kg based on the RBC calculated using the BAF models presented in Appendix C to solve for a LOAEL HQ equal to 1.0.

For copper, the RBC and pre-FS RAC developed for the S/TSIU were the benchmarks used to assess risk to wildlife receptors. The RBC was exceeded at eight locations and the pre-FS RAC was exceeded at only two locations (Table 3.3-1).

Where tissue data were available for estimating exposure, and assuming a diet consisting of 70% invertebrates and 30% seeds, LOAEL HQs greater than or equal to 1.0 were calculated at (B45.8W) in Physical Reach 1, at ERI location ERA-28 in Physical Reach 3, and at LW-04A and LW-07A within Lower Whitewater Creek. In those cases, soil copper concentrations were less than the 1,114 mg/kg RBC.

Two locations (ERA-22 and ERA-28) had soil copper concentrations approximately equal to the 1,114 mg/kg RBC, and biota tissue data available for estimating exposures. A LOAEL HQ equal to 1.3 was calculated at ERA-28 and 1.1 for ERA-22. These results indicate that the RBC is a reasonable estimator of risk to the small ground-feeding bird and that sampling locations containing copper in excess of 1,114 mg/kg may be considered to pose unacceptable levels of risk to the small ground-feeding bird.

Because copper concentrations were generally higher in invertebrates than plants, a diet consisting of 100% invertebrates results in higher HQs. LOAEL HQs greater than 1.0 using the 100% invertebrate diet were calculated for locations with copper concentrations ranging from 196.6 mg/kg in the Side Channel area to 1,120 mg/kg in Physical Reach 3. While these results show uncertainty in the risk model, it is likely that the RBC is a reasonable indicator of risks to the small ground-feeding bird receptor. Tissue data were not available from any location with soil copper concentrations greater than the pre-FS RAC (1,600 mg/kg).

Areas of the H/WCIU that are found to have soil copper concentrations greater than the 1,114 mg/kg RBC should be considered as having an increased potential for risk of effects to small ground-feeding birds. Areas of the H/WCIU found to have copper concentrations in excess of 1,600 mg/kg should be considered to be the areas of highest risk to small ground-feeding bird populations and the birds inhabiting these areas may be exposed to copper levels that exceed the LOAEL dose, especially species that are resident to these areas and/or nest there.

No data on population size, nesting success or individual level effects are available for the Site to confirm whether adverse effects are occurring. Some adverse effects on some individuals seem likely, but the overall effect on the assessment endpoint is unclear.

4.0 RISK ANALYSIS FOR AQUATIC RECEPTORS IN THE H/WCIU

Overall, aquatic habitat at the Chino Mine Site is limited and is dominated by non-perennial drainages, stock tanks, and a few natural springs. The H/WCIU also has limited intermittent and perennial or long-term aquatic habitats. Surface water runoff in response to seasonal monsoon precipitation forms temporary pools along the drainages that provide habitat for a limited number of species adapted to such conditions. Therefore, the data collection and ecological risk analysis for H/WCIU focused on surface water and sediment conditions in these pools. The Sitewide BERA indicated that potentially unacceptable risks are present for aquatic biota in temporary pools along the Hanover and Whitewater Creek corridors. The COPCs of greatest concern were cadmium, copper, lead, and zinc.

4.1 Surface Water

The H/WCIU ERA surface water dataset is provided in Appendix A, Tables A-1 and A-2. Table 4.1-1 presents surface water data for cadmium, chromium, copper, lead, molybdenum, selenium and zinc compared to amphibian TRVs (Harfenist et al. 1989; Schafer 1999a), Chiricahua leopard frog (*Lithobates* = *Rana chiricahuensis*) toxicity values (Little and Calfee 2008), and acute and chronic New Mexico Water Quality Criteria (NMWQC) (20.6.4 NMAC), and acute criteria developed on an approach by the Arid West Water Quality Research Project (AWWQRP 2006). The following describe the sources and context for the screening levels used in Table 4.1-1.

As is the case through much of the Chino Mine Site, aquatic components of the ecosystem in the H/WCIU are limited to ephemeral, intermittent and generally non-perennial streams. Ephemeral streambeds are above the regional water table and typically only flow in direct response to runoff events from precipitation. Flow in intermittent stream segments is more extended at certain times of the year, such as when the stream receives seasonal flow from localized groundwater flows and runoff events. At different times of year, both of these conditions exist in various parts of Hanover Creek, Whitewater Creek, and Bayard Canyon. Aquatic habitat in the H/WCIU is predominantly composed of temporary pools and non-perennial sections of Hanover Creek, Bayard Canyon, Lucky Bill Canyon, Whitewater Creek, and the Side Channel area of Whitewater Creek south of the tailings impoundments. Temporary pools along these reaches can persist for several weeks or longer (Golder 2007). Several stock ponds are also present in Lower Whitewater Creek and represent a more permanent source of water and aquatic habitat than the drainages.

For regulatory purposes, both the chronic and acute NMWQCs apply to surface waters classified as perennial or intermittent with a designated, existing or attainable use of “aquatic life” (i.e., permanent aquatic habitat). In cases typical of the southwestern part of the state with ephemeral water bodies where the designated use is defined as “limited aquatic life,” only the acute NMWQCs may be applicable for purposes of compliance with state water quality standards. However, no formal hydrologic classification according to NMED’s Hydrology Protocol in the H/WCIU drainages has been conducted. For risk assessment purposes, comparisons to both acute and chronic criteria are used as screening values. All sample locations are shown in comparison to the NMWQCs on Figures 4.1-1 through 4.1-3.

The NMWQCs were developed from federal nationwide acute water quality criterion (AWQCs) which are based on toxicity data from a wide range of freshwater taxa. Some of the taxa used in the nationwide AWQCs are almost certainly not present in permanent or non-perennial aquatic environments at the Chino Mine Site. If the taxa that are present at the Site are more tolerant of exposure to the metal COPCs evaluated for the H/WCIU ERA, then using the NMWQC as a benchmark may overestimate risk. USEPA (1994, 2013) provides guidelines for recalculating the water quality criteria for the assemblage of species that are present at a given site.

The AWWQRP used this approach to recalculate criteria for cadmium, copper, and zinc in effluent-dominated streams based on species that are more likely to be present in streams of the desert southwestern United States. The investigators examined the database of current species used to derive the ambient water quality criteria for a series of metals. The taxa included in the recalculation process were fish and invertebrates that are more representative of various waterbodies in the study areas. Databases were also augmented with new data not previously included in the AWQC documents. The revised databases were then used to derive acute and chronic water quality criteria according to the methods of Stephan et al. (1985).

For the purposes of the ecological risk assessment, revised acute and chronic criteria were recalculated for the H/WCIU for cadmium, copper, and zinc. This recalculation was conducted only for the H/WCIU ERA, and the recalculated benchmarks do not represent changes to state water quality standards. A detailed discussion of the methodology and the results of the recalculation are shown in Appendix D. Copper criteria based on southwestern stream taxa are substantially greater than the criterion calculated based on the national database, resulting in a less restrictive criterion. Recalculated cadmium and zinc criteria were also higher, but by lower amounts relative to existing AWQCs. The potential effects of alternative criteria for copper and zinc on interpretation of potential toxicity are discussed under the applicable sections below.

Additional water quality-based TRVs were included for amphibians, because their life cycle and potential sensitivity may differ from invertebrates and fish that are typically the basis for the NMWQCs. Amphibians potentially present are mostly limited to species that require water only for breeding and are either terrestrial as adults or can burrow into the mud as breeding pools begin to dry. Species potentially present in the project vicinity include the red-spotted toad, Great Plains toad, southwestern toad, Woodhouse’s toad, Couch’s spadefoot toad, New Mexico spadefoot toad, and plains spadefoot toad (Williamson et al. 1994). The tiger salamander and canyon treefrog are also potentially present.

The Chiricahua leopard frog (*Lithobates = Rana chiricahuensis*) is listed as a federal threatened species by the U.S. Fish and Wildlife Service (USFWS) (67 FR 40790). The 2007 USFWS recovery plan cites small populations present in some areas of the Chino Mine property including Brown Spring, in Bolton Canyon, Ash Spring, Apache Tank, "and perhaps in Lucky Bill Canyon". Lucky Bill Canyon drains directly to Bayard Canyon, but is primarily upstream of most recent mining areas in the H/WCIU. Populations on other parts of the Chino Mine property including West Lampbright, Main Rustler, West Rustler, and Martin canyons are likely extinct due to chytridiomycosis (USFWS 2007). Therefore, the presence of Chiricahua leopard frogs in the H/WCIU is not known and has not been documented in surveys conducted to date. Screening of water and sediment concentrations for toxicity is included in the analysis below, but is only relevant if the presence of the Chiricahua leopard frog is confirmed and NMED or other regulatory agencies need information to manage risk to this listed species.

General TRVs for amphibians are available from Harfenist et al. 1989. In addition, the U.S. Geological Survey (USGS) (under contract to the USFWS) completed a study of the effects of copper and several other contaminants on larvae of the Chiricahua leopard frog (Little and Calfee 2008).

No-observed-effect concentrations (NOECs) and lowest-observed-effect concentrations (LOECs) were available from Little and Calfee (2008) for cadmium, copper, and zinc (Table 4.1-2). The benchmarks used for comparison to surface water data in Table 4.1-1 represent the geometric mean NOEC and LOEC from the growth, development, and survival endpoints provided in Little and Calfee (2008), adjusted for Site-specific water hardness. The values were adjusted for hardness using the same assumptions that are specified for adjustment of NMWQCs for these metals (20.6.4.900.I NMAC); however, there is uncertainty in the adjusted values due to the potential effects of differences between laboratory water parameters and those found in H/WCIU waters.

4.1.1 Cadmium

Dissolved cadmium was detected in 24 of 29 total samples. The amphibian no-effect TRV (0.004 milligrams per liter [mg/L]) was exceeded in 13 samples. The recalculated acute criterion was exceeded at two locations: B-Ranch (2006 sample) and U03-9600 (1999 sample) (Table 4.1-1). The chronic NMWQC was exceeded in 22 samples and the recalculated chronic criterion was exceeded in 10 samples. The two highest non-qualified results were detected at B-Ranch and U03-9600 (0.034 and 0.037 mg/L, respectively). These locations also had the highest concentrations of dissolved copper and zinc.

The Chiricahua leopard frog study (Little and Calfee 2008) showed no lethal effects at the highest dose, but weight gain and developmental endpoints were affected at 0.11 mg/L (LOEC). No effects were noted for any endpoint at 0.019 mg/kg (NOEC) for dissolved cadmium. The geometric mean NOEC and LOEC were equal to 0.039 and 0.11 mg/L respectively (at 102.9

mg/L hardness). Neither the geometric mean NOEC nor LOEC (converted using Site-specific hardness) were exceeded in any of the summer rainfall pool samples.

4.1.2 Chromium

Chromium was detected in two samples, U03-9900 and B-Ranch, and the amphibian no-effect TRV (0.003 mg/L) was exceeded at sampling location U03-9900. No NMWQC were exceeded at either location. Detection limits exceeded the amphibian TRV at several locations. No CLF-specific benchmarks were available for chromium.

4.1.3 Copper

Dissolved copper was detected in all summer rainfall pool samples. Upstream of the Lucky Bill/Bayard Canyon confluence, copper concentrations in WWC-38.1 exceeded the recalculated acute and chronic criteria, the acute and chronic NMWQC, the amphibian no-effect TRV (0.02 mg/L); dissolved copper concentration in sample U03-9000 exceeded the chronic criteria. Concentrations at all locations except LWWR-Ranchers Pond downstream of the Lucky Bill/Bayard Canyon confluence exceeded the recalculated acute and chronic criteria as well as the acute and chronic NMWQC. The two highest copper concentrations were detected at locations Grunerud-1 (1.22 mg/L) and B-Ranch (2.34 mg/L) in Whitewater Creek upstream of Hurley, which also had the two lowest recorded pH values (4.6 and 4.2 SU, respectively).

The general amphibian TRV was exceeded at all locations downstream of the Lucky Bill/Bayard Canyon confluence. The general TRV represents a no-effect level for successful metamorphosis in frogs (Porter and Hakanson 1976, as cited in Harfenist et al. 1989). Fort and Stover (1997, as cited in Pauli et al. 2000) observed abnormal limb development in frogs at copper concentrations above 0.5 mg/L. Dissolved copper was detected above 0.5 mg/L in five summer rainfall pool samples at two locations from the Phase I RI sampling event (U03-9302 and U03-9600) and at three locations from the Golder (2007) sampling event (B-Ranch, Grunerud-1, and LWWC-1). The NOEC identified in Little and Calfee (2008) for growth endpoints for the Chiricahua leopard frog was equal to 0.003 mg/L. Reduction in body weights of the frog with chronic exposure to copper at 0.007 mg/L resulted in significantly reduced body weights when compared to the control. Length and Gosner stage endpoints were reduced at 0.047 mg/L with no effect observed at 0.007 mg/L. One hundred percent (100%) mortality (i.e., LC100) was observed in tadpoles within 2 weeks of exposure to 0.165 mg/L copper. The geometric means of the reported NOEC and LOEC endpoints were equal to 0.009 and 0.041 mg/L respectively (at 102.9 mg/L hardness). For screening the H/WCIU rainfall pool data, the geometric means were recalculated to adjust for hardness using the parameters established by NMED for calculating hardness-dependent copper criteria. Copper concentrations in two samples on Hanover Creek and Whitewater Creek upstream of Bayard Canyon (WWS-38.1 and U03-9000) exceeded the hardness-adjusted NOEC screening level. All locations in and downstream of Bayard Canyon except U03-9500 exceeded the NOEC; LOEC was exceeded at 13 locations; and the LC100 was exceeded at five locations.

4.1.4 Lead

Dissolved lead was detected in 15 of 29 total samples. The chronic NMWQC was exceeded in one sample collected during the Phase I RI sampling event (U03-9001). Neither the acute NMWQC nor the amphibian NOEC was exceeded in any sample. No Chiricahua leopard frog screening levels were available.

4.1.5 Selenium

Total selenium was detected in 18 of 29 samples. No detected total selenium concentrations exceeded the acute or chronic NMWQCs, or the amphibian no-effect TRV. No Chiricahua leopard frog screening levels were available.

4.1.6 Zinc

Dissolved zinc was detected in 23 of 29 total samples. Results exceeded the amphibian no-effect TRV (0.2 mg/L) at 16 sampling locations, the acute NMWCC at 20 locations, chronic NMWQC at 21 locations, the acute AWWQRP at 14 locations, and the chronic AWWQRP at 21 locations. Similar to dissolved copper results, dissolved zinc concentrations were highest at B-Ranch and Grunerud-1 (7.89 and 5.84 mg/L, respectively).

The Chiricahua leopard frog study showed no adverse effects to growth, development, or mortality for the zinc concentrations tested. The hardness-adjusted NOEC and was exceeded at 16 locations. A Chiricahua leopard frog LOEC was not available.

4.2 Sediment

The H/WCIU sediment dataset is provided in Appendix A, Table A-3. Table 4.2-1 presents sediment data for cadmium, chromium, copper, lead, molybdenum, selenium, and zinc compared to sediment TRVs. Cadmium, copper, lead, and zinc were selected for further analysis in the H/WCIU based on results of the Sitewide BERA which indicated they were the primary aquatic COPCs at the Chino Mine Site. Chromium, molybdenum, and selenium were included based on their presence as soil COPCs at the Site. Figures 4.2-1 through 4.2-9 show the sediment data with comparisons to the sediment TRVs.

Two types of sediment TRVs were evaluated. The probable effects concentration (PEC; MacDonald et al. 2000) represents a concentration above which significant effects are predicted. The PEC is generally analogous to the LOAEL TRV used for the wildlife endpoint. In addition, sediment toxicity thresholds (STTs) from the Tri-States Mining District (TSMD) were also considered for this assessment at the request of CMC due to their derivation from areas with historic mining impacts. The STTs were published in 2009 (MacDonald et al. 2009) and were not available for the draft H/WCIU ERA. Two SSTs are shown in Table 4.2-1; the SST_{10} which is representative of a 10% reduction in survival or biomass, and the SST_{20} representative of a 20% reduction in survival or biomass of the test species. Similar to the water quality TRVs, PECs and STTs were developed based primarily on aquatic stages of insects that inhabit permanent water bodies. The ephemeral stream and temporary pond conditions at the Site can affect the assemblages of species in aquatic habitats. However, many of the PEC and STT values are based, at least in part, on toxicity tests of larval *Chironomus* sp, a ubiquitous group of dipteran midges that can be tolerant of adverse physical and chemical conditions. Therefore, the PEC and STT values have applicability as a screening tool in assessing risk, but definitive characterization of toxicity would require site-specific toxicity tests. Exceedance of the PEC was noted for cadmium (8 of 103 samples), copper (88 of 103 samples), lead (50 of 103 samples), and zinc (45 of 103 samples).

Copper concentrations did not exceeded the PEC in one of the seven active channel sediment samples (U03-1500B; 2,619 mg/kg) collected after the tailings spill event from the East Train pipeline into Whitewater Creek (August 1999). Those samples are shown on Table 4.2-1 as Sample IDs U03-1500B, U03-1600B, U03-1700B, U03-1702B, U03-1900B, U03-1901B, and U03-1902B.

Background sediment data from the 2004 sediment background investigations (Golder 2004) were also considered. The median background concentrations from Exposure Reach 1 (includes Physical Reaches 1, 2 and 3) were equal to 137 mg/kg, 56 mg/kg, and 242 mg/kg for copper, lead, and zinc, respectively. All of those concentrations were less than their respective PECs.

The STTs from the TSMD were also exceeded in multiple locations for copper, lead, and zinc as shown in Table 4.2-1. The SST_{10} for copper was exceeded at all locations (n=103) and at 44 and 7 locations for lead and zinc, respectively. The SST_{20} for lead and zinc were exceeded at 22 and 4 locations, respectively.

MacDonald et al. (2000) and MacDonald et al. (2009) both recommend the use of comparisons of sediment concentrations of multiple COPCs in order to more accurately predict the potential for benthic risk from mixtures of COPCs. When comparing the PEC, MacDonald et al. (2000) recommends using a calculation of the mean PEC quotient (mean PEC-Q), which is the mean of the ratio of the COPC/PEC for each COPC. Mean PEC-Qs greater than 0.6 were shown to be good predictors of sediment toxicity. Gray shaded cells on Table 4.2-1 indicate calculated mean PEC-Qs greater than 0.6.

MacDonald et al. (2009) recommend the use of the sum of the COPC/SST_{10} for cadmium, copper, lead, and zinc as a predictor of effects to benthic invertebrates when the sum SST is greater than 3.0. As indicated in Table 4.2-1, the sum SST is greater than 3.0 at all locations except two in lower Whitewater Creek and one in the Side Channel area.

4.3 Aquatic Life Conclusions

In most cases where surface water exists in the H/WCIU, copper concentrations exceeded acute and/or chronic water quality criteria, as well as amphibian and Chiricahua leopard frog-specific NOECs and LOECs. Although the majority of the aquatic habitat is limited by ephemeral conditions, rainfall pool areas that may remain for extended periods of time can be utilized by invertebrate and amphibian species. Within the ephemeral areas of the H/WCIU, acute criteria represent the most applicable criteria assessing compliance with water quality regulations. In areas of more permanent water, such as stock tanks and rancher's ponds that could support breeding sites for amphibians and aquatic invertebrates, chronic criteria and amphibian TRVs provide useful comparison tools.

Acute and chronic NMWQCs and AWWQP water quality criterion (WQCs) were exceeded in summer rainfall pools for cadmium, copper, and zinc, indicating a potential risk to aquatic invertebrates or other aquatic life that may utilize the water when present. Risks to aquatic life from sediment exposure also appear to be significant within summer rainfall pools. Cadmium, copper, lead, and zinc concentrations exceeded sediment TRVs that are potentially predictive of adverse effects on sediment organisms, if water is present long enough for colonization by aquatic invertebrates. However, the quality of the habitat and the highly ephemeral nature of the drainages with each seasonal precipitation event must be taken into consideration in any risk management decisions. More permanent water bodies that are potentially affected include stock ponds along Whitewater Creek (e.g., LWWC Rancher's Pond and U03-9301). The amphibian TRV, the Chiricahua leopard frog NOEC and LOEC, and chronic criteria for copper were exceeded indicating potential risk to aquatic life at these locations. At several locations, the LC-100 value for the Chiricahua leopard frog was exceeded. While this TRV is specific to the Chiricahua leopard frog, it also may be indicative of the potential for effects to other amphibians.

Consideration of future conditions may also be important in assessing risk to aquatic receptors. For example, potential flow from Whitewater Creek has been diverted eastward into the Bolton Draw drainage via a large excavation. Currently, flow in Hanover and Whitewater Creeks is likely ephemeral for much of the length of the H/WCIU. However, if conditions change such that flow is increased, residual salts in sediments may be solubilized and made more available to aquatic life. Such conditions could result if waste water from domestic water treatment or industrial use is discharged to Whitewater Creek above the diversion. In addition, considerations of habitat and physical stressors, such as potentially low oxygen levels in summer rainfall pools, should be considered in risk management decisions. Data on such stressors is not currently available.

5.0 UNCERTAINTIES

Uncertainty is an inherent part of risk assessment. The Sitewide BERA Report (NewFields 2005) presented a comprehensive evaluation of the uncertainties specific to the Sitewide BERA including:

- Sampling uncertainty and data gaps (i.e., uncertainty about spatial distribution of contamination as a consequence of limitations in sampling a site).
- Uncertainty in the selection of COPCs.
- Uncertainty in the natural (seasonal and/or annual) variability in the species, populations, communities, and ecosystems in question, as well as uncertainty regarding individual sensitivity to COPCs.
- Uncertainty in risk characterization using laboratory-based toxicity values and the HQ approach.
- Uncertainty in models and parameters used to estimate risk potentials.
- Uncertainty in assessing background COPC concentrations that may relate to calculated risk potentials.

A thorough discussion of these uncertainties is provided in the Sitewide BERA and all apply to the risk assessment for the H/WCIU.

In general, the Sitewide BERA presented a conservative determination of COPCs and a less conservative risk characterization that provided ranges of potential risks for use in making risk management decisions. Site-wide COPCs were selected based on a conservative screening approach that minimized the potential for Type I error, or the potential for not selecting chemicals that are potential risk drivers as COPCs. This approach allows similar limitations of Type I error within the H/WCIU since the COPCs from the Sitewide BERA were carried into this risk assessment.

Risk-based conclusions were reached in the Sitewide BERA based on potential ranges of risk to the assessment endpoints. Similarly, this risk assessment used the conclusions reached in the Sitewide BERA to assess potential risks within the H/WCIU. Conditions in the H/WCIU were reviewed in terms of the conditions that were discussed as potential risk drivers in the Sitewide BERA. This approach assumes similar uncertainties in the H/WCIU assessment as those that were identified and discussed in the Sitewide BERA.

There are additional uncertainties related to each assessment endpoint that require further discussion.

For the vegetation community assessment endpoint, risk-based models using pCu^{2+} in soils to predict community-level effects are a significant source of uncertainty. Although the Sitewide BERA showed strong correlations between pCu^{2+} in surface soils and community-level vegetation effects such as canopy cover and species richness, models designed to approximate reality are inherently uncertain. While it is unclear whether the pCu^{2+} over- or under-estimates the potential for community-level effects on the Site vegetation, this source of uncertainty should be considered in risk management decisions for the Site.

Similarly, for the small ground-feeding bird, risks were assessed within the narrow band of riparian areas potentially affected by water flowing in Hanover and Whitewater Creeks and in areas where sediments were deposited following high-flow conditions. The model used for the assessment assumed that the receptors focus all of their activities, including all feeding, to this narrow corridor. The assessment endpoint for wildlife receptors is based on effects to populations of receptors. It is uncertain whether a viable population of small ground-feeding birds inhabits the areas associated with elevated COPC concentrations or whether local populations utilize the riparian areas more frequently than more upland areas. It is likely that receptor populations utilize both the riparian areas and the surrounding upland areas, but the proportion of habitat use within each of the areas is unknown.

Finally, for the aquatic receptors endpoint, very limited data regarding habitat quality and aquatic community presence and structure is available. While there are clearly concentrations of COPCs in surface water and sediment within the H/WCIU that could have deleterious effects to the aquatic community, the current presence or health of the community is not known. This uncertainty should also be considered by risk managers when determining a risk-based course of action for the H/WCIU.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Recent events and new data required the reanalysis of risks in the H/WCIU subsequent to the completion of the 2008 draft ERA report (NewFields 2008). The ‘white rain’ event may have a long-term effect on the pH of soils throughout the Site, and additional data related to the terrestrial invertebrates used in the exposure model provided a better estimation of risk to receptors ingesting invertebrates. Both have been included in this revised assessment.

Wildlife habitat throughout Hanover and Whitewater Creeks downstream to Hurley is impacted by both physical and chemical stressors. Physical disturbance due to grazing, construction, tailings removal, and flooding seems to have affected extensive areas in active channel and bar areas, as well as overbank areas and terraces where much of the vegetation associated with the ephemeral drainage occurs. Vegetated areas on overbanks and bars that were the focus of the ERA analysis contained elevated concentrations of cadmium, copper, lead, and zinc that could result in toxicity to vegetation and exposure of wildlife receptors to concentrations that exceed LOAEL benchmarks. However, it is unclear to what extent toxicity has contributed to the decrease in wildlife habitat quality under baseline conditions.

Elevated concentrations and increased risk primarily from lead and zinc appear to be related to sources in the Hanover Creek reach extending from the confluence with Whitewater Creek upstream to the AOC boundary, and to the remediated Groundhog Mine area, which affects upper Whitewater Creek and Bayard Canyon.

Copper is the primary source of risk in more downstream areas, particularly downstream of Bayard on Whitewater Creek and in the areas of Bolton Draw where Whitewater Creek has been diverted. Elevated copper concentrations and depressed pH are observed in soils and overbank sediments throughout Whitewater Creek, extending to the Lower Whitewater Creek segments that are south of the main Chino Mine Site and tailing pond areas.

Aquatic habitat in the H/WCIU is primarily limited due to lack of persistent water sources. However, metal concentrations and low pH in water and sediment result in potentially toxic conditions in pools and during seasonal flows, as evidenced by exceedance of acute NMWQC and AWWQP WQCs, exceedance of TRVs for the Chiricahua leopard frog, and exceedance of sediment PECs in some locations. Direct measurement of toxicity of water or sediment was not conducted, nor was quantitative characterization of aquatic communities in permanent or temporary water bodies. Sediment and water toxicity tests with appropriate test species could be conducted to reduce uncertainty, but it is unclear whether results would alter risk management decisions. Quantitative characterization of aquatic communities in temporary water bodies is likely to be associated with substantial variability due to habitat differences and is unlikely to be a useful tool in determining the extent of toxic effects on aquatic fauna.

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TABLES

Table 1.1-1
Summary of Assessment Endpoints for Chino Mine Ecological Risk Assessment
(Originally presented in the Sitewide BERA)
H/WCIU ERA

Management Goal:

Prevent or remediate adverse direct or indirect effects on ecological communities or populations of ecological receptors from toxic exposure to chemicals in mine waste

Assessment Endpoint	Risk Hypotheses or Question	Measures
	Exposure Assessment	
1. Vegetation Community of Upland Sites	1. COC concentrations in soils or vegetation do not exceed reference	Distribution of metals in soils and vegetation from site and reference areas
	2. COC concentrations in site soils do not exceed screening level TRVs	Metal concentrations in soils, TRVs for vegetation
	3. Nutrient levels are sufficient to support normal vegetation growth	K, P, NO_2+NO_3 TOC, pH in soils of site and background
	4. What proportion of landscape unit with [metals] in soils exceeding TRV or site-specific risk-based criterion	Distribution of elevated metal concentrations in soils or sediments
	Effects Assessment	
	5. Existing vegetation community at site is not degraded with respect to reference	Vegetation community structure in site and background areas; results of range quality assessment; sites located along gradient of conditions if possible
	6. Are COC concentrations or altered physical conditions in soils inhibiting recruitment?	Vegetation community and phytotoxicity test results for germination, root elongation, seedling growth from gradient of soil conditions
	7. Dose-response relationship exists between toxicity and soil contamination	" "
	8. What proportion of landscape unit(s) with adverse effects?	Spatial distribution of areas exhibiting adverse effects; elevated concentrations
	9. Are habitats in landscape unit fractionated by physical disturbance or chemical contamination?	Mapped distribution of vegetation types, wildlife species that may be restricted to habitat types against metal concentrations

Table 1.1-1
Summary of Assessment Endpoints for Chino Mine Ecological Risk Assessment
(Originally presented in the Sitewide BERA)
H/WCIU ERA

Management Goal:

Prevent or remediate adverse direct or indirect effects on ecological communities or populations of ecological receptors from toxic exposure to chemicals in mine waste

Assessment Endpoint	Risk Hypotheses or Question	Measures
	<u>Exposure Assessment</u>	
2. Vegetation Community of Ephemeral Drainages	1. COC concentrations in soils/sediments or vegetation exceed reference	Distribution of metals in soils and vegetation from site and reference areas
	2. COC concentrations in site soils exceed screening level TRVs	Metal concentrations in soils, TRVs for vegetation
	3. Dose-response relationship exists between residues and soil contamination	Metal concentrations in soils and plant tissues from co-located sites along gradient of conditions
	4. Nutrient levels are sufficient to support normal vegetation growth	K, P, NO_2+NO_3 TOC, pH in soils of site and background
	5. What proportion of landscape unit has [metals] in soils exceeding TRV or site-specific risk-based criterion?	Distribution of elevated metal concentrations in soils or sediments
	<u>Effects Assessment</u>	
	6. Existing vegetation community at site is not degraded with respect to reference area	Qualitative comparison of species present to unaffected or less affected sites (reference condition may not be available)
	7. COC concentrations are not accumulating in plant tissues	Metal concentrations in soils and plant tissues from gradient of conditions
	8. Are COC concentrations or altered physical conditions in soils inhibiting recruitment?	Phytotoxicity test results for germination, root elongation, seedling growth from gradient of soil conditions
	9. Dose-response relationship exists between toxicity and soil contamination	" "
	10. What proportion of landscape unit(s) with adverse effects?	Distribution of areas exhibiting adverse effects; elevated concentrations
	11. Habitats in landscape unit fractionated by physical disturbance or chemical contamination?	Mapped distribution of vegetation types, wildlife species that may be restricted to habitat types against metal concentrations

Table 1.1-1
Summary of Assessment Endpoints for Chino Mine Ecological Risk Assessment
(Originally presented in the Sitewide BERA)
H/WCIU ERA

Management Goal:

Prevent or remediate adverse direct or indirect effects on ecological communities or populations of ecological receptors from toxic exposure to chemicals in mine waste

Assessment Endpoint	Risk Hypotheses or Question	Measures
	Exposure Assessment	
3. Herbivorous, Insectivorous, and Omnivorous Birds	1. COC exposures do not exceed TRVs (estimate by habitat type [i.e., upland, ephemeral drainage] and location on site)	COC concentrations in soils, seeds, foliage, invertebrates; TRVs for small and large granivorous, omnivorous, and insectivorous birds; Intake calculations
	2. COC in exposure media do not exceed reference levels	COC concentrations in soils, seeds, foliage from site units and reference area
	3. What soil concentrations are associated with exposures that exceed TRVs?	Correlation between COC concentrations in soils and either (a) concentrations in forage or prey or (b) bioaccumulation factors
	Effects Assessment	
	4. Habitat quality is not degraded in potentially affected areas	Habitat quality (vegetation community structure) in site vs. reference
	5. What portion of landscape unit with [metals] in soils and vegetation exceed risk-based criterion?	Spatial distribution of elevated metal concentrations in sediments, soils, and vegetation in landscape unit(s)
	Exposure Assessment	
4. Raptors	1. COC exposures do not exceed TRVs (estimate by habitat type [i.e., upland, ephemeral drainage] and location on site)	COC concentrations in soils, invertebrates, small mammals TRVs for raptors; Intake calculations
	2. COC in exposure media do not exceed reference levels	COC concentrations in soils, prey
	3. What soil concentrations are associated with exposures that exceed TRVs?	Correlation between COC concentrations in soils and either (a) concentrations in forage or prey or (b) bioaccumulation factors
	Effects Assessment	
	4. Habitat quality is not degraded in potentially affected areas	Habitat quality (vegetation community structure) in site vs. reference
	5. What portion of landscape unit with [metals] in soils and vegetation exceed risk-based criterion?	Spatial distribution of elevated metal concentrations in sediments, soils, and vegetation in landscape unit(s)

Table 1.1-1

Summary of Assessment Endpoints for Chino Mine Ecological Risk Assessment

(Originally presented in the Sitewide BERA)

H/WCIU ERA

Management Goal:

Prevent or remediate adverse direct or indirect effects on ecological communities or populations of ecological receptors from toxic exposure to chemicals in mine waste

Assessment Endpoint	Risk Hypotheses or Question	Measures
	Exposure Assessment	
5. Herbivorous, Granivorous, and Omnivorous Small Mammals	1. COC exposures do not exceed TRVs (estimate by habitat type [i.e., upland, ephemeral drainage] and location on site)	COC concentrations in soils, seeds, foliage, invertebrates; TRVs for small and large granivorous, omnivorous, and insectivorous birds; Intake calculations
	2. COC in exposure media do not exceed reference levels	COC concentrations in soils, seeds, foliage from site units and reference area
	3. What soil concentrations are associated with exposures that exceed TRVs?	Correlation between COC concentrations in soils and either (a) concentrations in forage or prey or (b) bioaccumulation factors
	Effects Assessment	
	4 Histopathology is associated with elevated concentrations in tissues	COC concentrations in liver, kidney; Histopathological assessment of tissues
	5 Habitat quality is not degraded on site	Habitat quality (vegetation community structure) in site vs. reference
	6 What portion of landscape unit with [metals] in soils and vegetation exceed risk-based criterion?	Spatial distribution of elevated metal concentrations in sediments, soils, and vegetation in landscape unit(s)
	Exposure Assessment	
6. Ruminants	1. COC exposures do not exceed TRVs (estimate by habitat type [i.e., upland, ephemeral drainage] and location on site)	COC concentrations in soils, foliage of palatable species; TRVs for ruminants; Intake calculations
	2. COC in exposure media do not exceed reference levels	COC concentrations in soils, seeds, foliage from site units and reference area
	3. What soil concentrations are associated with exposures that exceed TRVs?	Correlation between COC concentrations in soils and either (a) concentrations in forage (b) bioaccumulation factors for uptake soil-forage
	Effects Assessment	
	4. Habitat quality is not degraded on site	Habitat quality (vegetation community structure) in site vs. reference
	5. What portion of landscape unit with [metals] in soils and vegetation exceed risk-based criterion?	Spatial distribution of elevated metal concentrations in sediments, soils, and vegetation in landscape unit(s)

Table 1.1-1
Summary of Assessment Endpoints for Chino Mine Ecological Risk Assessment
(Originally presented in the Sitewide BERA)
H/WCIU ERA

Management Goal:

Prevent or remediate adverse direct or indirect effects on ecological communities or populations of ecological receptors from toxic exposure to chemicals in mine waste

Assessment Endpoint	Risk Hypotheses or Question	Measures
	<u>Exposure Assessment</u>	
7. Mammalian Predators	1. COC exposures do not exceed TRVs (estimate by habitat type [i.e., upland, ephemeral drainage] and location on site)	COC concentrations in soils, small mammals; TRVs for mammals; Intake calculations
	2. COC in exposure media do not exceed reference levels	COC concentrations in soils, seeds, foliage from site units and reference area
	3. What soil concentrations are associated with exposures that exceed TRVs?	Correlation between COC concentrations in soils and either (a) concentrations in forage (b) bioaccumulation factors for uptake soil-forage
	<u>Effects Assessment</u>	
	4. Habitat quality is not degraded on site	Habitat quality (vegetation community structure) in site vs. reference
	5. What portion of landscape unit with [metals] in soils and vegetation exceed risk-based criterion?	Spatial distribution of elevated metal concentrations in sediments, soils, and vegetation in landscape unit(s)
	<u>Exposure Assessment</u>	
8. Aquatic Community and Amphibians	1. Metal concentrations in water do not exceed toxicity thresholds for amphibians or aquatic life	Data on water quality from temporary and permanent aquatic habitat
	2. COC in exposure media do not exceed reference levels	Data on water quality from temporary and permanent aquatic habitat in reference area
	<u>Effects Assessment</u>	
	3. Determine whether aquatic animals and amphibians occur in aquatic habitats to the extent expected	Presence/absence of breeding aquatic invertebrates, fish, or amphibians in aquatic habitats; site and reference (if available)
	4. Sediment are not toxic to aquatic stages of amphibians and the aquatic community.	Data on metal content of sediment in temporary and aquatic habitats; sediment toxicity testing if necessary

Table 1.1-2

R-Squared Values from Linear Regression Analyses for Laboratory Phytotoxicity and Community Endpoints (All Sites)

(Originally presented in the Sitewide BERA)

H/WCIU ERA

	Community and Phytotoxicity Endpoints								
	Community		Dry Weight		Length		Other Measures		
	Richness	Canopy Cover	Stem	Root	Stem	Root	Nodules	Emergence	Survival
Chemical Variables									
pCu^{2+}	**0.614**	**0.462**	0.733	**0.694**	0.665	0.486	0.432	0.231	0.267
Soluble Copper (SPLP)	0.455	0.242	0.338	0.546	0.298	**0.548**	0.194	**0.399**	**0.408**
$CaCl_2$ Soluble Copper	0.507	0.067	0.337	0.373	0.178	0.313	**0.480**	0.084	0.118
Total Copper (ln trans)	0.472	0.240	0.305	0.411	0.176	0.369	0.407	0.106	0.104
pH, paste	0.461	0.100	0.215	0.202	0.339	0.151	0.364	0.053	0.090
Soluble Zinc (SPLP)	0.231	0.058	0.095	0.150	0.064	0.179	0.118	0.221	0.209
Total Zinc	0.000	0.032	0.036	0.036	0.117	0.042	0.104	0.054	0.075
Soluble Cadmium (SPLP)	0.002	0.077	0.021	0.024	0.007	0.002	0.032	0.003	0.001
Total Cadmium	0.037	0.002	0.002	0.001	0.011	0.001	0.152	0.001	0.000
Soluble Aluminum (SPLP)	0.170	0.107	0.198	0.159	0.246	0.218	0.023	0.296	0.267
Total Aluminum	0.116	0.033	0.195	0.112	0.221	0.089	0.010	0.031	0.034
Total Selenium	0.267	0.118	0.086	0.138	0.033	0.132	0.248	0.046	0.041
Physical Variables									
Soil DOC	0.071	**0.367**	**0.307**	0.108	**0.257**	0.021	0.056	0.033	0.038
Soil Organic Matter	0.029	0.005	0.006	0.003	0.003	0.027	**0.141**	0.086	0.072
% Silt	0.019	0.024	0.003	0.039	0.009	0.100	0.007	0.187	0.166
% Clay	**0.117**	0.049	0.078	0.105	0.080	0.035	0.033	0.006	0.003
% Sand	0.080	0.060	0.030	**0.111**	0.047	**0.146**	0.000	**0.196**	**0.167**

Notes:

Shaded cells indicate highest R-squared value.

Soluble copper data from Site 26 were eliminated for all endpoints.

$CaCl_2$ - Calcium Chloride

DOC - Dissolved Organic Carbon

SPLP-Synthetic Precipitation Leaching Procedure

Table 1.1-3

Predictablity of pCu^{2+} in Chino ERA Soil Samples

(Originally presented in the Sitewide BERA)

H/WCIU ERA

Combination of Locations	Variables	Equation	R-squared
All Locations	2-variables	$3.28+(1.12*pH)-(0.64*\ln[Cu_{tot}])$	0.90
	3-variables	$2.77+(1.12*pH)-(0.62*\ln[Cu_{tot}])+(0.17*[DOC])$	0.92
Upland Study Only	2-variables	$6.16+(1*pH)-(1.02*\ln[Cu_{tot}])$	0.96
	3-variables	$4.63+(1*pH)-(0.84*\ln[Cu_{tot}])+(0.19*[DOC])$	0.96
Upland Study & Reference	2-variables	$7.34+(0.93*pH)-(1.15*\ln[Cu_{tot}])$	0.97
	3-variables	$6.47+(0.92*pH)-(1.04*\ln[Cu_{tot}])+(0.13*[DOC])$	0.97
Ephemeral Drainage	2-variables	$-0.55+(1.32*pH)-(0.18*\ln[Cu_{tot}])$	0.93
	3-variables	$1.15+(1.12*pH)-(0.18*\ln[Cu_{tot}])+(1.76*[DOC])$	0.96

Note: *Stepwise multiple regression was used to identify variables that were most important in predicting* pCu^{2+}. *Soil pH and total copper concentration (ln-transformed) typically accounted for more than 90 percent of the variability. Dissolved organic carbon was typically the third most important but contributed relatively little to predictive power.*

Table 2.1-1
Predicted Cupric Ion Activity (pCu^{2+}) in Ephemeral Drainage Sediment Samples
H/WCIU ERA

Physical Reach	Sample ID	pH	Total Copper Concentration (mg/kg)	pCu^{2+}	Toxic in Phytotoxicity Tests			
					Rye		Alfalfa	
					Emergence	Growth	Emergence	Growth
1	U02-3100	7.68	476.1	8.47	N/A	N/A	N/A	N/A
	U02-3102	5.36	163	5.60	N/A	N/A	N/A	N/A
	U02-ER001	6.4	549	6.76	N/A	N/A	N/A	N/A
	U02-ER002	6.83	618	7.30	N/A	N/A	N/A	N/A
	U02-ER003	6.6	449	7.06	N/A	N/A	N/A	N/A
	U02-ER004	6.73	438	7.23	N/A	N/A	N/A	N/A
	U02-2100	7.68	484.2	8.47	N/A	N/A	N/A	N/A
	U02-2102	7.68	498.8	8.46	N/A	N/A	N/A	N/A
	U02-5003	NA	421	NA	N/A	N/A	N/A	N/A
	U02-ER005	7.65	544	8.41	N/A	N/A	N/A	N/A
	U02-ER006	7.66	441	8.47	N/A	N/A	N/A	N/A
	U02-ER007	7.54	463	8.30	N/A	N/A	N/A	N/A
	U02-ER009	7.61	585	8.35	N/A	N/A	N/A	N/A
	U02-ER010	6.4	423	6.81	N/A	N/A	N/A	N/A
	ERA-29	7.42	459.7	8.31	O	**X**	**X**	**X**
2	U03-3200	5.38	983.8	5.31	N/A	N/A	N/A	N/A
	ERA-32*	7.59	436.9	8.75	N/A	N/A	N/A	N/A
	U03-4202	6.98	248.5	7.67	N/A	N/A	N/A	N/A
	U03-4203	7.51	193.6	8.42	N/A	N/A	N/A	N/A
	U03-4205	4.45	499.1	4.21	N/A	N/A	N/A	N/A
	U03-4206	5.75	205.5	6.08	N/A	N/A	N/A	N/A
	U03-4207	3.85	412.4	3.45	N/A	N/A	N/A	N/A
	U03-2200	5.66	611.4	5.77	N/A	N/A	N/A	N/A
3	U03-3300	7	3250	7.23	N/A	N/A	N/A	N/A
	U03-3302	6.43	1439	6.63	N/A	N/A	N/A	N/A
	U03-3303	5.07	780.2	4.94	N/A	N/A	N/A	N/A
	U03-3305	7.75	517.8	8.56	N/A	N/A	N/A	N/A
	U03-3306	7.55	770.9	8.22	N/A	N/A	N/A	N/A
	U03-3308	7.4	600.9	8.07	N/A	N/A	N/A	N/A
	U03-3309	7.3	242.2	8.10	N/A	N/A	N/A	N/A
	U03-3311	7.08	132.5	7.92	N/A	N/A	N/A	N/A
	U03-3312	7.08	782.2	7.60	N/A	N/A	N/A	N/A
	U03-3314	7.08	714.2	7.61	N/A	N/A	N/A	N/A
	U03-3316	7.08	832.7	7.59	N/A	N/A	N/A	N/A
	U03-3317	7.08	585.1	7.65	N/A	N/A	N/A	N/A
	U03-3318	7.08	952.3	7.56	N/A	N/A	N/A	N/A
	U03-3320	7.08	1454	7.48	N/A	N/A	N/A	N/A
	U03-3321	7.08	956.6	7.56	N/A	N/A	N/A	N/A
	U03-3322	7.08	1175	7.52	N/A	N/A	N/A	N/A
	U03-4306	5.82	1400.0	5.83	N/A	N/A	N/A	N/A
	U03-4308	4.07	336.1	3.78	N/A	N/A	N/A	N/A
	U03-4309	5.14	288.5	5.22	N/A	N/A	N/A	N/A
	U03-4311	4.43	482.9	4.19	N/A	N/A	N/A	N/A
	U03-4313	4.51	349.1	4.35	N/A	N/A	N/A	N/A
	U03-4314	3.92	335.8	3.58	N/A	N/A	N/A	N/A
	U03-4315	3.89	277.7	3.57	N/A	N/A	N/A	N/A
	U03-4317	4.47	520.6	4.22	N/A	N/A	N/A	N/A

Table 2.1-1
Predicted Cupric Ion Activity (pCu^{2+}) in Ephemeral Drainage Sediment Samples
H/WCIU ERA

Physical Reach	Sample ID	pH	Total Copper Concentration (mg/kg)	pCu^{2+}	Toxic in Phytotoxicity Tests			
					Rye		Alfalfa	
					Emergence	Growth	Emergence	Growth
3	U03-4319	4.11	497.4	3.76	N/A	N/A	N/A	N/A
	U03-4320	4.31	605.4	3.99	N/A	N/A	N/A	N/A
	U03-4321	3.66	416.5	3.20	N/A	N/A	N/A	N/A
	U03-4322	3.74	303.2	3.36	N/A	N/A	N/A	N/A
	U03-4324	6.62	409.5	7.11	N/A	N/A	N/A	N/A
	U03-6300	7.08	662.0	7.63	N/A	N/A	N/A	N/A
	U03-2300	6.21	505.1	6.53	N/A	N/A	N/A	N/A
	U03-2302	3.92	382.1	3.55	N/A	N/A	N/A	N/A
	U03-2303	6.17	1307	6.30	N/A	N/A	N/A	N/A
	U03-2305	4.45	680.7	4.15	N/A	N/A	N/A	N/A
	U03-2306	6.3	485.2	6.65	N/A	N/A	N/A	N/A
	U03-2307	4.73	531.9	4.56	N/A	N/A	N/A	N/A
	U03-2309	6.02	1085	6.14	N/A	N/A	N/A	N/A
	U03-2311	6	977.8	6.13	N/A	N/A	N/A	N/A
	U03-2312	4.15	393.5	3.85	N/A	N/A	N/A	N/A
	U03-2313	4.26	439.4	3.98	N/A	N/A	N/A	N/A
	U03-2315	4.52	573.4	4.27	N/A	N/A	N/A	N/A
	U03-2316	3.73	1112	3.11	N/A	N/A	N/A	N/A
	U03-2318	3.86	452.1	3.44	N/A	N/A	N/A	N/A
	U03-2320	4.31	422.2	4.05	N/A	N/A	N/A	N/A
	U03-2321	4.04	438.1	3.69	N/A	N/A	N/A	N/A
	U03-2322	4.02	395.7	3.68	N/A	N/A	N/A	N/A
	ERA-22	7.3	1120	7.82	O	**X**	O	**X**
	ERA-28	7.53	1060	8.12	N/A	N/A	N/A	N/A
4	U03-3400	7.12	2384	7.45	N/A	N/A	N/A	N/A
6	U03-3600	4.04	342.4	3.73	N/A	N/A	N/A	N/A
	U03-3602	4.45	189.6	4.38	N/A	N/A	N/A	N/A
	U03-3604	3.98	285.1	3.69	N/A	N/A	N/A	N/A
	U03-2600 B	3.39	103.6	3.09	N/A	N/A	N/A	N/A
	U03-2602 B	6.18	324.8	6.57	N/A	N/A	N/A	N/A
	U03-6600	3.71	359.6	3.29	N/A	N/A	N/A	N/A
8	U03-3800	5.78	296.6	6.05	N/A	N/A	N/A	N/A
	ERA-27	5.76	327.7	6.21	N/A	N/A	N/A	N/A
	U03-2800	4.17	193	4.01	N/A	N/A	N/A	N/A
	U03-3900	7.53	345.6	8.34	N/A	N/A	N/A	N/A
9	U03-3901	7.4	540.9	8.09	N/A	N/A	N/A	N/A
	U03-3902	5.36	981.4	5.29	N/A	N/A	N/A	N/A
	U03-6900	7.34	98.1	8.31	N/A	N/A	N/A	N/A
	U03-2900 B	7.94	139.4	9.04	N/A	N/A	N/A	N/A
	U03-2901 B	7.18	179.1	7.99	N/A	N/A	N/A	N/A
BC	ERA-33	6.59	176.2	8.48	N/A	N/A	N/A	N/A
	U03-3003	3.24	149.0	2.83	N/A	N/A	N/A	N/A
	U03-3004	2.5	510.0	1.63	N/A	N/A	N/A	N/A

Table 2.1-1
Predicted Cupric Ion Activity (pCu^{2+}) in Ephemeral Drainage Sediment Samples
H/WCIU ERA

Physical Reach	Sample ID	pH	Total Copper Concentration (mg/kg)	pCu^{2+}	Toxic in Phytotoxicity Tests			
					Rye		Alfalfa	
					Emergence	Growth	Emergence	Growth
SC	U03-51050	4.18	208	4.00	N/A	N/A	N/A	N/A
	U03-51052	4.73	335	4.64	N/A	N/A	N/A	N/A
	U03-51053	3.87	210	3.59	N/A	N/A	N/A	N/A
	U03-51055	7.38	171	8.26	N/A	N/A	N/A	N/A
	U03-51056	3.72	196	3.40	N/A	N/A	N/A	N/A
	U03-51058	4.3	263	4.11	N/A	N/A	N/A	N/A
	U03-51060	6.33	482	6.68	N/A	N/A	N/A	N/A
	U03-51062	7.83	76	9.00	N/A	N/A	N/A	N/A
	U03-51063	7.87	92	9.01	N/A	N/A	N/A	N/A
LWW	U03-31152	6.48	314	6.97	N/A	N/A	N/A	N/A
	U03-31259	6.83	261	7.46	N/A	N/A	N/A	N/A
	U03-31264	7.49	343	8.29	N/A	N/A	N/A	N/A
	U03-31368	7.86	266	8.82	N/A	N/A	N/A	N/A
	U03-31578	6.84	371	7.41	N/A	N/A	N/A	N/A
	U03-11150	4.62	183	4.60	N/A	N/A	N/A	N/A
	U03-11254	4.09	233	3.86	N/A	N/A	N/A	N/A
	U03-11255	4.42	281	4.26	N/A	N/A	N/A	N/A
	U03-11256	4.37	118	4.35	N/A	N/A	N/A	N/A
	U03-11260	6.57	2360	6.71	N/A	N/A	N/A	N/A
	U03-11261	6.31	2000	6.40	N/A	N/A	N/A	N/A
LWW	U03-11262	4.65	465	4.47	N/A	N/A	N/A	N/A
	U03-11288	6.49	784	6.81	N/A	N/A	N/A	N/A
	U03-11366	7.85	159	8.89	N/A	N/A	N/A	N/A
	U03-11471	7.34	388	8.06	N/A	N/A	N/A	N/A
	U03-11576	6.41	157	6.99	N/A	N/A	N/A	N/A
	U03-11579	7.01	463	7.59	N/A	N/A	N/A	N/A
	U03-61153	6.83	761	7.26	N/A	N/A	N/A	N/A
	U03-61258	6.2	236	6.64	N/A	N/A	N/A	N/A
	U03-61265	7.7	128	8.73	N/A	N/A	N/A	N/A
	U03-61369	7.39	101	8.36	N/A	N/A	N/A	N/A
	U03-61474	7.83	43	9.10	N/A	N/A	N/A	N/A
	U03-61575	7.84	94	8.97	N/A	N/A	N/A	N/A
	U03-11284	6.31	429	6.68	N/A	N/A	N/A	N/A
	U03-11586	5.72	941	5.76	N/A	N/A	N/A	N/A
	U03-11682	8.08	41	9.44	N/A	N/A	N/A	N/A
	U03-11680	7.55	43	8.73	N/A	N/A	N/A	N/A

Notes: Phytotoxicity tests performed as part of the Sitewide BERA (NewFields 2005).

All pCu^{2+} values calculated using the following equation: $pCu^{2+} = -0.56+(1.32*pH)-(0.18*ln[Cu_{tot}])$ except for ERA-22, ERA-27, ERA-28, ERA-29, ERA-32, ERA-33.

ERA-22, ERA-27, ERA-28, ERA-29, ERA-32, ERA-33 are measured values and are not calculated using the Ephemeral Drainage equation.

Grey shading indicates samples in LWW and SC collected as active channel sediments. All other samples (white) are from bar and overbank locations.

N/A - No toxicity test conducted on the sample.

X - Statistically significant effects noted.

O - No statistically significant effects noted.

* Location ERA32 was remediated as part of the Groundhog Removal Action (Golder 2009). Data from ERA32 replaced with 95% UCL of post-remediation composite samples from Golder (2009).

TABLE 2.2-1
Summary of Vegetation Cover at H/WCIU Sampling Locations
H/WCIU ERA

				Basal Cover Summary[2]				Canopy Summary	Diversity		
Location	**SiteType**	**pCu^{2+}**	**Vegetation Alliance[1]**	**Percent Rock Cover**	**Percent Bare Ground**	**Percent Litter Cover**	**Percent Live Vegetation**	**Percent Canopy Cover[2]**	**Total Richness**	**Woody Richness**	**Percent Alien[3]**
ERA22	Ephemeral Drainage	7.14	Fluv For	15	50	35	0	52	26	4	12
ERA27	Ephemeral Drainage	6.03	Fluv For	15	54	31	0	45	25	4	0
ERA28	Ephemeral Drainage	7.26	Fluv For	0	43	56	1	85	26	2	1.2
ERA29	Ephemeral Drainage	7.67	Fluv For	6	27	60	7	77	28	2	60
ERA32*	Ephemeral Drainage	7.92	Mine Fac	16	60	24	0	51	27	4	5.9
ERA33	Ephemeral Drainage	7.36	Fluv For	6	11	15	NA	57	41	8	5.3

1 Alliance According to *Comprehensive Vegetation Survey of The Chino Mine, Grant County, New Mexico (DBS&A 2000)*

Fluv For = Fluvial Forest and Shrubland

Mine Fac = Mine Facilities/Urban

2 Basal Cover refers to condition at ground surface

3 Canopy cover refers to vegetaion cover at 1 meter or less in height

4 Alien refers to non-native species (woody and herbaceous)

* Location ERA32 was remediated as part of the Groundhog Removal Action (Golder 2009). Data from ERA32 replaced with 95%UCL of post-remediation composite samples from Golder (2009).

Table 3.1-1
Comparison of H/WCIU and Sitewide BERA Upper-Bound Exposure Point Concentrations
H/WCIU ERA

COPC	Comparison of 95 Percentiles		H/WCIU 95% UCL	UCL Statistic
	H/WCIU 95th Percentile	Sitewide BERA 95th Percentile Upland Soils (NewFields 2005)		
H/WCIU - All Reaches				
Cadmium	***5.64***	3.22	2.01	95% Chebyshev (Mean, Sd) UCL
Chromium	***27.15***	16.8	15.42	95% Approximate Gamma UCL
Copper	1280	2310	746.9	95% Chebyshev (Mean, Sd) UCL
Lead	***521.5***	40.9	244.5	95% Approximate Gamma UCL
Molybdenum	16.34	43	8.615	95% Approximate Gamma UCL
Selenium	1.029	2	0.55	95% Chebyshev (Mean,Sd) UCL
Zinc	***2207***	91.5	790.8	95% Approximate Gamma UCL
Physical Reach 1				
Cadmium	***7.7***	3.22	5.76	95% Approximate Gamma UCL
Chromium	15.7	16.8	14.7	95% Student's t UCL
Copper	594.9	2310	515	95% Student's t UCL
Lead	***840.7***	40.9	504	95% Approximate Gamma UCL
Molybdenum	9.52	43	10.2	95% Chebyshev (Mean, Sd) UCL
Selenium	1.061	2	0.73	95% Approximate Gamma UCL
Zinc	***3148***	91.5	2338	95% Approximate Gamma UCL
Physical Reach 2				
Cadmium	***4.6***	3.22	4.2	95% H-UCL
Chromium	***26.1***	16.8	20.4	95% Student's t UCL
Copper	853.5	2310	625	95% Student's t UCL
Lead	***1280***	40.9	1303	95% Chebyshev (Mean, Sd) UCL
Molybdenum	11.72	43	7.94	95% Student's t UCL
Selenium	0.485	2	0.417	95% Hall's Bootstrap UCL
Zinc	***986***	91.5	728	95% Approximate Gamma UCL
Physical Reach 3				
Cadmium	***4.62***	3.22	2.26	95% Approximate Gamma UCL
Chromium	***28.4***	16.8	18.5	95% Student's t UCL
Copper	1425	2310	831	95% Approximate Gamma UCL
Lead	***389.5***	40.9	228	95% Student's t UCL
Molybdenum	11.62	43	8.09	95% Student's t UCL
Selenium	0.836	2	0.56	95% Chebyshev (Mean, Sd) UCL
Zinc	***1498***	91.5	849	95% H-UCL
Physical Reaches 4 and 5				
Cadmium	---	3.22	2.42	---
Chromium	---	16.8	9.58	---
Copper	---	2310	***2384***	---
Lead	---	40.9	***53.17***	---
Molybdenum	---	43	16.37	---
Selenium	---	2	1.56	---
Zinc	---	91.5	***174.9***	---

Table 3.1-1
Comparison of H/WCIU and Sitewide BERA Upper-Bound Exposure Point Concentrations
H/WCIU ERA

COPC	Comparison of 95 Percentiles		H/WCIU 95% UCL	UCL Statistic
	H/WCIU 95th Percentile	Sitewide BERA 95th Percentile Upland Soils (NewFields 2005)		
Physical Reaches 6 and 7				
Cadmium	1.95	3.22	2.47	--
Chromium	12.55	16.8	12.9	--
Copper	355.3	2310	360	--
Lead	40.28	40.9	48.3	--
Molybdenum	14.38	43	14.6	--
Selenium	1.061	2	1.08	--
Zinc	***114.6***	91.5	140.8	--
Physical Reaches 8 and 9				
Cadmium	0.658	3.22	0.59	95% Chebyshev (Mean, Sd) UCL
Chromium	***17.41***	16.8	13.0	95% Student's t UCL
Copper	805.2	2310	565	95% Approximate Gamma UCL
Lead	37.72	40.9	32.0	95% Student's t UCL
Molybdenum	19.27	43	14.1	95% Student's t UCL
Selenium	0.637	2	0.74	95% H-UCL
Zinc	***148.1***	91.5	115	95% Student's t UCL
Bayard Canyon				
Cadmium	1.35	3.22	1.35	---
Chromium	6.19	16.8	6.19	---
Copper	509.7	2310	509.7	---
Lead	***1836***	40.9	1836	---
Molybdenum	7.1	43	7.1	---
Selenium	0.27	2	0.27	---
Zinc	***392.5***	91.5	392.5	---
Side Channel				
Cadmium	0.888	3.22	0.598	95% Student's t UCL
Chromium	***19.9***	16.8	***17.68***	95% Student's t UCL
Copper	423.2	2310	303	95% Student's t UCL
Lead	***42.2***	40.9	31.8	95% Student's t UCL
Molybdenum	17.18	43	14.49	95% Adjusted Gamma UCL
Selenium	0.268	2	0.198	95% Student's t UCL
Zinc	***191***	91.5	***143.3***	95% Student's t UCL
Lower Whitewater Creek				
Cadmium	0.53	3.22	0.39	95% Student's t UCL
Chromium	***17.4***	16.8	14.7	95% Student's t UCL
Copper	566	2310	353	95% Student's t UCL
Lead	***58.05***	40.9	41.2	95% Student's t UCL
Molybdenum	15.05	43	9.1	95% Student's t UCL
Selenium	0.25	2	0.29	--
Zinc	***173***	91.5	122.1	95% Student's t UCL

Notes:

All units presented as mg/kg dry weight.

COPC has a higher 95th Percentile in H/WCIU data than observed in ERI Data.

Max detect used. Insufficient sample numbers available to calculate a UCL or max detect equivalent to 95th percentile.

Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Data from Side Channel are active channel data (< 2,000 um @ 0 - 6") from Golder (2002).

Table 3.3-1
Copper Hazard Quotient Calculations
Comparison to Benchmarks
H/WCIU ERA

Location	Soil Copper (mg/kg)	RBC HQ (1,114 mg/kg)	S/TSIU pre-FS RAC HQ (1,600 mg/kg)
Physical Reach 1			
ERA 29	459.7	0.4	0.3
U02-2100	484.2	0.4	0.3
U02-2102	498.8	0.4	0.3
U02-3100	476.1	0.4	0.3
U02-3102	163.0	0.1	0.1
U02-5003	421.0	0.4	0.3
U02-ER001	549.0	0.5	0.3
U02-ER002	618.0	0.6	0.4
U02-ER003	449.0	0.4	0.3
U02-ER004	438.0	0.4	0.3
U02-ER005	544.0	0.5	0.3
U02-ER006	441.0	0.4	0.3
U02-ER007	463.0	0.4	0.3
U02-ER009	585.0	0.5	0.4
U02-ER010	423.0	0.4	0.3
Physical Reach 2			
ERA 32*	436.9	0.4	0.3
U03-2200	611.4	0.5	0.4
U03-3200	983.8	0.9	0.6
U03-4202	248.5	0.2	0.2
U03-4203	193.6	0.2	0.1
U03-4205	499.1	0.4	0.3
U03-4206	205.5	0.2	0.1
U03-4207	412.4	0.4	0.3
Physical Reach 3			
ERA 22	1,120.0	1.0	0.7
ERA 28	1,060.0	0.9	0.7
U03-2300	505.1	0.5	0.3
U03-2302	382.1	0.3	0.2
U03-2303	1,306.8	1.2	0.8
U03-2305	680.7	0.6	0.4
U03-2306	485.2	0.4	0.3
U03-2307	531.9	0.5	0.3
U03-2309	1,085.4	0.9	0.7
U03-2311	977.8	0.9	0.6
U03-2312	393.5	0.4	0.2
U03-2313	439.4	0.4	0.3
U03-2315	573.4	0.5	0.4
U03-2316	1,112.4	1.0	0.7
U03-2318	452.1	0.4	0.3
U03-2320	422.2	0.4	0.3
U03-2321	438.1	0.4	0.3
U03-2322	395.7	0.4	0.2
U03-3300	3,250.0	2.9	2.0
U03-3302	1,438.9	1.3	0.9
U03-3303	780.2	0.7	0.5

Table 3.3-1
Copper Hazard Quotient Calculations
Comparison to Benchmarks
H/WCIU ERA

Location	Soil Copper (mg/kg)	RBC HQ (1,114 mg/kg)	S/TSIU pre-FS RAC HQ (1,600 mg/kg)
U03-3305	517.8	0.5	0.3
U03-3306	770.9	0.7	0.5
U03-3308	600.9	0.5	0.4
U03-3309	242.2	0.2	0.2
U03-3311	132.5	0.1	0.1
U03-3312	782.2	0.7	0.5
U03-3314	714.2	0.6	0.4
U03-3316	832.7	0.7	0.5
U03-3317	585.1	0.5	0.4
U03-3318	952.3	0.9	0.6
U03-3320	1,454.1	1.3	0.9
U03-3321	956.6	0.9	0.6
U03-3322	1,174.8	1.1	0.7
U03-6300	662.5	0.6	0.4
U03-4306	1,400.0	1.3	0.9
U03-4308	336.1	0.3	0.2
U03-4309	288.5	0.3	0.2
U03-4311	482.9	0.4	0.3
U03-4313	349.1	0.3	0.2
U03-4314	335.8	0.3	0.2
U03-4315	277.7	0.2	0.2
U03-4317	520.6	0.5	0.3
U03-4319	497.4	0.4	0.3
U03-4320	605.4	0.5	0.4
U03-4321	416.5	0.4	0.3
U03-4322	303.2	0.3	0.2
U03-4324	409.5	0.4	0.3
Physical Reaches 4 and 5			
U03-3400	2,383.9	2.1	1.5
Physical Reaches 6 and 7			
U03-2600 B	103.6	0.1	0.1
U03-2602 B	324.8	0.3	0.2
U03-3600	342.4	0.3	0.2
U03-3602	189.6	0.2	0.1
U03-3604	285.1	0.3	0.2
U03-6600	359.6	0.3	0.2
Physical Reaches 8 and 9			
ERA 27	327.7	0.3	0.2
U03-2800	193.0	0.2	0.1
U03-3800	296.6	0.3	0.2
U03-3900	345.6	0.3	0.2
U03-2900 B	139.4	0.1	0.1
U03-2901 B	179.1	0.2	0.1
U03-3901	540.9	0.5	0.3
U03-3902	981.4	0.9	0.6
U03-6900	98.1	0.1	0.1

Table 3.3-1
Copper Hazard Quotient Calculations
Comparison to Benchmarks
H/WCIU ERA

Location	Soil Copper (mg/kg)	RBC HQ (1,114 mg/kg)	S/TSIU pre-FS RAC HQ (1,600 mg/kg)
Bayard Canyon			
ERA 33	176.2	0.2	0.1
U03-3003	148.5	0.1	0.1
U03-3004	509.7	0.5	0.3
Lower Whitewater Creek			
U03-31152	314.0	0.3	0.2
U03-31259	261.0	0.2	0.2
U03-31264	343.0	0.3	0.2
U03-31368	266.0	0.2	0.2
U03-31578	371.0	0.3	0.2
U03-61153	761.0	0.7	0.5
U03-61258	236.0	0.2	0.1
U03-61265	128.0	0.1	0.1
U03-61369	101.0	0.1	0.1
U03-61474	43.4	0.04	0.03
U03-61575	93.9	0.1	0.1
Side Channel			
U03-51050	208.0	0.2	0.1
U03-51053	210.0	0.2	0.1
U03-51056	196.0	0.2	0.1
U03-51058	263.0	0.2	0.2
U03-51060	482.0	0.4	0.3
U03-51063	92.2	0.1	0.1
U03-51052	335.0	0.3	0.2
U03-51055	171.0	0.2	0.1
U03-51062	76.4	0.1	0.1

Notes:

RBC - Risk-Based Concentration

S/TSIU pre-FS RAC - Smelter and Tailings Soil Investigation Unit, Pre-Feasibility Study Remedial Action Criteria

HQ greater than 1.0.

*Data from ERA-32 replaced with 95% UCL of post-remediation composite samples from Golder (2009)

Table 3.3-2
Comparison of H/WCIU Copper Exposure Point Concentrations to Benchmarks
H/WCIU ERA

Reach	Soil Copper EPCs		Benchmarks			
			HQ RBC (1,114 mg/kg)		HQ S/TSIU Pre-FS RAC (1,600 mg/kg)	
	95th Percentile	95% UCL	95th Percentile	95% UCL	95th Percentile	95% UCL
H/WCIU - All Reaches	1,300	743	1.2	0.7	0.8	0.5
Physical Reach 1	594.9	515	0.5	0.5	0.4	0.3
Physical Reach 2*	**853.5**	625	0.8	0.6	0.5	0.4
Physical Reach 3	1,425	831	1.3	0.7	0.9	0.5
Physical Reach 4	**2,384**	**2,384**	2.1	2.1	1.5	1.5
Physical Reaches 6 and 7	355.3	**360**	0.3	0.3	0.2	0.2
Physical Reaches 8 and 9	805.2	565	0.7	0.5	0.5	0.4
Bayard Canyon	**509.7**	**509.7**	0.5	0.5	0.3	0.3
Side Channel	423.2	303	0.4	0.3	0.3	0.2
Lower Whitewater Creek	566	353	0.5	0.3	0.4	0.2

Notes:

All units presented as milligrams per kilogram (mg/kg) dry weight.

Max detect used. Insufficient sample numbers available to calculate a UCL or max detect equivalent to 95th percentile.

HQs greater than 1.

HQ - Hazard Quotient

RBC - Risk-Based Concentration

S/TSIU pre-FS RAC - Smelter and Tailings Soil Investigation Unit Pre-Feasibility Study Remedial Action Criteria.

95th Percentile EPC (as used in Sitewide BERA) and calculated using NCSS 2007.

95% UCL - 95th upper confidence limit on the mean calculated using ProUCL.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Data from Side Channel are active channel data (< 2,000 um at 0 - 6") from Golder (2002).

Table 3.3-3a
Copper Hazard Quotient Calculations
Small Ground Feeding Bird; Mixed Diet
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Cu	B45.8W	0.918	0.287	0	0.3	0.7	10.50	16.90	79.70	0.00E+00	1.46E+00	3.79E+01	3.94E+01	10	0.0287	463.0	0.10	1.33E+00	4.07E+01	28	42	1.5	1.0
Cu	B47.2E	0.918	0.287	0	0.3	0.7	11.10	5.19	11.50	0.00E+00	4.47E-01	5.47E+00	5.92E+00	10	0.0287	544.0	0.10	1.56E+00	7.48E+00	28	42	0.3	0.2
Cu	O43.5W	0.918	0.287	0	0.3	0.7	10.20	11.90	54.90	0.00E+00	1.02E+00	2.61E+01	2.71E+01	10	0.0287	438.0	0.10	1.26E+00	2.84E+01	28	42	1.0	0.7
Cu	O44.2E	0.918	0.287	0	0.3	0.7	11.60	3.52	28.10	0.00E+00	3.03E-01	1.34E+01	1.37E+01	10	0.0287	449.0	0.10	1.29E+00	1.50E+01	28	42	0.5	0.4
Cu	O48.8E	0.918	0.287	0	0.3	0.7	12.90	4.42	29.20	0.00E+00	3.81E-01	1.39E+01	1.43E+01	10	0.0287	549.0	0.10	1.58E+00	1.58E+01	28	42	0.6	0.4
Cu	ERA-29	0.918	0.287	0	0.3	0.7	16.30	38.70	34.30	0.00E+00	3.33E+00	1.63E+01	1.96E+01	10	0.0287	459.7	0.10	1.32E+00	2.10E+01	28	42	0.7	0.5
Physical Reach 2																							
Cu	ERA-32*	0.918	0.287	0	0.3	0.7	42.30	34.73	33.90	0.00E+00	2.99E+00	2.18E+01	2.48E+01	10	0.0287	436.9	0.10	1.25E+00	2.60E+01	28	42	0.9	0.6
Physical Reach 3																							
Cu	ERA-22	0.918	0.287	0	0.3	0.7	144.00	36.57	45.50	0.00E+00	3.15E+00	2.92E+01	3.24E+01	10	0.0287	1120.0	0.10	3.21E+00	3.56E+01	28	42	1.3	0.8
Cu	ERA-28	0.918	0.287	0	0.3	0.7	42.60	30.80	56.40	0.00E+00	2.65E+00	3.62E+01	3.89E+01	10	0.0287	1060.0	0.10	3.04E+00	4.19E+01	28	42	1.5	1.0
Physical Reach 8																							
Cu	ERA-27	0.918	0.287	0	0.3	0.7	43.90	27.83	44.70	0.00E+00	2.40E+00	2.87E+01	3.11E+01	10	0.0287	327.7	0.10	9.40E-01	3.21E+01	28	42	1.1	0.8
Side Channel Area																							
Cu	SC-1	0.918	0.287	0	0.3	0.7	25.10	25.10	49.30	0.00E+00	2.16E+00	3.17E+01	3.38E+01	10	0.0287	196.4	0.10	5.64E-01	3.44E+01	28	42	1.2	0.8
Cu	SC-2	0.918	0.287	0	0.3	0.7	47.10	47.10	55.50	0.00E+00	4.06E+00	3.57E+01	3.97E+01	10	0.0287	196.4	0.10	5.64E-01	4.03E+01	28	42	1.4	1.0
Cu	SC-3	0.918	0.287	0	0.3	0.7	47.40	47.40	32.80	0.00E+00	4.08E+00	2.11E+01	2.52E+01	10	0.0287	196.4	0.10	5.64E-01	2.57E+01	28	42	0.9	0.6
Lower Whitewater Creek																							
Cu	LW-03-A	0.918	0.287	0	0.3	0.7	19.30	19.30	30.80	0.00E+00	1.66E+00	1.98E+01	2.15E+01	10	0.0287	233.0	0.10	6.69E-01	2.21E+01	28	42	0.8	0.5
Cu	LW-03E-A	0.918	0.287	0	0.3	0.7	34.50	34.50	21.10	0.00E+00	2.97E+00	1.36E+01	1.65E+01	10	0.0287	233.0	0.10	6.69E-01	1.72E+01	28	42	0.6	0.4
Cu	LW-04-A	0.918	0.287	0	0.3	0.7	32.70	32.70	78.00	0.00E+00	2.82E+00	5.01E+01	5.29E+01	10	0.0287	954.2	0.10	2.74E+00	5.57E+01	28	42	2.0	1.3
Cu	LW-05-A	0.918	0.287	0	0.3	0.7	14.00	14.00	N/A	0.00E+00	1.21E+00	N/A	1.21E+00	10	0.0287	954.2	0.10	2.74E+00	3.94E+00	28	42	NA	NA
Cu	LW-06-A	0.918	0.287	0	0.3	0.7	17.60	17.60	41.40	0.00E+00	1.52E+00	2.66E+01	2.81E+01	10	0.0287	271.2	0.10	7.78E-01	2.89E+01	28	42	1.0	0.7
Cu	LW-07-A	0.918	0.287	0	0.3	0.7	30.00	30.00	95.10	0.00E+00	2.58E+00	6.11E+01	6.37E+01	10	0.0287	537.5	0.10	1.54E+00	6.52E+01	28	42	2.3	1.6
Bayard Canyon																							
Cu	ERA-33	0.918	0.287	0	0.3	0.7	15.20	25.17	25.00	0.00E+00	2.17E+00	1.61E+01	1.82E+01	10	0.0287	176.2	0.10	5.06E-01	1.87E+01	28	42	0.7	0.4

Notes:

BW - Body weight

DW - Dry weight

kg/kg - kilograms per kilogram

mg/kg - milligrams per kilogram

N/A: Not analyzed

NA: Not applicable

Italicized : Concentrations found in foliage were used as seed tissue concentrations.

Calculation details are provided in Appendix A.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

Hazard Quotient (HQ) greater than 1.0

Table 3.3-3b
Copper Hazard Quotient Calculations
Small Ground Feeding Bird; Insectivorous Diet
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (0%)	Invertebrate (100%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Cu	B45.8W	0.918	0.287	0	0	1	10.50	16.90	79.70	0.00E+00	0.00E+00	5.41E+01	5.41E+01	10	0.0287	463.0	0.10	1.33E+00	5.55E+01	28	42	2.0	1.3
Cu	B47.2E	0.918	0.287	0	0	1	11.10	5.19	11.50	0.00E+00	0.00E+00	7.81E+00	7.81E+00	10	0.0287	544.0	0.10	1.56E+00	9.37E+00	28	42	0.3	0.2
Cu	O43.5W	0.918	0.287	0	0	1	10.20	11.90	54.90	0.00E+00	0.00E+00	3.73E+01	3.73E+01	10	0.0287	438.0	0.10	1.26E+00	3.86E+01	28	42	1.4	0.9
Cu	O44.2E	0.918	0.287	0	0	1	11.60	3.52	28.10	0.00E+00	0.00E+00	1.91E+01	1.91E+01	10	0.0287	449.0	0.10	1.29E+00	2.04E+01	28	42	0.7	0.5
Cu	O48.8E	0.918	0.287	0	0	1	12.90	4.42	29.20	0.00E+00	0.00E+00	1.98E+01	1.98E+01	10	0.0287	549.0	0.10	1.58E+00	2.14E+01	28	42	0.8	0.5
Cu	ERA-29	0.918	0.287	0	0	1	16.30	38.70	34.30	0.00E+00	0.00E+00	2.33E+01	2.33E+01	10	0.0287	459.7	0.10	1.32E+00	2.46E+01	28	42	0.9	0.6
Physical Reach 2																							
Cu	ERA-32*	0.918	0.287	0	0	1	42.30	34.73	33.90	0.00E+00	0.00E+00	3.11E+01	3.11E+01	10	0.0287	436.9	0.10	1.25E+00	3.24E+01	28	42	1.2	0.8
Physical Reach 3																							
Cu	ERA-22	0.918	0.287	0	0	1	144.00	36.57	45.50	0.00E+00	0.00E+00	4.18E+01	4.18E+01	10	0.0287	1120.0	0.10	3.21E+00	4.50E+01	28	42	1.6	1.1
Cu	ERA-28	0.918	0.287	0	0	1	42.60	30.80	56.40	0.00E+00	0.00E+00	5.18E+01	5.18E+01	10	0.0287	1060.0	0.10	3.04E+00	5.48E+01	28	42	2.0	1.3
Physical Reach 8																							
Cu	ERA-27	0.918	0.287	0	0	1	43.90	27.83	44.70	0.00E+00	0.00E+00	4.10E+01	4.10E+01	10	0.0287	327.7	0.10	9.40E-01	4.20E+01	28	42	1.5	1.0
Side Channel Area																							
Cu	SC-1	0.918	0.287	0	0	1	25.10	25.10	49.30	0.00E+00	0.00E+00	4.53E+01	4.53E+01	10	0.0287	196.6	0.10	5.64E-01	4.58E+01	28	42	1.6	1.1
Cu	SC-2	0.918	0.287	0	0	1	47.10	47.10	55.50	0.00E+00	0.00E+00	5.09E+01	5.09E+01	10	0.0287	196.6	0.10	5.64E-01	5.15E+01	28	42	1.8	1.2
Cu	SC-3	0.918	0.287	0	0	1	47.40	47.40	32.80	0.00E+00	0.00E+00	3.01E+01	3.01E+01	10	0.0287	196.6	0.10	5.64E-01	3.07E+01	28	42	1.1	0.7
Lower Whitewater Creek																							
Cu	LW-03-A	0.918	0.287	0	0	1	19.30	19.30	30.80	0.00E+00	0.00E+00	2.83E+01	2.83E+01	10	0.0287	233.0	0.10	6.69E-01	2.89E+01	28	42	1.0	0.7
Cu	LW-03E-A	0.918	0.287	0	0	1	34.50	34.50	21.10	0.00E+00	0.00E+00	1.94E+01	1.94E+01	10	0.0287	233.0	0.10	6.69E-01	2.00E+01	28	42	0.7	0.5
Cu	LW-04-A	0.918	0.287	0	0	1	32.70	32.70	78.00	0.00E+00	0.00E+00	7.16E+01	7.16E+01	10	0.0287	954.2	0.10	2.74E+00	7.43E+01	28	42	2.7	1.8
Cu	LW-05-A	0.918	0.287	0	0	1	14.00	14.00	N/A	0.00E+00	0.00E+00	N/A	0.00E+00	10	0.0287	954.2	0.10	2.74E+00	2.74E+00	28	42	NA	NA
Cu	LW-06-A	0.918	0.287	0	0	1	17.60	17.60	41.40	0.00E+00	0.00E+00	3.80E+01	3.80E+01	10	0.0287	271.2	0.10	7.78E-01	3.88E+01	28	42	1.4	0.9
Cu	LW-07-A	0.918	0.287	0	0	1	30.00	30.00	95.10	0.00E+00	0.00E+00	8.73E+01	8.73E+01	10	0.0287	537.5	0.10	1.54E+00	8.88E+01	28	42	3.2	2.1
Bayard Canyon																							
Cu	ERA-33	0.918	0.287	0	0	1	15.20	25.17	25.00	0.00E+00	0.00E+00	2.30E+01	2.30E+01	10	0.0287	176.2	0.10	5.06E-01	2.35E+01	28	42	0.8	0.6

Notes:

BW - Body weight

DW - Dry weight

kg/kg - kilograms per kilogram

mg/kg - milligrams per kilogram

N/A - Not analyzed

NA - Not applicable

Italicized : Concentrations found in foliage were used as seed tissue concentrations.

Calculation details are provided in Appendix A.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

Hazard Quotient (HQ) greater than 1.0

Table 3.4-1
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Cadmium	95% ile	0.918	0.287	0	0.3	0.7	0.75	0.64	0.55	0.00E+00	5.52E-02	3.53E-01	4.08E-01	10	0.0287	7.7	1.00	2.21E-01	6.29E-01	1.7	24	0.4	0.03
Cadmium	95th UCL	0.918	0.287	0	0.3	0.7	0.69	0.50	0.49	0.00E+00	4.31E-02	3.14E-01	3.57E-01	10	0.0287	5.76	1.00	1.65E-01	5.23E-01	1.7	24	0.3	0.02
Cadmium	ERA 29	0.918	0.287	0	0.3	0.7	0.70	0.52	0.50	0.00E+00	4.46E-02	3.19E-01	3.64E-01	10	0.0287	6	1.00	1.72E-01	5.36E-01	1.7	24	0.3	0.02
Cadmium	U02-2100	0.918	0.287	0	0.3	0.7	0.66	0.44	0.46	0.00E+00	3.82E-02	2.96E-01	3.35E-01	10	0.0287	5.0	1.00	1.43E-01	4.78E-01	1.7	24	0.3	0.02
Cadmium	U02-2102	0.918	0.287	0	0.3	0.7	0.61	0.36	0.41	0.00E+00	3.08E-02	2.65E-01	2.96E-01	10	0.0287	3.8	1.00	1.09E-01	4.05E-01	1.7	24	0.2	0.02
Cadmium	U02-3100	0.918	0.287	0	0.3	0.7	0.84	0.92	0.65	0.00E+00	7.91E-02	4.15E-01	4.94E-01	10	0.0287	11.5	1.00	3.31E-01	8.25E-01	1.7	24	0.5	0.03
Cadmium	U02-3102	0.918	0.287	0	0.3	0.7	0.56	0.29	0.37	0.00E+00	2.49E-02	2.37E-01	2.61E-01	10	0.0287	2.8	1.00	8.15E-02	3.43E-01	1.7	24	0.2	0.01
Cadmium	U02-5003	0.918	0.287	0	0.3	0.7	0.39	0.14	0.22	0.00E+00	1.21E-02	1.42E-01	1.54E-01	10	0.0287	0.8	1.00	2.30E-02	1.77E-01	1.7	24	0.1	0.01
Cadmium	U02-ER001	0.918	0.287	0	0.3	0.7	0.64	0.42	0.45	0.00E+00	3.59E-02	2.87E-01	3.23E-01	10	0.0287	4.6	1.00	1.32E-01	4.55E-01	1.7	24	0.3	0.02
Cadmium	U02-ER002	0.918	0.287	0	0.3	0.7	0.68	0.48	0.48	0.00E+00	4.15E-02	3.08E-01	3.50E-01	10	0.0287	5.5	1.00	1.58E-01	5.08E-01	1.7	24	0.3	0.02
Cadmium	U02-ER003	0.918	0.287	0	0.3	0.7	0.70	0.52	0.50	0.00E+00	4.46E-02	3.19E-01	3.64E-01	10	0.0287	6.0	1.00	1.72E-01	5.36E-01	1.7	24	0.3	0.02
Cadmium	U02-ER004	0.918	0.287	0	0.3	0.7	0.65	0.42	0.45	0.00E+00	3.65E-02	2.89E-01	3.26E-01	10	0.0287	4.7	1.00	1.35E-01	4.61E-01	1.7	24	0.3	0.02
Cadmium	U02-ER005	0.918	0.287	0	0.3	0.7	0.62	0.37	0.42	0.00E+00	3.21E-02	2.71E-01	3.03E-01	10	0.0287	4.0	1.00	1.15E-01	4.18E-01	1.7	24	0.2	0.02
Cadmium	U02-ER006	0.918	0.287	0	0.3	0.7	0.57	0.30	0.38	0.00E+00	2.59E-02	2.42E-01	2.68E-01	10	0.0287	3.0	1.00	8.61E-02	3.54E-01	1.7	24	0.2	0.01
Cadmium	U02-ER007	0.918	0.287	0	0.3	0.7	0.56	0.29	0.37	0.00E+00	2.52E-02	2.38E-01	2.64E-01	10	0.0287	2.9	1.00	8.32E-02	3.47E-01	1.7	24	0.2	0.01
Cadmium	U02-ER009	0.918	0.287	0	0.3	0.7	0.57	0.30	0.38	0.00E+00	2.59E-02	2.42E-01	2.68E-01	10	0.0287	3.0	1.00	8.61E-02	3.54E-01	1.7	24	0.2	0.01
Cadmium	U02-ER010	0.918	0.287	0	0.3	0.7	0.46	0.18	0.28	0.00E+00	1.59E-02	1.78E-01	1.94E-01	10	0.0287	1.4	1.00	4.02E-02	2.34E-01	1.7	24	0.1	0.01
Physical Reach 2																							
Cadmium	95% ile*	0.918	0.287	0	0.3	0.7	0.64	0.42	0.45	0.00E+00	3.59E-02	2.87E-01	3.23E-01	10	0.0287	4.6	1.00	1.32E-01	4.55E-01	1.7	24	0.3	0.02
Cadmium	95th UCL*	0.918	0.287	0	0.3	0.7	0.63	0.39	0.43	0.00E+00	3.34E-02	2.77E-01	3.10E-01	10	0.0287	4.2	1.00	1.21E-01	4.31E-01	1.7	24	0.3	0.02
Cadmium	ERA 32*	0.918	0.287	0	0.3	0.7	0.55	0.28	0.36	0.00E+00	2.42E-02	2.33E-01	2.57E-01	10	0.0287	2.7	1.00	7.84E-02	3.35E-01	1.7	24	0.2	0.01
Cadmium	U03-2200	0.918	0.287	0	0.3	0.7	0.69	0.49	0.49	0.00E+00	4.25E-02	3.12E-01	3.55E-01	10	0.0287	5.7	1.00	1.63E-01	5.17E-01	1.7	24	0.3	0.02
Cadmium	U03-3200	0.918	0.287	0	0.3	0.7	0.48	0.21	0.30	0.00E+00	1.78E-02	1.93E-01	2.10E-01	10	0.0287	1.7	1.00	4.90E-02	2.59E-01	1.7	24	0.2	0.01
Cadmium	U03-4202	0.918	0.287	0	0.3	0.7	0.36	0.13	0.20	0.00E+00	1.12E-02	1.31E-01	1.42E-01	10	0.0287	0.7	1.00	1.87E-02	1.61E-01	1.7	24	0.1	0.01
Cadmium	U03-4203	0.918	0.287	0	0.3	0.7	0.38	0.13	0.21	0.00E+00	1.16E-02	1.36E-01	1.48E-01	10	0.0287	0.7	1.00	2.06E-02	1.68E-01	1.7	24	0.1	0.01
Cadmium	U03-4205	0.918	0.287	0	0.3	0.7	0.40	0.15	0.23	0.00E+00	1.28E-02	1.50E-01	1.62E-01	10	0.0287	0.9	1.00	2.61E-02	1.88E-01	1.7	24	0.1	0.01
Cadmium	U03-4206	0.918	0.287	0	0.3	0.7	0.36	0.13	0.20	0.00E+00	1.10E-02	1.29E-01	1.40E-01	10	0.0287	0.6	1.00	1.80E-02	1.58E-01	1.7	24	0.1	0.01
Cadmium	U03-4207	0.918	0.287	0	0.3	0.7	0.39	0.14	0.22	0.00E+00	1.21E-02	1.42E-01	1.55E-01	10	0.0287	0.8	1.00	2.31E-02	1.78E-01	1.7	24	0.1	0.01
Physical Reach 3																							
Cadmium	95% ile	0.918	0.287	0	0.3	0.7	0.65	0.42	0.45	0.00E+00	3.60E-02	2.87E-01	3.23E-01	10	0.0287	4.62	1.00	1.33E-01	4.56E-01	1.7	24	0.3	0.02
Cadmium	95th UCL	0.918	0.287	0	0.3	0.7	0.52	0.25	0.34	0.00E+00	2.12E-02	2.16E-01	2.37E-01	10	0.0287	2.26	1.00	6.49E-02	3.02E-01	1.7	24	0.2	0.01
Cadmium	ERA 22	0.918	0.287	0	0.3	0.7	0.66	0.44	0.46	0.00E+00	3.79E-02	2.95E-01	3.33E-01	10	0.0287	4.9	1.00	1.42E-01	4.75E-01	1.7	24	0.3	0.02
Cadmium	ERA 28	0.918	0.287	0	0.3	0.7	0.59	0.33	0.40	0.00E+00	2.88E-02	2.56E-01	2.85E-01	10	0.0287	3.5	1.00	9.95E-02	3.84E-01	1.7	24	0.2	0.02
Cadmium	U03-2300	0.918	0.287	0	0.3	0.7	0.52	0.24	0.33	0.00E+00	2.08E-02	2.13E-01	2.34E-01	10	0.0287	2.2	1.00	6.27E-02	2.96E-01	1.7	24	0.2	0.01
Cadmium	U03-2302	0.918	0.287	0	0.3	0.7	0.42	0.16	0.25	0.00E+00	1.39E-02	1.61E-01	1.75E-01	10	0.0287	1.1	1.00	3.12E-02	2.06E-01	1.7	24	0.1	0.01
Cadmium	U03-2303	0.918	0.287	0	0.3	0.7	0.55	0.27	0.36	0.00E+00	2.35E-02	2.29E-01	2.53E-01	10	0.0287	2.6	1.00	7.53E-02	3.28E-01	1.7	24	0.2	0.01
Cadmium	U03-2305	0.918	0.287	0	0.3	0.7	0.51	0.23	0.32	0.00E+00	1.96E-02	2.06E-01	2.25E-01	10	0.0287	2.0	1.00	5.76E-02	2.83E-01	1.7	24	0.2	0.01
Cadmium	U03-2306	0.918	0.287	0	0.3	0.7	0.49	0.21	0.30	0.00E+00	1.81E-02	1.95E-01	2.13E-01	10	0.0287	1.8	1.00	5.04E-02	2.64E-01	1.7	24	0.2	0.01

Table 3.4-1
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Cadmium	U03-2307	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-2309	0.918	0.287	0	0.3	0.7	0.51	0.23	0.32	0.00E+00	2.00E-02	2.08E-01	2.28E-01	10	0.0287	2.1	1.00	5.91E-02	2.87E-01	1.7	24	0.2	0.01
Cadmium	U03-2311	0.918	0.287	0	0.3	0.7	0.58	0.31	0.39	0.00E+00	2.71E-02	2.48E-01	2.75E-01	10	0.0287	3.2	1.00	9.17E-02	3.67E-01	1.7	24	0.2	0.02
Cadmium	U03-2312	0.918	0.287	0	0.3	0.7	0.28	0.10	0.14	0.00E+00	8.79E-03	9.20E-02	1.01E-01	10	0.0287	0.3	1.00	7.76E-03	1.09E-01	1.7	24	0.1	0.005
Cadmium	U03-2313	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-2315	0.918	0.287	0	0.3	0.7	0.41	0.15	0.24	0.00E+00	1.31E-02	1.52E-01	1.66E-01	10	0.0287	1.0	1.00	2.73E-02	1.93E-01	1.7	24	0.1	0.01
Cadmium	U03-2316	0.918	0.287	0	0.3	0.7	0.41	0.15	0.24	0.00E+00	1.33E-02	1.55E-01	1.68E-01	10	0.0287	1.0	1.00	2.83E-02	1.96E-01	1.7	24	0.1	0.01
Cadmium	U03-2318	0.918	0.287	0	0.3	0.7	0.30	0.11	0.15	0.00E+00	9.09E-03	9.82E-02	1.07E-01	10	0.0287	0.3	1.00	9.13E-03	1.16E-01	1.7	24	0.1	0.005
Cadmium	U03-2320	0.918	0.287	0	0.3	0.7	0.29	0.10	0.15	0.00E+00	9.02E-03	9.67E-02	1.06E-01	10	0.0287	0.3	1.00	8.80E-03	1.15E-01	1.7	24	0.1	0.005
Cadmium	U03-2321	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-2322	0.918	0.287	0	0.3	0.7	0.38	0.14	0.22	0.00E+00	1.19E-02	1.39E-01	1.51E-01	10	0.0287	0.8	1.00	2.19E-02	1.73E-01	1.7	24	0.1	0.01
Cadmium	U03-3300	0.918	0.287	0	0.3	0.7	0.56	0.29	0.37	0.00E+00	2.54E-02	2.39E-01	2.64E-01	10	0.0287	2.9	1.00	8.38E-02	3.48E-01	1.7	24	0.2	0.01
Cadmium	U03-3302	0.918	0.287	0	0.3	0.7	0.72	0.56	0.51	0.00E+00	4.81E-02	3.31E-01	3.79E-01	10	0.0287	6.6	1.00	1.88E-01	5.67E-01	1.7	24	0.3	0.02
Cadmium	U03-3303	0.918	0.287	0	0.3	0.7	0.58	0.32	0.39	0.00E+00	2.73E-02	2.49E-01	2.77E-01	10	0.0287	3.2	1.00	9.29E-02	3.69E-01	1.7	24	0.2	0.02
Cadmium	U03-3305	0.918	0.287	0	0.3	0.7	0.50	0.22	0.32	0.00E+00	1.92E-02	2.03E-01	2.22E-01	10	0.0287	1.9	1.00	5.55E-02	2.77E-01	1.7	24	0.2	0.01
Cadmium	U03-3306	0.918	0.287	0	0.3	0.7	0.59	0.32	0.39	0.00E+00	2.78E-02	2.51E-01	2.79E-01	10	0.0287	3.3	1.00	9.50E-02	3.74E-01	1.7	24	0.2	0.02
Cadmium	U03-3308	0.918	0.287	0	0.3	0.7	0.48	0.21	0.30	0.00E+00	1.78E-02	1.93E-01	2.11E-01	10	0.0287	1.7	1.00	4.91E-02	2.60E-01	1.7	24	0.2	0.01
Cadmium	U03-3309	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-3311	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-3312	0.918	0.287	0	0.3	0.7	0.48	0.20	0.30	0.00E+00	1.75E-02	1.91E-01	2.08E-01	10	0.0287	1.7	1.00	4.78E-02	2.56E-01	1.7	24	0.2	0.01
Cadmium	U03-3314	0.918	0.287	0	0.3	0.7	0.47	0.20	0.29	0.00E+00	1.71E-02	1.88E-01	2.05E-01	10	0.0287	1.6	1.00	4.59E-02	2.51E-01	1.7	24	0.1	0.01
Cadmium	U03-3316	0.918	0.287	0	0.3	0.7	0.47	0.19	0.28	0.00E+00	1.65E-02	1.83E-01	1.99E-01	10	0.0287	1.5	1.00	4.31E-02	2.43E-01	1.7	24	0.1	0.01
Cadmium	U03-3317	0.918	0.287	0	0.3	0.7	0.43	0.17	0.26	0.00E+00	1.45E-02	1.66E-01	1.81E-01	10	0.0287	1.2	1.00	3.40E-02	2.15E-01	1.7	24	0.1	0.01
Cadmium	U03-3318	0.918	0.287	0	0.3	0.7	0.56	0.28	0.36	0.00E+00	2.43E-02	2.33E-01	2.58E-01	10	0.0287	2.8	1.00	7.89E-02	3.37E-01	1.7	24	0.2	0.01
Cadmium	U03-3320	0.918	0.287	0	0.3	0.7	0.62	0.38	0.42	0.00E+00	3.24E-02	2.73E-01	3.05E-01	10	0.0287	4.0	1.00	1.16E-01	4.21E-01	1.7	24	0.2	0.02
Cadmium	U03-3321	0.918	0.287	0	0.3	0.7	0.33	0.12	0.18	0.00E+00	1.01E-02	1.16E-01	1.26E-01	10	0.0287	0.5	1.00	1.37E-02	1.39E-01	1.7	24	0.1	0.01
Cadmium	U03-3322	0.918	0.287	0	0.3	0.7	0.57	0.30	0.38	0.00E+00	2.61E-02	2.43E-01	2.69E-01	10	0.0287	3.0	1.00	8.74E-02	3.57E-01	1.7	24	0.2	0.01
Cadmium	U03-4306	0.918	0.287	0	0.3	0.7	0.76	0.68	0.56	0.00E+00	5.86E-02	3.63E-01	4.21E-01	10	0.0287	8.2	1.00	2.36E-01	6.57E-01	1.7	24	0.4	0.03
Cadmium	U03-4308	0.918	0.287	0	0.3	0.7	0.43	0.17	0.26	0.00E+00	1.45E-02	1.67E-01	1.81E-01	10	0.0287	1.2	1.00	3.40E-02	2.15E-01	1.7	24	0.1	0.01
Cadmium	U03-4309	0.918	0.287	0	0.3	0.7	0.43	0.17	0.26	0.00E+00	1.42E-02	1.64E-01	1.78E-01	10	0.0287	1.1	1.00	3.28E-02	2.11E-01	1.7	24	0.1	0.01
Cadmium	U03-4311	0.918	0.287	0	0.3	0.7	0.43	0.16	0.25	0.00E+00	1.40E-02	1.62E-01	1.76E-01	10	0.0287	1.1	1.00	3.19E-02	2.08E-01	1.7	24	0.1	0.01
Cadmium	U03-4313	0.918	0.287	0	0.3	0.7	0.45	0.18	0.27	0.00E+00	1.53E-02	1.73E-01	1.89E-01	10	0.0287	1.3	1.00	3.77E-02	2.26E-01	1.7	24	0.1	0.01
Cadmium	U03-4314	0.918	0.287	0	0.3	0.7	0.41	0.15	0.24	0.00E+00	1.31E-02	1.53E-01	1.67E-01	10	0.0287	1.0	1.00	2.77E-02	1.94E-01	1.7	24	0.1	0.01
Cadmium	U03-4315	0.918	0.287	0	0.3	0.7	0.46	0.19	0.28	0.00E+00	1.60E-02	1.79E-01	1.95E-01	10	0.0287	1.4	1.00	4.08E-02	2.36E-01	1.7	24	0.1	0.01
Cadmium	U03-4317	0.918	0.287	0	0.3	0.7	0.49	0.21	0.31	0.00E+00	1.84E-02	1.97E-01	2.16E-01	10	0.0287	1.8	1.00	5.20E-02	2.68E-01	1.7	24	0.2	0.01
Cadmium	U03-4319	0.918	0.287	0	0.3	0.7	0.47	0.20	0.29	0.00E+00	1.69E-02	1.87E-01	2.03E-01	10	0.0287	1.6	1.00	4.51E-02	2.49E-01	1.7	24	0.1	0.01
Cadmium	U03-4320	0.918	0.287	0	0.3	0.7	0.46	0.19	0.28	0.00E+00	1.61E-02	1.80E-01	1.96E-01	10	0.0287	1.4	1.00	4.12E-02	2.37E-01	1.7	24	0.1	0.01
Cadmium	U03-4321	0.918	0.287	0	0.3	0.7	0.22	0.09	0.10	0.00E+00	7.85E-03	6.64E-02	7.42E-02	10	0.0287	0.1	1.00	3.44E-03	7.77E-02	1.7	24	0.0	0.003
Cadmium	U03-4322	0.918	0.287	0	0.3	0.7	0.36	0.13	0.20	0.00E+00	1.12E-02	1.31E-01	1.42E-01	10	0.0287	0.6	1.00	1.86E-02	1.61E-01	1.7	24	0.1	0.01
Cadmium	U03-4324	0.918	0.287	0	0.3	0.7	0.47	0.19	0.29	0.00E+00	1.66E-02	1.84E-01	2.01E-01	10	0.0287	1.5	1.00	4.38E-02	2.45E-01	1.7	24	0.1	0.01
Cadmium	U03-6300	0.918	0.287	0	0.3	0.7	0.31	0.11	0.16	0.00E+00	9.33E-03	1.03E-01	1.12E-01	10	0.0287	0.4	1.00	1.02E-02	1.22E-01	1.7	24	0.1	0.01
Physical Reach 4																							
Cadmium	U03-3400	0.918	0.287	0	0.3	0.7	0.53	0.26	0.35	0.00E+00	2.22E-02	2.22E-01	2.44E-01	10	0.0287	2.4	1.00	6.94E-02	3.13E-01	1.7	24	0.2	0.01

Table 3.4-1
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reaches 6 and 7																							
Cadmium	95% ile	0.918	0.287	0	0.3	0.7	0.50	0.22	0.32	0.00E+00	1.93E-02	2.03E-01	2.23E-01	10	0.0287	1.95	1.00	5.60E-02	2.79E-01	1.7	24	0.2	0.01
Cadmium	U03-2600 B	0.918	0.287	0	0.3	0.7	0.23	0.09	0.11	0.00E+00	7.98E-03	7.06E-02	7.86E-02	10	0.0287	0.1	1.00	4.02E-03	8.26E-02	1.7	24	0.05	0.003
Cadmium	U03-2602 B	0.918	0.287	0	0.3	0.7	0.54	0.26	0.35	0.00E+00	2.25E-02	2.24E-01	2.46E-01	10	0.0287	2.5	1.00	7.08E-02	3.17E-01	1.7	24	0.2	0.01
Cadmium	U03-3600	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-3602	0.918	0.287	0	0.3	0.7	0.32	0.11	0.17	0.00E+00	9.67E-03	1.09E-01	1.18E-01	10	0.0287	0.4	1.00	1.18E-02	1.30E-01	1.7	24	0.1	0.01
Cadmium	U03-3604	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-6600	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Physical Reaches 8 and 9																							
Cadmium	95% ile	0.918	0.287	0	0.3	0.7	0.37	0.13	0.20	0.00E+00	1.12E-02	1.31E-01	1.43E-01	10	0.0287	0.658	1.00	1.89E-02	1.62E-01	1.7	24	0.1	0.01
Cadmium	95th UCL	0.918	0.287	0	0.3	0.7	0.35	0.13	0.20	0.00E+00	1.08E-02	1.26E-01	1.37E-01	10	0.0287	0.59	1.00	1.69E-02	1.54E-01	1.7	24	0.1	0.01
Cadmium	ERA 27	0.918	0.287	0	0.3	0.7	0.37	0.13	0.21	0.00E+00	1.15E-02	1.35E-01	1.47E-01	10	0.0287	0.7	1.00	2.02E-02	1.67E-01	1.7	24	0.1	0.01
Cadmium	U03-2800	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-3800	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-3900	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-2900 B	0.918	0.287	0	0.3	0.7	0.35	0.13	0.20	0.00E+00	1.08E-02	1.26E-01	1.37E-01	10	0.0287	0.6	1.00	1.69E-02	1.54E-01	1.7	24	0.1	0.01
Cadmium	U03-2901 B	0.918	0.287	0	0.3	0.7	0.23	0.09	0.11	0.00E+00	7.98E-03	7.06E-02	7.86E-02	10	0.0287	0.1	1.00	4.02E-03	8.26E-02	1.7	24	0.0	0.003
Cadmium	U03-3901	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-3902	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Cadmium	U03-6900	0.918	0.287	0	0.3	0.7	0.26	0.10	0.13	0.00E+00	8.38E-03	8.23E-02	9.07E-02	10	0.0287	0.2	1.00	5.88E-03	9.66E-02	1.7	24	0.1	0.004
Bayard Canyon																							
Cadmium	ERA 33	0.918	0.287	0	0.3	0.7	0.45	0.18	0.27	0.00E+00	1.52E-02	1.73E-01	1.88E-01	10	0.0287	1.3	1.00	3.72E-02	2.25E-01	1.7	24	0.1	0.01
Cadmium	U03-3003	0.918	0.287	0	0.3	0.7	0.35	0.13	0.20	0.00E+00	1.08E-02	1.26E-01	1.36E-01	10	0.0287	0.6	1.00	1.68E-02	1.53E-01	1.7	24	0.1	0.01
Cadmium	U03-3004	0.918	0.287	0	0.3	0.7	0.45	0.18	0.27	0.00E+00	1.55E-02	1.75E-01	1.91E-01	10	0.0287	1.3	1.00	3.87E-02	2.30E-01	1.7	24	0.1	0.01
Lower Whitewater Creek																							
Cadmium	95% ile	0.918	0.287	0	0.3	0.7	0.34	0.12	0.19	0.00E+00	1.04E-02	1.21E-01	1.31E-01	10	0.0287	0.53	1.00	1.52E-02	1.46E-01	1.7	24	0.1	0.01
Cadmium	95th UCL	0.918	0.287	0	0.3	0.7	0.31	0.11	0.17	0.00E+00	9.54E-03	1.07E-01	1.16E-01	10	0.0287	0.39	1.00	1.12E-02	1.27E-01	1.7	24	0.1	0.01
Cadmium	U03-31152	0.918	0.287	0	0.3	0.7	0.30	0.11	0.16	0.00E+00	9.29E-03	1.02E-01	1.11E-01	10	0.0287	0.4	1.00	1.00E-02	1.21E-01	1.7	24	0.1	0.01
Cadmium	U03-31259	0.918	0.287	0	0.3	0.7	0.27	0.10	0.14	0.00E+00	8.60E-03	8.77E-02	9.63E-02	10	0.0287	0.2	1.00	6.89E-03	1.03E-01	1.7	24	0.1	0.004
Cadmium	U03-31264	0.918	0.287	0	0.3	0.7	0.31	0.11	0.17	0.00E+00	9.54E-03	1.07E-01	1.16E-01	10	0.0287	0.4	1.00	1.12E-02	1.27E-01	1.7	24	0.1	0.01
Cadmium	U03-31368	0.918	0.287	0	0.3	0.7	0.33	0.12	0.18	0.00E+00	9.92E-03	1.13E-01	1.23E-01	10	0.0287	0.5	1.00	1.29E-02	1.36E-01	1.7	24	0.1	0.01
Cadmium	U03-31578	0.918	0.287	0	0.3	0.7	0.34	0.12	0.18	0.00E+00	1.02E-02	1.17E-01	1.27E-01	10	0.0287	0.5	1.00	1.41E-02	1.41E-01	1.7	24	0.1	0.01
Cadmium	U03-61153	0.918	0.287	0	0.3	0.7	0.35	0.12	0.19	0.00E+00	1.07E-02	1.24E-01	1.35E-01	10	0.0287	0.6	1.00	1.64E-02	1.51E-01	1.7	24	0.1	0.01
Cadmium	U03-61258	0.918	0.287	0	0.3	0.7	0.29	0.10	0.15	0.00E+00	8.98E-03	9.59E-02	1.05E-01	10	0.0287	0.3	1.00	8.61E-03	1.13E-01	1.7	24	0.1	0.005
Cadmium	U03-61265	0.918	0.287	0	0.3	0.7	0.29	0.10	0.15	0.00E+00	8.85E-03	9.33E-02	1.02E-01	10	0.0287	0.3	1.00	8.04E-03	1.10E-01	1.7	24	0.1	0.005
Cadmium	U03-61369	0.918	0.287	0	0.3	0.7	0.27	0.10	0.13	0.00E+00	8.48E-03	8.47E-02	9.32E-02	10	0.0287	0.2	1.00	6.31E-03	9.95E-02	1.7	24	0.1	0.004
Cadmium	U03-61474	0.918	0.287	0	0.3	0.7	0.25	0.09	0.12	0.00E+00	8.17E-03	7.63E-02	8.45E-02	10	0.0287	0.2	1.00	4.88E-03	8.94E-02	1.7	24	0.1	0.004
Cadmium	U03-61575	0.918	0.287	0	0.3	0.7	0.29	0.10	0.15	0.00E+00	8.92E-03	9.46E-02	1.04E-01	10	0.0287	0.3	1.00	8.32E-03	1.12E-01	1.7	24	0.1	0.005

Table 3.4-1
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Side Channel																							
Cadmium	Geometric Mean	0.918	0.287	0	0.3	0.7	0.30	0.11	0.15	0.00E+00	9.10E-03	9.84E-02	1.08E-01	10	0.0287	0.32	1.00	9.18E-03	1.17E-01	1.7	24	0.1	0.005

Notes:

Calculation details are provided in Appendix A.

Tissue concentration models are provided in Appendix B.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009).

Side Channel soil data represent the geometric mean of Golder (2002).

BW - Body weight

DW - Dry weight

kg/kg - kilograms per kilogram

mg/kg - milligrams per kilogram

NOAEL - No-Observed-Adverse-Effects-Level

LOAEL - Lowest-Observed-Adverse-Effects-Level

Table 3.4-2
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concen tration (mg/kg)	Bioavaila bility Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Cadmium	95% ile	0.665	0.212	0.11	0.43	0.46	0.75	0.64	0.55	5.48E-02	5.85E-02	1.68E-01	2.81E-01	10	0.0212	7.7	1.00	1.63E-01	4.45E-01	2.5	5	0.2	0.09
Cadmium	95th UCL	0.665	0.212	0.11	0.43	0.46	0.69	0.50	0.49	5.04E-02	4.56E-02	1.50E-01	2.46E-01	10	0.0212	5.76	1.00	1.22E-01	3.68E-01	2.5	5	0.1	0.07
Cadmium	ERA 29	0.665	0.212	0.11	0.43	0.46	0.70	0.52	0.50	5.10E-02	4.72E-02	1.52E-01	2.50E-01	10	0.0212	6	1.00	1.27E-01	3.77E-01	2.5	5	0.2	0.08
Cadmium	U02-2100	0.665	0.212	0.11	0.43	0.46	0.66	0.44	0.46	4.83E-02	4.05E-02	1.41E-01	2.30E-01	10	0.0212	5.0	1.00	1.06E-01	3.35E-01	2.5	5	0.1	0.07
Cadmium	U02-2102	0.665	0.212	0.11	0.43	0.46	0.61	0.36	0.41	4.46E-02	3.26E-02	1.26E-01	2.04E-01	10	0.0212	3.8	1.00	8.03E-02	2.84E-01	2.5	5	0.1	0.06
Cadmium	U02-3100	0.665	0.212	0.11	0.43	0.46	0.84	0.92	0.65	6.16E-02	8.38E-02	1.98E-01	3.43E-01	10	0.0212	11.5	1.00	2.44E-01	5.87E-01	2.5	5	0.2	0.1
Cadmium	U02-3102	0.665	0.212	0.11	0.43	0.46	0.56	0.29	0.37	4.10E-02	2.63E-02	1.13E-01	1.80E-01	10	0.0212	2.8	1.00	6.02E-02	2.40E-01	2.5	5	0.1	0.05
Cadmium	U02-5003	0.665	0.212	0.11	0.43	0.46	0.39	0.14	0.22	2.83E-02	1.28E-02	6.77E-02	1.09E-01	10	0.0212	0.8	1.00	1.70E-02	1.26E-01	2.5	5	0.1	0.03
Cadmium	U02-ER001	0.665	0.212	0.11	0.43	0.46	0.64	0.42	0.45	4.72E-02	3.80E-02	1.37E-01	2.22E-01	10	0.0212	4.6	1.00	9.75E-02	3.19E-01	2.5	5	0.1	0.06
Cadmium	U02-ER002	0.665	0.212	0.11	0.43	0.46	0.68	0.48	0.48	4.97E-02	4.39E-02	1.47E-01	2.40E-01	10	0.0212	5.5	1.00	1.17E-01	3.57E-01	2.5	5	0.1	0.07
Cadmium	U02-ER003	0.665	0.212	0.11	0.43	0.46	0.70	0.52	0.50	5.10E-02	4.72E-02	1.52E-01	2.50E-01	10	0.0212	6.0	1.00	1.27E-01	3.77E-01	2.5	5	0.2	0.08
Cadmium	U02-ER004	0.665	0.212	0.11	0.43	0.46	0.65	0.42	0.45	4.75E-02	3.86E-02	1.38E-01	2.24E-01	10	0.0212	4.7	1.00	9.96E-02	3.24E-01	2.5	5	0.1	0.06
Cadmium	U02-ER005	0.665	0.212	0.11	0.43	0.46	0.62	0.37	0.42	4.53E-02	3.40E-02	1.29E-01	2.08E-01	10	0.0212	4.0	1.00	8.48E-02	2.93E-01	2.5	5	0.1	0.06
Cadmium	U02-ER006	0.665	0.212	0.11	0.43	0.46	0.57	0.30	0.38	4.16E-02	2.74E-02	1.15E-01	1.84E-01	10	0.0212	3.0	1.00	6.36E-02	2.48E-01	2.5	5	0.1	0.05
Cadmium	U02-ER007	0.665	0.212	0.11	0.43	0.46	0.56	0.29	0.37	4.12E-02	2.67E-02	1.14E-01	1.81E-01	10	0.0212	2.9	1.00	6.15E-02	2.43E-01	2.5	5	0.1	0.05
Cadmium	U02-ER009	0.665	0.212	0.11	0.43	0.46	0.57	0.30	0.38	4.16E-02	2.74E-02	1.15E-01	1.84E-01	10	0.0212	3.0	1.00	6.36E-02	2.48E-01	2.5	5	0.1	0.05
Cadmium	U02-ER010	0.665	0.212	0.11	0.43	0.46	0.46	0.18	0.28	3.33E-02	1.68E-02	8.47E-02	1.35E-01	10	0.0212	1.4	1.00	2.97E-02	1.65E-01	2.5	5	0.1	0.03
Physical Reach 2																							
Cadmium	95% ile*	0.665	0.212	0.11	0.43	0.46	0.64	0.42	0.45	4.72E-02	3.80E-02	1.37E-01	2.22E-01	10	0.0212	4.6	1.00	9.75E-02	3.19E-01	2.5	5	0.1	0.06
Cadmium	95th UCL*	0.665	0.212	0.11	0.43	0.46	0.63	0.39	0.43	4.59E-02	3.53E-02	1.32E-01	2.13E-01	10	0.0212	4.2	1.00	8.90E-02	3.02E-01	2.5	5	0.1	0.06
Cadmium	ERA 32*	0.665	0.212	0.11	0.43	0.46	0.55	0.28	0.36	4.05E-02	2.56E-02	1.11E-01	1.77E-01	10	0.0212	2.7	1.00	5.79E-02	2.35E-01	2.5	5	0.1	0.05
Cadmium	U03-2200	0.665	0.212	0.11	0.43	0.46	0.69	0.49	0.49	5.01E-02	4.50E-02	1.49E-01	2.44E-01	10	0.0212	5.7	1.00	1.20E-01	3.64E-01	2.5	5	0.1	0.07
Cadmium	U03-3200	0.665	0.212	0.11	0.43	0.46	0.48	0.21	0.30	3.53E-02	1.88E-02	9.17E-02	1.46E-01	10	0.0212	1.7	1.00	3.62E-02	1.82E-01	2.5	5	0.1	0.04
Cadmium	U03-4202	0.665	0.212	0.11	0.43	0.46	0.36	0.13	0.20	2.67E-02	1.18E-02	6.23E-02	1.01E-01	10	0.0212	0.7	1.00	1.38E-02	1.15E-01	2.5	5	0.05	0.02
Cadmium	U03-4203	0.665	0.212	0.11	0.43	0.46	0.38	0.13	0.21	2.74E-02	1.23E-02	6.48E-02	1.04E-01	10	0.0212	0.7	1.00	1.52E-02	1.20E-01	2.5	5	0.05	0.02
Cadmium	U03-4205	0.665	0.212	0.11	0.43	0.46	0.40	0.15	0.23	2.94E-02	1.35E-02	7.12E-02	1.14E-01	10	0.0212	0.9	1.00	1.92E-02	1.33E-01	2.5	5	0.1	0.03
Cadmium	U03-4206	0.665	0.212	0.11	0.43	0.46	0.36	0.13	0.20	2.64E-02	1.17E-02	6.13E-02	9.94E-02	10	0.0212	0.6	1.00	1.33E-02	1.13E-01	2.5	5	0.05	0.02
Cadmium	U03-4207	0.665	0.212	0.11	0.43	0.46	0.39	0.14	0.22	2.84E-02	1.28E-02	6.78E-02	1.09E-01	10	0.0212	0.8	1.00	1.70E-02	1.26E-01	2.5	5	0.1	0.03
Physical Reach 3																							
Cadmium	95% ile	0.665	0.212	0.11	0.43	0.46	0.65	0.42	0.45	4.72E-02	3.81E-02	1.37E-01	2.22E-01	10	0.0212	4.62	1.00	9.79E-02	3.20E-01	2.5	5	0.1	0.06
Cadmium	95th UCL	0.665	0.212	0.11	0.43	0.46	0.52	0.25	0.34	3.83E-02	2.25E-02	1.03E-01	1.64E-01	10	0.0212	2.26	1.00	4.79E-02	2.11E-01	2.5	5	0.1	0.04
Cadmium	ERA 22	0.665	0.212	0.11	0.43	0.46	0.66	0.44	0.46	4.81E-02	4.02E-02	1.41E-01	2.29E-01	10	0.0212	4.9	1.00	1.05E-01	3.33E-01	2.5	5	0.1	0.07
Cadmium	ERA 28	0.665	0.212	0.11	0.43	0.46	0.59	0.33	0.40	4.34E-02	3.05E-02	1.22E-01	1.96E-01	10	0.0212	3.5	1.00	7.35E-02	2.69E-01	2.5	5	0.1	0.05
Cadmium	U03-2300	0.665	0.212	0.11	0.43	0.46	0.52	0.24	0.33	3.80E-02	2.20E-02	1.01E-01	1.61E-01	10	0.0212	2.2	1.00	4.63E-02	2.08E-01	2.5	5	0.1	0.04
Cadmium	U03-2302	0.665	0.212	0.11	0.43	0.46	0.42	0.16	0.25	3.10E-02	1.47E-02	7.66E-02	1.22E-01	10	0.0212	1.1	1.00	2.30E-02	1.45E-01	2.5	5	0.1	0.03
Cadmium	U03-2303	0.665	0.212	0.11	0.43	0.46	0.55	0.27	0.36	4.00E-02	2.49E-02	1.09E-01	1.74E-01	10	0.0212	2.6	1.00	5.56E-02	2.30E-01	2.5	5	0.1	0.05
Cadmium	U03-2305	0.665	0.212	0.11	0.43	0.46	0.51	0.23	0.32	3.70E-02	2.08E-02	9.79E-02	1.56E-01	10	0.0212	2.0	1.00	4.25E-02	1.98E-01	2.5	5	0.1	0.04
Cadmium	U03-2306	0.665	0.212	0.11	0.43	0.46	0.49	0.21	0.30	3.56E-02	1.92E-02	9.28E-02	1.48E-01	10	0.0212	1.8	1.00	3.73E-02	1.85E-01	2.5	5	0.1	0.04
Cadmium	U03-2307	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-2309	0.665	0.212	0.11	0.43	0.46	0.51	0.23	0.32	3.73E-02	2.12E-02	9.90E-02	1.57E-01	10	0.0212	2.1	1.00	4.37E-02	2.01E-01	2.5	5	0.1	0.04
Cadmium	U03-2311	0.665	0.212	0.11	0.43	0.46	0.58	0.31	0.39	4.24E-02	2.87E-02	1.18E-01	1.89E-01	10	0.0212	3.2	1.00	6.77E-02	2.57E-01	2.5	5	0.1	0.05
Cadmium	U03-2312	0.665	0.212	0.11	0.43	0.46	0.28	0.10	0.14	2.06E-02	9.31E-03	4.38E-02	7.37E-02	10	0.0212	0.3	1.00	5.73E-03	7.95E-02	2.5	5	0.03	0.02
Cadmium	U03-2313	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-2315	0.665	0.212	0.11	0.43	0.46	0.41	0.15	0.24	2.98E-02	1.38E-02	7.26E-02	1.16E-01	10	0.0212	1.0	1.00	2.02E-02	1.36E-01	2.5	5	0.1	0.03
Cadmium	U03-2316	0.665	0.212	0.11	0.43	0.46	0.41	0.15	0.24	3.01E-02	1.41E-02	7.36E-02	1.18E-01	10	0.0212	1.0	1.00	2.09E-02	1.39E-01	2.5	5	0.1	0.03

Table 3.4-2
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Cadmium	U03-2318	0.665	0.212	0.11	0.43	0.46	0.30	0.11	0.15	2.16E-02	9.63E-03	4.67E-02	7.80E-02	10	0.0212	0.3	1.00	6.75E-03	8.48E-02	2.5	5	0.03	0.02
Cadmium	U03-2320	0.665	0.212	0.11	0.43	0.46	0.29	0.10	0.15	2.14E-02	9.55E-03	4.61E-02	7.70E-02	10	0.0212	0.3	1.00	6.50E-03	8.35E-02	2.5	5	0.03	0.02
Cadmium	U03-2321	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-2322	0.665	0.212	0.11	0.43	0.46	0.38	0.14	0.22	2.79E-02	1.26E-02	6.64E-02	1.07E-01	10	0.0212	0.8	1.00	1.61E-02	1.23E-01	2.5	5	0.05	0.02
Cadmium	U03-3300	0.665	0.212	0.11	0.43	0.46	0.56	0.29	0.37	4.13E-02	2.68E-02	1.14E-01	1.82E-01	10	0.0212	2.9	1.00	6.19E-02	2.44E-01	2.5	5	0.1	0.05
Cadmium	U03-3302	0.665	0.212	0.11	0.43	0.46	0.72	0.56	0.51	5.23E-02	5.09E-02	1.58E-01	2.61E-01	10	0.0212	6.6	1.00	1.39E-01	4.00E-01	2.5	5	0.2	0.08
Cadmium	U03-3303	0.665	0.212	0.11	0.43	0.46	0.58	0.32	0.39	4.26E-02	2.89E-02	1.19E-01	1.90E-01	10	0.0212	3.2	1.00	6.86E-02	2.59E-01	2.5	5	0.1	0.05
Cadmium	U03-3305	0.665	0.212	0.11	0.43	0.46	0.50	0.22	0.32	3.66E-02	2.03E-02	9.64E-02	1.53E-01	10	0.0212	1.9	1.00	4.10E-02	1.94E-01	2.5	5	0.1	0.04
Cadmium	U03-3306	0.665	0.212	0.11	0.43	0.46	0.59	0.32	0.39	4.29E-02	2.94E-02	1.20E-01	1.92E-01	10	0.0212	3.3	1.00	7.02E-02	2.62E-01	2.5	5	0.1	0.05
Cadmium	U03-3308	0.665	0.212	0.11	0.43	0.46	0.48	0.21	0.30	3.53E-02	1.88E-02	9.18E-02	1.46E-01	10	0.0212	1.7	1.00	3.62E-02	1.82E-01	2.5	5	0.1	0.04
Cadmium	U03-3309	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-3311	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-3312	0.665	0.212	0.11	0.43	0.46	0.48	0.20	0.30	3.51E-02	1.85E-02	9.09E-02	1.44E-01	10	0.0212	1.7	1.00	3.53E-02	1.80E-01	2.5	5	0.1	0.04
Cadmium	U03-3314	0.665	0.212	0.11	0.43	0.46	0.47	0.20	0.29	3.47E-02	1.81E-02	8.94E-02	1.42E-01	10	0.0212	1.6	1.00	3.39E-02	1.76E-01	2.5	5	0.1	0.04
Cadmium	U03-3316	0.665	0.212	0.11	0.43	0.46	0.47	0.19	0.28	3.40E-02	1.74E-02	8.71E-02	1.39E-01	10	0.0212	1.5	1.00	3.18E-02	1.70E-01	2.5	5	0.1	0.03
Cadmium	U03-3317	0.665	0.212	0.11	0.43	0.46	0.43	0.17	0.26	3.18E-02	1.54E-02	7.92E-02	1.26E-01	10	0.0212	1.2	1.00	2.51E-02	1.51E-01	2.5	5	0.1	0.03
Cadmium	U03-3318	0.665	0.212	0.11	0.43	0.46	0.56	0.28	0.36	4.06E-02	2.57E-02	1.11E-01	1.77E-01	10	0.0212	2.8	1.00	5.83E-02	2.36E-01	2.5	5	0.1	0.05
Cadmium	U03-3320	0.665	0.212	0.11	0.43	0.46	0.62	0.38	0.42	4.54E-02	3.43E-02	1.30E-01	2.10E-01	10	0.0212	4.0	1.00	8.58E-02	2.95E-01	2.5	5	0.1	0.06
Cadmium	U03-3321	0.665	0.212	0.11	0.43	0.46	0.33	0.12	0.18	2.44E-02	1.07E-02	5.50E-02	9.01E-02	10	0.0212	0.5	1.00	1.01E-02	1.00E-01	2.5	5	0.04	0.02
Cadmium	U03-3322	0.665	0.212	0.11	0.43	0.46	0.57	0.30	0.38	4.18E-02	2.77E-02	1.16E-01	1.85E-01	10	0.0212	3.0	1.00	6.45E-02	2.50E-01	2.5	5	0.1	0.05
Cadmium	U03-4306	0.665	0.212	0.11	0.43	0.46	0.76	0.68	0.56	5.59E-02	6.20E-02	1.73E-01	2.90E-01	10	0.0212	8.2	1.00	1.74E-01	4.65E-01	2.5	5	0.2	0.09
Cadmium	U03-4308	0.665	0.212	0.11	0.43	0.46	0.43	0.17	0.26	3.18E-02	1.54E-02	7.93E-02	1.26E-01	10	0.0212	1.2	1.00	2.51E-02	1.52E-01	2.5	5	0.1	0.03
Cadmium	U03-4309	0.665	0.212	0.11	0.43	0.46	0.43	0.17	0.26	3.14E-02	1.51E-02	7.81E-02	1.25E-01	10	0.0212	1.1	1.00	2.42E-02	1.49E-01	2.5	5	0.1	0.03
Cadmium	U03-4311	0.665	0.212	0.11	0.43	0.46	0.43	0.16	0.25	3.12E-02	1.49E-02	7.72E-02	1.23E-01	10	0.0212	1.1	1.00	2.36E-02	1.47E-01	2.5	5	0.1	0.03
Cadmium	U03-4313	0.665	0.212	0.11	0.43	0.46	0.45	0.18	0.27	3.27E-02	1.62E-02	8.26E-02	1.31E-01	10	0.0212	1.3	1.00	2.78E-02	1.59E-01	2.5	5	0.1	0.03
Cadmium	U03-4314	0.665	0.212	0.11	0.43	0.46	0.41	0.15	0.24	2.99E-02	1.39E-02	7.30E-02	1.17E-01	10	0.0212	1.0	1.00	2.05E-02	1.37E-01	2.5	5	0.1	0.03
Cadmium	U03-4315	0.665	0.212	0.11	0.43	0.46	0.46	0.19	0.28	3.35E-02	1.69E-02	8.52E-02	1.36E-01	10	0.0212	1.4	1.00	3.01E-02	1.66E-01	2.5	5	0.1	0.03
Cadmium	U03-4317	0.665	0.212	0.11	0.43	0.46	0.49	0.21	0.31	3.59E-02	1.95E-02	9.40E-02	1.49E-01	10	0.0212	1.8	1.00	3.84E-02	1.88E-01	2.5	5	0.1	0.04
Cadmium	U03-4319	0.665	0.212	0.11	0.43	0.46	0.47	0.20	0.29	3.45E-02	1.79E-02	8.88E-02	1.41E-01	10	0.0212	1.6	1.00	3.33E-02	1.75E-01	2.5	5	0.1	0.03
Cadmium	U03-4320	0.665	0.212	0.11	0.43	0.46	0.46	0.19	0.28	3.36E-02	1.70E-02	8.56E-02	1.36E-01	10	0.0212	1.4	1.00	3.04E-02	1.67E-01	2.5	5	0.1	0.03
Cadmium	U03-4321	0.665	0.212	0.11	0.43	0.46	0.22	0.09	0.10	1.63E-02	8.31E-03	3.16E-02	5.62E-02	10	0.0212	0.1	1.00	2.54E-03	5.87E-02	2.5	5	0.02	0.01
Cadmium	U03-4322	0.665	0.212	0.11	0.43	0.46	0.36	0.13	0.20	2.66E-02	1.18E-02	6.22E-02	1.01E-01	10	0.0212	0.6	1.00	1.38E-02	1.14E-01	2.5	5	0.05	0.02
Cadmium	U03-4324	0.665	0.212	0.11	0.43	0.46	0.47	0.19	0.29	3.42E-02	1.76E-02	8.77E-02	1.39E-01	10	0.0212	1.5	1.00	3.23E-02	1.72E-01	2.5	5	0.1	0.03
Cadmium	U03-6300	0.665	0.212	0.11	0.43	0.46	0.31	0.11	0.16	2.24E-02	9.87E-03	4.89E-02	8.11E-02	10	0.0212	0.4	1.00	7.54E-03	8.86E-02	2.5	5	0.04	0.02
Physical Reach 4																							
Cadmium	U03-3400	0.665	0.212	0.11	0.43	0.46	0.53	0.26	0.35	3.91E-02	2.35E-02	1.06E-01	1.68E-01	10	0.0212	2.4	1.00	5.13E-02	2.19E-01	2.5	5	0.1	0.04
Physical Reaches 6 and 7																							
Cadmium	95% ile	0.665	0.212	0.11	0.43	0.46	0.50	0.22	0.32	3.67E-02	2.04E-02	9.68E-02	1.54E-01	10	0.0212	1.95	1.00	4.13E-02	1.95E-01	2.5	5	0.1	0.04
Cadmium	U03-2600 B	0.665	0.212	0.11	0.43	0.46	0.23	0.09	0.11	1.70E-02	8.45E-03	3.36E-02	5.91E-02	10	0.0212	0.1	1.00	2.97E-03	6.21E-02	2.5	5	0.02	0.01
Cadmium	U03-2602 B	0.665	0.212	0.11	0.43	0.46	0.54	0.26	0.35	3.93E-02	2.39E-02	1.06E-01	1.70E-01	10	0.0212	2.5	1.00	5.23E-02	2.22E-01	2.5	5	0.1	0.04
Cadmium	U03-3600	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-3602	0.665	0.212	0.11	0.43	0.46	0.32	0.11	0.17	2.33E-02	1.02E-02	5.18E-02	8.53E-02	10	0.0212	0.4	1.00	8.69E-03	9.40E-02	2.5	5	0.04	0.02
Cadmium	U03-3604	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-6600	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Physical Reaches 8 and 9																							
Cadmium	95% ile	0.665	0.212	0.11	0.43	0.46	0.37	0.13	0.20	2.68E-02	1.19E-02	6.26E-02	1.01E-01	10	0.0212	0.658	1.00	1.39E-02	1.15E-01	2.5	5	0.05	0.02

Table 3.4-2
Hazard Quotient Calculations at Locations Lacking Tissue Data
Cadmium; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Cadmium	95th UCL	0.665	0.212	0.11	0.43	0.46	0.35	0.13	0.20	2.59E-02	1.14E-02	5.99E-02	9.72E-02	10	0.0212	0.59	1.00	1.25E-02	1.10E-01	2.5	5	0.04	0.02
Cadmium	ERA 27	0.665	0.212	0.11	0.43	0.46	0.37	0.13	0.21	2.73E-02	1.22E-02	6.43E-02	1.04E-01	10	0.0212	0.7	1.00	1.49E-02	1.19E-01	2.5	5	0.05	0.02
Cadmium	U03-2800	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-3800	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-3900	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-2900 B	0.665	0.212	0.11	0.43	0.46	0.35	0.13	0.20	2.59E-02	1.14E-02	5.99E-02	9.73E-02	10	0.0212	0.6	1.00	1.25E-02	1.10E-01	2.5	5	0.04	0.02
Cadmium	U03-2901 B	0.665	0.212	0.11	0.43	0.46	0.23	0.09	0.11	1.70E-02	8.45E-03	3.36E-02	5.91E-02	10	0.0212	0.1	1.00	2.97E-03	6.21E-02	2.5	5	0.02	0.01
Cadmium	U03-3901	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-3902	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Cadmium	U03-6900	0.665	0.212	0.11	0.43	0.46	0.26	0.10	0.13	1.90E-02	8.88E-03	3.92E-02	6.71E-02	10	0.0212	0.2	1.00	4.35E-03	7.14E-02	2.5	5	0.03	0.01
Bayard Canyon																							
Cadmium	ERA 33	0.665	0.212	0.11	0.43	0.46	0.45	0.18	0.27	3.26E-02	1.61E-02	8.22E-02	1.31E-01	10	0.0212	1.3	1.00	2.75E-02	1.58E-01	2.5	5	0.1	0.03
Cadmium	U03-3003	0.665	0.212	0.11	0.43	0.46	0.35	0.13	0.20	2.59E-02	1.14E-02	5.98E-02	9.71E-02	10	0.0212	0.6	1.00	1.24E-02	1.10E-01	2.5	5	0.04	0.02
Cadmium	U03-3004	0.665	0.212	0.11	0.43	0.46	0.45	0.18	0.27	3.30E-02	1.64E-02	8.35E-02	1.33E-01	10	0.0212	1.3	1.00	2.86E-02	1.62E-01	2.5	5	0.1	0.03
Lower Whitewater Creek																							
Cadmium	95% ile	0.665	0.212	0.11	0.43	0.46	0.34	0.12	0.19	2.51E-02	1.10E-02	5.74E-02	9.35E-02	10	0.0212	0.53	1.00	1.12E-02	1.05E-01	2.5	5	0.04	0.02
Cadmium	95th UCL	0.665	0.212	0.11	0.43	0.46	0.31	0.11	0.17	2.30E-02	1.01E-02	5.07E-02	8.38E-02	10	0.0212	0.39	1.00	8.27E-03	9.21E-02	2.5	5	0.04	0.02
Cadmium	U03-31152	0.665	0.212	0.11	0.43	0.46	0.30	0.11	0.16	2.23E-02	9.84E-03	4.86E-02	8.07E-02	10	0.0212	0.4	1.00	7.42E-03	8.81E-02	2.5	5	0.04	0.02
Cadmium	U03-31259	0.665	0.212	0.11	0.43	0.46	0.27	0.10	0.14	1.99E-02	9.11E-03	4.17E-02	7.08E-02	10	0.0212	0.2	1.00	5.09E-03	7.59E-02	2.5	5	0.03	0.02
Cadmium	U03-31264	0.665	0.212	0.11	0.43	0.46	0.31	0.11	0.17	2.30E-02	1.01E-02	5.07E-02	8.38E-02	10	0.0212	0.4	1.00	8.27E-03	9.21E-02	2.5	5	0.04	0.02
Cadmium	U03-31368	0.665	0.212	0.11	0.43	0.46	0.33	0.12	0.18	2.39E-02	1.05E-02	5.37E-02	8.82E-02	10	0.0212	0.5	1.00	9.54E-03	9.77E-02	2.5	5	0.04	0.02
Cadmium	U03-31578	0.665	0.212	0.11	0.43	0.46	0.34	0.12	0.18	2.45E-02	1.08E-02	5.56E-02	9.09E-02	10	0.0212	0.5	1.00	1.04E-02	1.01E-01	2.5	5	0.04	0.02
Cadmium	U03-61153	0.665	0.212	0.11	0.43	0.46	0.35	0.12	0.19	2.57E-02	1.13E-02	5.91E-02	9.60E-02	10	0.0212	0.6	1.00	1.21E-02	1.08E-01	2.5	5	0.04	0.02
Cadmium	U03-61258	0.665	0.212	0.11	0.43	0.46	0.29	0.10	0.15	2.13E-02	9.51E-03	4.57E-02	7.64E-02	10	0.0212	0.3	1.00	6.36E-03	8.28E-02	2.5	5	0.03	0.02
Cadmium	U03-61265	0.665	0.212	0.11	0.43	0.46	0.29	0.10	0.15	2.09E-02	9.37E-03	4.44E-02	7.46E-02	10	0.0212	0.3	1.00	5.94E-03	8.06E-02	2.5	5	0.03	0.02
Cadmium	U03-61369	0.665	0.212	0.11	0.43	0.46	0.27	0.10	0.13	1.94E-02	8.98E-03	4.03E-02	6.87E-02	10	0.0212	0.2	1.00	4.66E-03	7.34E-02	2.5	5	0.03	0.01
Cadmium	U03-61474	0.665	0.212	0.11	0.43	0.46	0.25	0.09	0.12	1.80E-02	8.65E-03	3.63E-02	6.30E-02	10	0.0212	0.2	1.00	3.60E-03	6.66E-02	2.5	5	0.03	0.01
Cadmium	U03-61575	0.665	0.212	0.11	0.43	0.46	0.29	0.10	0.15	2.11E-02	9.44E-03	4.50E-02	7.55E-02	10	0.0212	0.3	1.00	6.15E-03	8.17E-02	2.5	5	0.03	0.02
Side Channel																							
Cadmium	Geometric Mean	0.665	0.212	0.11	0.43	0.46	0.30	0.11	0.15	2.17E-02	9.64E-03	4.69E-02	7.82E-02	10	0.0212	0.3	1.00	6.78E-03	8.50E-02	2.5	5	0.03	0.02

Notes:

Calculation details are provided in Appendix A.

Tissue concentration models are provided in Appendix B.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

BW - Body weight

DW - Dry weight

kg/kg - kilograms per kilogram

mg/kg - milligrams per kilogram

NOAEL - No-Observed-Adverse-Effects-Level

LOAEL - Lowest-Observed-Adverse-Effects-Level

Table 3.4-3

Hazard Quotient Calculations at Locations Lacking Tissue Data

Lead; Small Ground-Feeding Bird

H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Lead	95%ile	0.918	0.287	0	0.3	0.7	14.80	7.85	2.65	0.00E+00	6.76E-01	1.70E+00	2.38E+00	10	0.0287	841	0.25	6.03E+00	8.41E+00	4	9	2.1	0.9
Lead	95th UCL	0.918	0.287	0	0.3	0.7	8.87	6.40	1.91	0.00E+00	5.51E-01	1.23E+00	1.78E+00	10	0.0287	504	0.25	3.62E+00	5.39E+00	4	9	1.3	0.6
Lead	ERA 29	0.918	0.287	0	0.3	0.7	6.44	5.63	1.60	0.00E+00	4.85E-01	1.03E+00	1.51E+00	10	0.0287	366	0.25	2.62E+00	4.14E+00	4	9	1.0	0.5
Lead	U02-2100	0.918	0.287	0	0.3	0.7	3.13	4.22	1.19	0.00E+00	3.64E-01	7.65E-01	1.13E+00	10	0.0287	178	0.25	1.28E+00	2.41E+00	4	9	0.6	0.3
Lead	U02-2102	0.918	0.287	0	0.3	0.7	3.09	4.20	1.19	0.00E+00	3.62E-01	7.62E-01	1.12E+00	10	0.0287	176	0.25	1.26E+00	2.38E+00	4	9	0.6	0.3
Lead	U02-3100	0.918	0.287	0	0.3	0.7	5.87	5.43	1.53	0.00E+00	4.67E-01	9.85E-01	1.45E+00	10	0.0287	334	0.25	2.39E+00	3.85E+00	4	9	1.0	0.4
Lead	U02-3102	0.918	0.287	0	0.3	0.7	4.78	5.00	1.40	0.00E+00	4.30E-01	8.97E-01	1.33E+00	10	0.0287	271	0.25	1.95E+00	3.28E+00	4	9	0.8	0.4
Lead	U02-5003	0.918	0.287	0	0.3	0.7	25.87	9.82	4.03	0.00E+00	8.45E-01	2.59E+00	3.44E+00	10	0.0287	1470	0.25	1.05E+01	1.40E+01	4	9	3.5	1.6
Lead	U02-ER001	0.918	0.287	0	0.3	0.7	5.49	5.28	1.48	0.00E+00	4.55E-01	9.54E-01	1.41E+00	10	0.0287	312	0.25	2.24E+00	3.65E+00	4	9	0.9	0.4
Lead	U02-ER002	0.918	0.287	0	0.3	0.7	5.23	5.18	1.45	0.00E+00	4.46E-01	9.33E-01	1.38E+00	10	0.0287	297	0.25	2.13E+00	3.51E+00	4	9	0.9	0.4
Lead	U02-ER003	0.918	0.287	0	0.3	0.7	8.06	6.16	1.81	0.00E+00	5.30E-01	1.16E+00	1.69E+00	10	0.0287	458	0.25	3.29E+00	4.98E+00	4	9	1.2	0.6
Lead	U02-ER004	0.918	0.287	0	0.3	0.7	10.05	6.73	2.05	0.00E+00	5.79E-01	1.32E+00	1.90E+00	10	0.0287	571	0.25	4.10E+00	6.00E+00	4	9	1.5	0.7
Lead	U02-ER005	0.918	0.287	0	0.3	0.7	2.97	4.13	1.17	0.00E+00	3.56E-01	7.52E-01	1.11E+00	10	0.0287	169	0.25	1.21E+00	2.32E+00	4	9	0.6	0.3
Lead	U02-ER006	0.918	0.287	0	0.3	0.7	1.57	3.20	0.99	0.00E+00	2.76E-01	6.39E-01	9.15E-01	10	0.0287	89.3	0.25	6.41E-01	1.56E+00	4	9	0.4	0.2
Lead	U02-ER007	0.918	0.287	0	0.3	0.7	2.22	3.68	1.08	0.00E+00	3.17E-01	6.91E-01	1.01E+00	10	0.0287	126	0.25	9.04E-01	1.91E+00	4	9	0.5	0.2
Lead	U02-ER009	0.918	0.287	0	0.3	0.7	2.90	4.09	1.16	0.00E+00	3.53E-01	7.46E-01	1.10E+00	10	0.0287	165	0.25	1.18E+00	2.28E+00	4	9	0.6	0.3
Lead	U02-ER010	0.918	0.287	0	0.3	0.7	5.58	5.32	1.50	0.00E+00	4.58E-01	9.61E-01	1.42E+00	10	0.0287	317	0.25	2.27E+00	3.69E+00	4	9	0.9	0.4
Physical Reach 2																							
Lead	95%ile*	0.918	0.287	0	0.3	0.7	22.53	9.29	3.61	0.00E+00	8.00E-01	2.32E+00	3.12E+00	10	0.0287	1280	0.25	9.18E+00	1.23E+01	4	9	3.1	1.4
Lead	95th UCL*	0.918	0.287	0	0.3	0.7	22.93	9.36	3.67	0.00E+00	8.05E-01	2.36E+00	3.16E+00	10	0.0287	1303	0.25	9.35E+00	1.25E+01	4	9	3.1	1.4
Lead	ERA 32*	0.918	0.287	0	0.3	0.7	33.26	10.85	4.96	0.00E+00	9.35E-01	3.19E+00	4.12E+00	10	0.0287	1890	0.25	1.36E+01	1.77E+01	4	9	4.4	2.0
Lead	U03-2200	0.918	0.287	0	0.3	0.7	2.07	3.58	1.06	0.00E+00	3.08E-01	6.80E-01	9.88E-01	10	0.0287	118	0.25	8.45E-01	1.83E+00	4	9	0.5	0.2
Lead	U03-3200	0.918	0.287	0	0.3	0.7	2.59	3.91	1.12	0.00E+00	3.37E-01	7.21E-01	1.06E+00	10	0.0287	147	0.25	1.06E+00	2.11E+00	4	9	0.5	0.2
Lead	U03-4202	0.918	0.287	0	0.3	0.7	1.94	3.49	1.04	0.00E+00	3.00E-01	6.69E-01	9.69E-01	10	0.0287	110	0.25	7.92E-01	1.76E+00	4	9	0.4	0.2
Lead	U03-4203	0.918	0.287	0	0.3	0.7	1.19	2.87	0.95	0.00E+00	2.47E-01	6.09E-01	8.56E-01	10	0.0287	67.7	0.25	4.86E-01	1.34E+00	4	9	0.3	0.1
Lead	U03-4205	0.918	0.287	0	0.3	0.7	1.70	3.31	1.01	0.00E+00	2.85E-01	6.50E-01	9.34E-01	10	0.0287	96.6	0.25	6.93E-01	1.63E+00	4	9	0.4	0.2
Lead	U03-4206	0.918	0.287	0	0.3	0.7	1.46	3.11	0.98	0.00E+00	2.68E-01	6.31E-01	8.99E-01	10	0.0287	83.1	0.25	5.96E-01	1.49E+00	4	9	0.4	0.2
Lead	U03-4207	0.918	0.287	0	0.3	0.7	2.59	3.91	1.12	0.00E+00	3.37E-01	7.21E-01	1.06E+00	10	0.0287	147	0.25	1.06E+00	2.11E+00	4	9	0.5	0.2
Physical Reach 3																							
Lead	95%ile	0.918	0.287	0	0.3	0.7	6.86	5.77	1.66	0.00E+00	4.97E-01	1.06E+00	1.56E+00	10	0.0287	390	0.25	2.79E+00	4.36E+00	4	9	1.1	0.5
Lead	95th UCL	0.918	0.287	0	0.3	0.7	4.01	4.66	1.30	0.00E+00	4.01E-01	8.35E-01	1.24E+00	10	0.0287	228	0.25	1.64E+00	2.87E+00	4	9	0.7	0.3
Lead	ERA 22	0.918	0.287	0	0.3	0.7	2.84	4.06	1.15	0.00E+00	3.49E-01	7.41E-01	1.09E+00	10	0.0287	161	0.25	1.16E+00	2.25E+00	4	9	0.6	0.2
Lead	ERA 28	0.918	0.287	0	0.3	0.7	3.92	4.62	1.29	0.00E+00	3.98E-01	8.28E-01	1.23E+00	10	0.0287	223	0.25	1.60E+00	2.83E+00	4	9	0.7	0.3
Lead	U03-2300	0.918	0.287	0	0.3	0.7	3.97	4.64	1.30	0.00E+00	4.00E-01	8.32E-01	1.23E+00	10	0.0287	226	0.25	1.62E+00	2.85E+00	4	9	0.7	0.3
Lead	U03-2302	0.918	0.287	0	0.3	0.7	4.82	5.01	1.40	0.00E+00	4.32E-01	9.00E-01	1.33E+00	10	0.0287	274	0.25	1.97E+00	3.30E+00	4	9	0.8	0.4
Lead	U03-2303	0.918	0.287	0	0.3	0.7	5.14	5.15	1.44	0.00E+00	4.43E-01	9.26E-01	1.37E+00	10	0.0287	292	0.25	2.10E+00	3.47E+00	4	9	0.9	0.4

Table 3.4-3
Hazard Quotient Calculations at Locations Lacking Tissue Data
Lead; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Lead	U03-2305	0.918	0.287	0	0.3	0.7	4.00	4.66	1.30	0.00E+00	4.01E-01	8.35E-01	1.24E+00	10	0.0287	227	0.25	1.63E+00	2.87E+00	4	9	0.7	0.3
Lead	U03-2306	0.918	0.287	0	0.3	0.7	4.37	4.82	1.35	0.00E+00	4.15E-01	8.64E-01	1.28E+00	10	0.0287	248	0.25	1.78E+00	3.06E+00	4	9	0.8	0.3
Lead	U03-2307	0.918	0.287	0	0.3	0.7	5.17	5.16	1.45	0.00E+00	4.44E-01	9.29E-01	1.37E+00	10	0.0287	294	0.25	2.11E+00	3.48E+00	4	9	0.9	0.4
Lead	U03-2309	0.918	0.287	0	0.3	0.7	5.99	5.47	1.55	0.00E+00	4.71E-01	9.94E-01	1.46E+00	10	0.0287	340	0.25	2.44E+00	3.91E+00	4	9	1.0	0.4
Lead	U03-2311	0.918	0.287	0	0.3	0.7	4.21	4.75	1.32	0.00E+00	4.09E-01	8.51E-01	1.26E+00	10	0.0287	239	0.25	1.72E+00	2.98E+00	4	9	0.7	0.3
Lead	U03-2312	0.918	0.287	0	0.3	0.7	3.82	4.57	1.28	0.00E+00	3.93E-01	8.20E-01	1.21E+00	10	0.0287	217	0.25	1.56E+00	2.77E+00	4	9	0.7	0.3
Lead	U03-2313	0.918	0.287	0	0.3	0.7	7.27	5.91	1.71	0.00E+00	5.09E-01	1.10E+00	1.61E+00	10	0.0287	413	0.25	2.96E+00	4.57E+00	4	9	1.1	0.5
Lead	U03-2315	0.918	0.287	0	0.3	0.7	3.16	4.24	1.19	0.00E+00	3.65E-01	7.67E-01	1.13E+00	10	0.0287	180	0.25	1.29E+00	2.42E+00	4	9	0.6	0.3
Lead	U03-2316	0.918	0.287	0	0.3	0.7	7.11	5.86	1.69	0.00E+00	5.04E-01	1.08E+00	1.59E+00	10	0.0287	404	0.25	2.90E+00	4.48E+00	4	9	1.1	0.5
Lead	U03-2318	0.918	0.287	0	0.3	0.7	3.49	4.41	1.23	0.00E+00	3.80E-01	7.94E-01	1.17E+00	10	0.0287	198	0.25	1.42E+00	2.60E+00	4	9	0.6	0.3
Lead	U03-2320	0.918	0.287	0	0.3	0.7	3.59	4.46	1.25	0.00E+00	3.84E-01	8.02E-01	1.19E+00	10	0.0287	204	0.25	1.46E+00	2.65E+00	4	9	0.7	0.3
Lead	U03-2321	0.918	0.287	0	0.3	0.7	3.75	4.54	1.27	0.00E+00	3.91E-01	8.14E-01	1.20E+00	10	0.0287	213	0.25	1.53E+00	2.73E+00	4	9	0.7	0.3
Lead	U03-2322	0.918	0.287	0	0.3	0.7	4.21	4.75	1.32	0.00E+00	4.09E-01	8.51E-01	1.26E+00	10	0.0287	239	0.25	1.72E+00	2.98E+00	4	9	0.7	0.3
Lead	U03-3300	0.918	0.287	0	0.3	0.7	9.46	6.57	1.98	0.00E+00	5.65E-01	1.27E+00	1.84E+00	10	0.0287	537	0.25	3.86E+00	5.69E+00	4	9	1.4	0.6
Lead	U03-3302	0.918	0.287	0	0.3	0.7	6.39	5.61	1.60	0.00E+00	4.83E-01	1.03E+00	1.51E+00	10	0.0287	363	0.25	2.60E+00	4.11E+00	4	9	1.0	0.5
Lead	U03-3303	0.918	0.287	0	0.3	0.7	5.68	5.35	1.51	0.00E+00	4.61E-01	9.69E-01	1.43E+00	10	0.0287	323	0.25	2.32E+00	3.75E+00	4	9	0.9	0.4
Lead	U03-3305	0.918	0.287	0	0.3	0.7	2.42	3.81	1.10	0.00E+00	3.28E-01	7.08E-01	1.04E+00	10	0.0287	138	0.25	9.88E-01	2.02E+00	4	9	0.5	0.2
Lead	U03-3306	0.918	0.287	0	0.3	0.7	4.11	4.70	1.31	0.00E+00	4.05E-01	8.43E-01	1.25E+00	10	0.0287	233	0.25	1.67E+00	2.92E+00	4	9	0.7	0.3
Lead	U03-3308	0.918	0.287	0	0.3	0.7	1.57	3.20	0.99	0.00E+00	2.75E-01	6.39E-01	9.14E-01	10	0.0287	89.0	0.25	6.38E-01	1.55E+00	4	9	0.4	0.2
Lead	U03-3309	0.918	0.287	0	0.3	0.7	0.67	2.28	0.88	0.00E+00	1.96E-01	5.67E-01	7.63E-01	10	0.0287	38.1	0.25	2.74E-01	1.04E+00	4	9	0.3	0.1
Lead	U03-3311	0.918	0.287	0	0.3	0.7	0.29	1.62	0.83	0.00E+00	1.40E-01	5.36E-01	6.76E-01	10	0.0287	16.3	0.25	1.17E-01	7.93E-01	4	9	0.2	0.1
Lead	U03-3312	0.918	0.287	0	0.3	0.7	2.11	3.60	1.06	0.00E+00	3.10E-01	6.83E-01	9.93E-01	10	0.0287	120	0.25	8.60E-01	1.85E+00	4	9	0.5	0.2
Lead	U03-3314	0.918	0.287	0	0.3	0.7	2.03	3.55	1.05	0.00E+00	3.06E-01	6.76E-01	9.82E-01	10	0.0287	116	0.25	8.29E-01	1.81E+00	4	9	0.5	0.2
Lead	U03-3316	0.918	0.287	0	0.3	0.7	1.94	3.49	1.04	0.00E+00	3.00E-01	6.69E-01	9.70E-01	10	0.0287	110	0.25	7.92E-01	1.76E+00	4	9	0.4	0.2
Lead	U03-3317	0.918	0.287	0	0.3	0.7	1.11	2.79	0.94	0.00E+00	2.40E-01	6.03E-01	8.43E-01	10	0.0287	63.3	0.25	4.54E-01	1.30E+00	4	9	0.3	0.1
Lead	U03-3318	0.918	0.287	0	0.3	0.7	2.35	3.76	1.09	0.00E+00	3.24E-01	7.02E-01	1.03E+00	10	0.0287	133	0.25	9.57E-01	1.98E+00	4	9	0.5	0.2
Lead	U03-3320	0.918	0.287	0	0.3	0.7	3.39	4.36	1.22	0.00E+00	3.75E-01	7.85E-01	1.16E+00	10	0.0287	193	0.25	1.38E+00	2.54E+00	4	9	0.6	0.3
Lead	U03-3321	0.918	0.287	0	0.3	0.7	0.58	2.15	0.87	0.00E+00	1.85E-01	5.60E-01	7.45E-01	10	0.0287	33.1	0.25	2.37E-01	9.82E-01	4	9	0.2	0.1
Lead	U03-3322	0.918	0.287	0	0.3	0.7	2.31	3.74	1.09	0.00E+00	3.22E-01	6.99E-01	1.02E+00	10	0.0287	131	0.25	9.42E-01	1.96E+00	4	9	0.5	0.2
Lead	U03-4306	0.918	0.287	0	0.3	0.7	5.65	5.34	1.51	0.00E+00	4.60E-01	9.67E-01	1.43E+00	10	0.0287	321	0.25	2.30E+00	3.73E+00	4	9	0.9	0.4
Lead	U03-4308	0.918	0.287	0	0.3	0.7	2.35	3.76	1.09	0.00E+00	3.24E-01	7.02E-01	1.03E+00	10	0.0287	133	0.25	9.58E-01	1.98E+00	4	9	0.5	0.2
Lead	U03-4309	0.918	0.287	0	0.3	0.7	1.69	3.30	1.01	0.00E+00	2.84E-01	6.49E-01	9.33E-01	10	0.0287	96.2	0.25	6.90E-01	1.62E+00	4	9	0.4	0.2
Lead	U03-4311	0.918	0.287	0	0.3	0.7	2.25	3.70	1.08	0.00E+00	3.19E-01	6.94E-01	1.01E+00	10	0.0287	128	0.25	9.19E-01	1.93E+00	4	9	0.5	0.2
Lead	U03-4313	0.918	0.287	0	0.3	0.7	2.60	3.92	1.12	0.00E+00	3.37E-01	7.22E-01	1.06E+00	10	0.0287	148	0.25	1.06E+00	2.12E+00	4	9	0.5	0.2
Lead	U03-4314	0.918	0.287	0	0.3	0.7	5.52	5.29	1.49	0.00E+00	4.56E-01	9.56E-01	1.41E+00	10	0.0287	313	0.25	2.25E+00	3.66E+00	4	9	0.9	0.4
Lead	U03-4315	0.918	0.287	0	0.3	0.7	1.28	2.95	0.96	0.00E+00	2.54E-01	6.16E-01	8.70E-01	10	0.0287	72.7	0.25	5.22E-01	1.39E+00	4	9	0.3	0.2
Lead	U03-4317	0.918	0.287	0	0.3	0.7	6.30	5.58	1.59	0.00E+00	4.80E-01	1.02E+00	1.50E+00	10	0.0287	358	0.25	2.57E+00	4.07E+00	4	9	1.0	0.5
Lead	U03-4319	0.918	0.287	0	0.3	0.7	1.67	3.28	1.01	0.00E+00	2.82E-01	6.47E-01	9.29E-01	10	0.0287	94.6	0.25	6.79E-01	1.61E+00	4	9	0.4	0.2
Lead	U03-4320	0.918	0.287	0	0.3	0.7	1.49	3.14	0.98	0.00E+00	2.70E-01	6.33E-01	9.03E-01	10	0.0287	84.7	0.25	6.08E-01	1.51E+00	4	9	0.4	0.2
Lead	U03-4321	0.918	0.287	0	0.3	0.7	4.08	4.69	1.31	0.00E+00	4.04E-01	8.40E-01	1.24E+00	10	0.0287	232	0.25	1.66E+00	2.91E+00	4	9	0.7	0.3
Lead	U03-4322	0.918	0.287	0	0.3	0.7	3.81	4.56	1.27	0.00E+00	3.93E-01	8.19E-01	1.21E+00	10	0.0287	217	0.25	1.55E+00	2.77E+00	4	9	0.7	0.3
Lead	U03-4324	0.918	0.287	0	0.3	0.7	2.79	4.03	1.15	0.00E+00	3.47E-01	7.37E-01	1.08E+00	10	0.0287	159	0.25	1.14E+00	2.22E+00	4	9	0.6	0.2
Lead	U03-6300	0.918	0.287	0	0.3	0.7	0.81	2.46	0.90	0.00E+00	2.12E-01	5.78E-01	7.90E-01	10	0.0287	46.1	0.25	3.31E-01	1.12E+00	4	9	0.3	0.1

Table 3.4-3
Hazard Quotient Calculations at Locations Lacking Tissue Data
Lead; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concen tration (mg/kg)	Bioavailab ility Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 4																							
Lead	U03-3400	0.918	0.287	0	0.3	0.7	0.94	2.60	0.92	0.00E+00	2.24E-01	5.88E-01	8.12E-01	10	0.0287	53.2	0.25	3.81E-01	1.19E+00	4	9	0.3	0.1
Physical Reaches 6 and 7																							
Lead	95%ile	0.918	0.287	0	0.3	0.7	0.71	2.33	0.89	0.00E+00	2.01E-01	5.70E-01	7.71E-01	10	0.0287	40.3	0.25	2.89E-01	1.06E+00	4	9	0.3	0.1
Lead	U03-2600 B	0.918	0.287	0	0.3	0.7	0.18	1.33	0.82	0.00E+00	1.15E-01	5.27E-01	6.42E-01	10	0.0287	10.0	0.25	7.17E-02	7.14E-01	4	9	0.2	0.1
Lead	U03-2602 B	0.918	0.287	0	0.3	0.7	0.85	2.51	0.90	0.00E+00	2.16E-01	5.81E-01	7.97E-01	10	0.0287	48.3	0.25	3.47E-01	1.14E+00	4	9	0.3	0.1
Lead	U03-3600	0.918	0.287	0	0.3	0.7	0.19	1.37	0.82	0.00E+00	1.18E-01	5.28E-01	6.46E-01	10	0.0287	10.6	0.25	7.60E-02	7.22E-01	4	9	0.2	0.1
Lead	U03-3602	0.918	0.287	0	0.3	0.7	0.16	1.30	0.82	0.00E+00	1.12E-01	5.26E-01	6.38E-01	10	0.0287	9.3	0.25	6.66E-02	7.04E-01	4	9	0.2	0.1
Lead	U03-3604	0.918	0.287	0	0.3	0.7	0.28	1.61	0.83	0.00E+00	1.39E-01	5.36E-01	6.75E-01	10	0.0287	16.1	0.25	1.15E-01	7.90E-01	4	9	0.2	0.1
Lead	U03-6600	0.918	0.287	0	0.3	0.7	0.14	1.23	0.82	0.00E+00	1.06E-01	5.25E-01	6.31E-01	10	0.0287	8.2	0.25	5.88E-02	6.90E-01	4	9	0.2	0.1
Physical Reaches 8 and 9																							
Lead	95%ile	0.918	0.287	0	0.3	0.7	0.66	2.27	0.88	0.00E+00	1.95E-01	5.66E-01	7.62E-01	10	0.0287	37.7	0.25	2.71E-01	1.03E+00	4	9	0.3	0.1
Lead	95th UCL	0.918	0.287	0	0.3	0.7	0.56	2.13	0.87	0.00E+00	1.83E-01	5.58E-01	7.41E-01	10	0.0287	32.0	0.25	2.30E-01	9.71E-01	4	9	0.2	0.1
Lead	ERA 27	0.918	0.287	0	0.3	0.7	0.61	2.19	0.87	0.00E+00	1.89E-01	5.62E-01	7.51E-01	10	0.0287	34.6	0.25	2.48E-01	9.99E-01	4	9	0.2	0.1
Lead	U03-2800	0.918	0.287	0	0.3	0.7	0.30	1.65	0.84	0.00E+00	1.42E-01	5.37E-01	6.79E-01	10	0.0287	16.9	0.25	1.21E-01	8.00E-01	4	9	0.2	0.1
Lead	U03-3800	0.918	0.287	0	0.3	0.7	0.69	2.31	0.89	0.00E+00	1.99E-01	5.69E-01	7.68E-01	10	0.0287	39.4	0.25	2.82E-01	1.05E+00	4	9	0.3	0.1
Lead	U03-3900	0.918	0.287	0	0.3	0.7	0.27	1.59	0.83	0.00E+00	1.37E-01	5.35E-01	6.72E-01	10	0.0287	15.5	0.25	1.11E-01	7.83E-01	4	9	0.2	0.1
Lead	U03-2900 B	0.918	0.287	0	0.3	0.7	0.34	1.74	0.84	0.00E+00	1.50E-01	5.41E-01	6.90E-01	10	0.0287	19.4	0.25	1.39E-01	8.30E-01	4	9	0.2	0.1
Lead	U03-2901 B	0.918	0.287	0	0.3	0.7	0.43	1.90	0.85	0.00E+00	1.64E-01	5.47E-01	7.11E-01	10	0.0287	24.2	0.25	1.73E-01	8.84E-01	4	9	0.2	0.1
Lead	U03-3901	0.918	0.287	0	0.3	0.7	0.62	2.21	0.88	0.00E+00	1.90E-01	5.63E-01	7.53E-01	10	0.0287	35.2	0.25	2.53E-01	1.01E+00	4	9	0.3	0.1
Lead	U03-3902	0.918	0.287	0	0.3	0.7	0.53	2.07	0.86	0.00E+00	1.79E-01	5.56E-01	7.34E-01	10	0.0287	30.1	0.25	2.16E-01	9.50E-01	4	9	0.2	0.1
Lead	U03-6900	0.918	0.287	0	0.3	0.7	0.43	1.90	0.85	0.00E+00	1.64E-01	5.47E-01	7.11E-01	10	0.0287	24.2	0.25	1.74E-01	8.85E-01	4	9	0.2	0.1
Bayard Canyon																							
Lead	ERA 33	0.918	0.287	0	0.3	0.7	9.70	6.63	2.01	0.00E+00	5.71E-01	1.29E+00	1.86E+00	10	0.0287	551	0.25	3.96E+00	5.82E+00	4	9	1.5	0.6
Lead	U03-3003	0.918	0.287	0	0.3	0.7	5.57	5.31	1.49	0.00E+00	4.57E-01	9.60E-01	1.42E+00	10	0.0287	316	0.25	2.27E+00	3.69E+00	4	9	0.9	0.4
Lead	U03-3004	0.918	0.287	0	0.3	0.7	32.31	10.73	4.84	0.00E+00	9.24E-01	3.11E+00	4.03E+00	10	0.0287	1836	0.25	1.32E+01	1.72E+01	4	9	4.3	1.9
Lower Whitewater Creek																							
Lead	95%ile	0.918	0.287	0	0.3	0.7	1.02	2.70	0.93	0.00E+00	2.32E-01	5.95E-01	8.27E-01	10	0.0287	58.05	0.25	4.17E-01	1.24E+00	4	9	0.3	0.1
Lead	95th UCL	0.918	0.287	0	0.3	0.7	0.73	2.35	0.89	0.00E+00	2.02E-01	5.71E-01	7.74E-01	10	0.0287	41.2	0.25	2.96E-01	1.07E+00	4	9	0.3	0.1
Lead	U03-31152	0.918	0.287	0	0.3	0.7	0.57	2.13	0.87	0.00E+00	1.84E-01	5.59E-01	7.42E-01	10	0.0287	32.3	0.25	2.32E-01	9.74E-01	4	9	0.2	0.1
Lead	U03-31259	0.918	0.287	0	0.3	0.7	0.44	1.93	0.85	0.00E+00	1.66E-01	5.48E-01	7.14E-01	10	0.0287	25.0	0.25	1.79E-01	8.94E-01	4	9	0.2	0.1
Lead	U03-31264	0.918	0.287	0	0.3	0.7	0.73	2.35	0.89	0.00E+00	2.02E-01	5.71E-01	7.74E-01	10	0.0287	41.2	0.25	2.96E-01	1.07E+00	4	9	0.3	0.1
Lead	U03-31368	0.918	0.287	0	0.3	0.7	0.75	2.38	0.89	0.00E+00	2.05E-01	5.73E-01	7.79E-01	10	0.0287	42.6	0.25	3.06E-01	1.08E+00	4	9	0.3	0.1
Lead	U03-31578	0.918	0.287	0	0.3	0.7	0.53	2.07	0.86	0.00E+00	1.78E-01	5.55E-01	7.33E-01	10	0.0287	29.9	0.25	2.15E-01	9.48E-01	4	9	0.2	0.1
Lead	U03-61153	0.918	0.287	0	0.3	0.7	1.29	2.96	0.96	0.00E+00	2.55E-01	6.17E-01	8.72E-01	10	0.0287	73.5	0.25	5.27E-01	1.40E+00	4	9	0.3	0.2
Lead	U03-61258	0.918	0.287	0	0.3	0.7	0.51	2.03	0.86	0.00E+00	1.75E-01	5.54E-01	7.29E-01	10	0.0287	28.7	0.25	2.06E-01	9.35E-01	4	9	0.2	0.1
Lead	U03-61265	0.918	0.287	0	0.3	0.7	0.52	2.05	0.86	0.00E+00	1.77E-01	5.55E-01	7.31E-01	10	0.0287	29.3	0.25	2.10E-01	9.41E-01	4	9	0.2	0.1
Lead	U03-61369	0.918	0.287	0	0.3	0.7	0.46	1.95	0.86	0.00E+00	1.68E-01	5.50E-01	7.18E-01	10	0.0287	25.9	0.25	1.86E-01	9.04E-01	4	9	0.2	0.1
Lead	U03-61474	0.918	0.287	0	0.3	0.7	0.24	1.52	0.83	0.00E+00	1.31E-01	5.33E-01	6.64E-01	10	0.0287	13.9	0.25	9.97E-02	7.64E-01	4	9	0.2	0.1
Lead	U03-61575	0.918	0.287	0	0.3	0.7	0.54	2.08	0.87	0.00E+00	1.79E-01	5.56E-01	7.35E-01	10	0.0287	30.4	0.25	2.18E-01	9.54E-01	4	9	0.2	0.1

Table 3.4-3
Hazard Quotient Calculations at Locations Lacking Tissue Data
Lead; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Side Channel																							
Lead	Geometric Mean	0.918	0.287	0	0.3	0.7	0.42	1.89	0.85	0.00E+00	1.62E-01	5.47E-01	7.09E-01	10	0.0287	23.7	0.25	1.70E-01	8.79E-01	4	9	0.2	0.1

Notes:

Calculation details are provided in Appendix A.

Tissue concentration models are provided in Appendix B.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

BW - Body weight

DW - Dry weight

kg/kg - kilograms per kilogram

mg/kg - milligrams per kilogram

NOAEL - No-Observed-Adverse-Effects-Level

LOAEL - Lowest-Observed-Adverse-Effects-Level

Hazard Quotient (HQ) greater than 1.0

Table 3.4-4

Hazard Quotient Calculations at Locations Lacking Tissue Data

Lead; Small Mammal

H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Lead	95% ile	0.665	0.212	0.11	0.43	0.46	14.80	7.85	2.65	1.08E+00	7.16E-01	8.10E-01	2.61E+00	10	0.0212	841	0.25	4.46E+00	7.06E+00	80	800	0.1	0.01
Lead	95th UCL	0.665	0.212	0.11	0.43	0.46	8.87	6.40	1.91	6.49E-01	5.83E-01	5.83E-01	1.82E+00	10	0.0212	504	0.25	2.67E+00	4.49E+00	80	800	0.1	0.01
Lead	ERA 29	0.665	0.212	0.11	0.43	0.46	6.44	5.63	1.60	4.71E-01	5.13E-01	4.90E-01	1.47E+00	10	0.0212	366	0.25	1.94E+00	3.41E+00	80	800	0.04	0.004
Lead	U02-2100	0.665	0.212	0.11	0.43	0.46	3.13	4.22	1.19	2.29E-01	3.85E-01	3.64E-01	9.78E-01	10	0.0212	178	0.25	9.44E-01	1.92E+00	80	800	0.02	0.002
Lead	U02-2102	0.665	0.212	0.11	0.43	0.46	3.09	4.20	1.19	2.26E-01	3.83E-01	3.63E-01	9.72E-01	10	0.0212	176	0.25	9.32E-01	1.90E+00	80	800	0.02	0.002
Lead	U02-3100	0.665	0.212	0.11	0.43	0.46	5.87	5.43	1.53	4.30E-01	4.95E-01	4.69E-01	1.39E+00	10	0.0212	334	0.25	1.77E+00	3.16E+00	80	800	0.04	0.004
Lead	U02-3102	0.665	0.212	0.11	0.43	0.46	4.78	5.00	1.40	3.50E-01	4.56E-01	4.27E-01	1.23E+00	10	0.0212	271	0.25	1.44E+00	2.67E+00	80	800	0.03	0.003
Lead	U02-5003	0.665	0.212	0.11	0.43	0.46	25.87	9.82	4.03	1.89E+00	8.95E-01	1.23E+00	4.02E+00	10	0.0212	1470	0.25	7.79E+00	1.18E+01	80	800	0.1	0.01
Lead	U02-ER001	0.665	0.212	0.11	0.43	0.46	5.49	5.28	1.48	4.02E-01	4.82E-01	4.54E-01	1.34E+00	10	0.0212	312	0.25	1.65E+00	2.99E+00	80	800	0.04	0.004
Lead	U02-ER002	0.665	0.212	0.11	0.43	0.46	5.23	5.18	1.45	3.82E-01	4.72E-01	4.44E-01	1.30E+00	10	0.0212	297	0.25	1.57E+00	2.87E+00	80	800	0.04	0.004
Lead	U02-ER003	0.665	0.212	0.11	0.43	0.46	8.06	6.16	1.81	5.90E-01	5.61E-01	5.52E-01	1.70E+00	10	0.0212	458	0.25	2.43E+00	4.13E+00	80	800	0.1	0.01
Lead	U02-ER004	0.665	0.212	0.11	0.43	0.46	10.05	6.73	2.05	7.35E-01	6.13E-01	6.29E-01	1.98E+00	10	0.0212	571	0.25	3.03E+00	5.00E+00	80	800	0.1	0.01
Lead	U02-ER005	0.665	0.212	0.11	0.43	0.46	2.97	4.13	1.17	2.18E-01	3.77E-01	3.58E-01	9.52E-01	10	0.0212	169	0.25	8.96E-01	1.85E+00	80	800	0.02	0.002
Lead	U02-ER006	0.665	0.212	0.11	0.43	0.46	1.57	3.20	0.99	1.15E-01	2.92E-01	3.04E-01	7.11E-01	10	0.0212	89.3	0.25	4.73E-01	1.18E+00	80	800	0.01	0.001
Lead	U02-ER007	0.665	0.212	0.11	0.43	0.46	2.22	3.68	1.08	1.62E-01	3.35E-01	3.29E-01	8.26E-01	10	0.0212	126	0.25	6.68E-01	1.49E+00	80	800	0.02	0.002
Lead	U02-ER009	0.665	0.212	0.11	0.43	0.46	2.90	4.09	1.16	2.12E-01	3.73E-01	3.55E-01	9.41E-01	10	0.0212	165	0.25	8.75E-01	1.82E+00	80	800	0.02	0.002
Lead	U02-ER010	0.665	0.212	0.11	0.43	0.46	5.58	5.32	1.50	4.08E-01	4.85E-01	4.58E-01	1.35E+00	10	0.0212	317	0.25	1.68E+00	3.03E+00	80	800	0.04	0.004
Physical Reach 2																							
Lead	95% ile*	0.665	0.212	0.11	0.43	0.46	22.53	9.29	3.61	1.65E+00	8.47E-01	1.11E+00	3.60E+00	10	0.0212	1280	0.25	6.78E+00	1.04E+01	80	800	0.1	0.01
Lead	95th UCL*	0.665	0.212	0.11	0.43	0.46	22.93	9.36	3.67	1.68E+00	8.53E-01	1.12E+00	3.65E+00	10	0.0212	1303	0.25	6.91E+00	1.06E+01	80	800	0.1	0.01
Lead	ERA 32*	0.665	0.212	0.11	0.43	0.46	33.26	10.85	4.96	2.43E+00	9.90E-01	1.52E+00	4.94E+00	10	0.0212	1890	0.25	1.00E+01	1.50E+01	80	800	0.2	0.02
Lead	U03-2200	0.665	0.212	0.11	0.43	0.46	2.07	3.58	1.06	1.52E-01	3.26E-01	3.24E-01	8.01E-01	10	0.0212	118	0.25	6.24E-01	1.43E+00	80	800	0.02	0.002
Lead	U03-3200	0.665	0.212	0.11	0.43	0.46	2.59	3.91	1.12	1.89E-01	3.57E-01	3.43E-01	8.89E-01	10	0.0212	147	0.25	7.80E-01	1.67E+00	80	800	0.02	0.002
Lead	U03-4202	0.665	0.212	0.11	0.43	0.46	1.94	3.49	1.04	1.42E-01	3.18E-01	3.19E-01	7.78E-01	10	0.0212	110	0.25	5.85E-01	1.36E+00	80	800	0.02	0.002
Lead	U03-4203	0.665	0.212	0.11	0.43	0.46	1.19	2.87	0.95	8.72E-02	2.61E-01	2.90E-01	6.38E-01	10	0.0212	67.7	0.25	3.59E-01	9.97E-01	80	800	0.01	0.001
Lead	U03-4205	0.665	0.212	0.11	0.43	0.46	1.70	3.31	1.01	1.24E-01	3.01E-01	3.09E-01	7.35E-01	10	0.0212	96.6	0.25	5.12E-01	1.25E+00	80	800	0.02	0.002
Lead	U03-4206	0.665	0.212	0.11	0.43	0.46	1.46	3.11	0.98	1.07E-01	2.84E-01	3.00E-01	6.91E-01	10	0.0212	83.1	0.25	4.40E-01	1.13E+00	80	800	0.01	0.001
Lead	U03-4207	0.665	0.212	0.11	0.43	0.46	2.59	3.91	1.12	1.89E-01	3.57E-01	3.43E-01	8.89E-01	10	0.0212	147	0.25	7.80E-01	1.67E+00	80	800	0.02	0.002
Physical Reach 3																							
Lead	95% ile	0.665	0.212	0.11	0.43	0.46	6.86	5.77	1.66	5.01E-01	5.26E-01	5.06E-01	1.53E+00	10	0.0212	390	0.25	2.06E+00	3.60E+00	80	800	0.04	0.004
Lead	95th UCL	0.665	0.212	0.11	0.43	0.46	4.01	4.66	1.30	2.94E-01	4.25E-01	3.98E-01	1.12E+00	10	0.0212	228	0.25	1.21E+00	2.32E+00	80	800	0.03	0.003
Lead	ERA 22	0.665	0.212	0.11	0.43	0.46	2.84	4.06	1.15	2.08E-01	3.70E-01	3.53E-01	9.30E-01	10	0.0212	161	0.25	8.55E-01	1.79E+00	80	800	0.02	0.002
Lead	ERA 28	0.665	0.212	0.11	0.43	0.46	3.92	4.62	1.29	2.87E-01	4.21E-01	3.94E-01	1.10E+00	10	0.0212	223	0.25	1.18E+00	2.28E+00	80	800	0.03	0.003
Lead	U03-2300	0.665	0.212	0.11	0.43	0.46	3.97	4.64	1.30	2.91E-01	4.23E-01	3.96E-01	1.11E+00	10	0.0212	226	0.25	1.20E+00	2.31E+00	80	800	0.03	0.003
Lead	U03-2302	0.665	0.212	0.11	0.43	0.46	4.82	5.01	1.40	3.53E-01	4.57E-01	4.29E-01	1.24E+00	10	0.0212	274	0.25	1.45E+00	2.69E+00	80	800	0.03	0.003
Lead	U03-2303	0.665	0.212	0.11	0.43	0.46	5.14	5.15	1.44	3.76E-01	4.69E-01	4.41E-01	1.29E+00	10	0.0212	292	0.25	1.55E+00	2.83E+00	80	800	0.04	0.004
Lead	U03-2305	0.665	0.212	0.11	0.43	0.46	4.00	4.66	1.30	2.93E-01	4.24E-01	3.97E-01	1.11E+00	10	0.0212	227	0.25	1.21E+00	2.32E+00	80	800	0.03	0.003
Lead	U03-2306	0.665	0.212	0.11	0.43	0.46	4.37	4.82	1.35	3.20E-01	4.40E-01	4.11E-01	1.17E+00	10	0.0212	248	0.25	1.32E+00	2.49E+00	80	800	0.03	0.003
Lead	U03-2307	0.665	0.212	0.11	0.43	0.46	5.17	5.16	1.45	3.78E-01	4.70E-01	4.42E-01	1.29E+00	10	0.0212	294	0.25	1.56E+00	2.85E+00	80	800	0.04	0.004
Lead	U03-2309	0.665	0.212	0.11	0.43	0.46	5.99	5.47	1.55	4.38E-01	4.98E-01	4.73E-01	1.41E+00	10	0.0212	340	0.25	1.80E+00	3.21E+00	80	800	0.04	0.004
Lead	U03-2311	0.665	0.212	0.11	0.43	0.46	4.21	4.75	1.32	3.08E-01	4.33E-01	4.05E-01	1.15E+00	10	0.0212	239	0.25	1.27E+00	2.41E+00	80	800	0.03	0.003
Lead	U03-2312	0.665	0.212	0.11	0.43	0.46	3.82	4.57	1.28	2.79E-01	4.17E-01	3.90E-01	1.09E+00	10	0.0212	217	0.25	1.15E+00	2.24E+00	80	800	0.03	0.003

Table 3.4-4
Hazard Quotient Calculations at Locations Lacking Tissue Data
Lead; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Lead	U03-2313	0.665	0.212	0.11	0.43	0.46	7.27	5.91	1.71	5.32E-01	5.39E-01	5.22E-01	1.59E+00	10	0.0212	413	0.25	2.19E+00	3.78E+00	80	800	0.05	0.005
Lead	U03-2315	0.665	0.212	0.11	0.43	0.46	3.16	4.24	1.19	2.31E-01	3.86E-01	3.65E-01	9.83E-01	10	0.0212	180	0.25	9.53E-01	1.94E+00	80	800	0.02	0.002
Lead	U03-2316	0.665	0.212	0.11	0.43	0.46	7.11	5.86	1.69	5.20E-01	5.34E-01	5.16E-01	1.57E+00	10	0.0212	404	0.25	2.14E+00	3.71E+00	80	800	0.05	0.005
Lead	U03-2318	0.665	0.212	0.11	0.43	0.46	3.49	4.41	1.23	2.55E-01	4.02E-01	3.78E-01	1.03E+00	10	0.0212	198	0.25	1.05E+00	2.09E+00	80	800	0.03	0.003
Lead	U03-2320	0.665	0.212	0.11	0.43	0.46	3.59	4.46	1.25	2.63E-01	4.06E-01	3.82E-01	1.05E+00	10	0.0212	204	0.25	1.08E+00	2.13E+00	80	800	0.03	0.003
Lead	U03-2321	0.665	0.212	0.11	0.43	0.46	3.75	4.54	1.27	2.74E-01	4.14E-01	3.88E-01	1.08E+00	10	0.0212	213	0.25	1.13E+00	2.21E+00	80	800	0.03	0.003
Lead	U03-2322	0.665	0.212	0.11	0.43	0.46	4.21	4.75	1.32	3.08E-01	4.33E-01	4.05E-01	1.15E+00	10	0.0212	239	0.25	1.27E+00	2.41E+00	80	800	0.03	0.003
Lead	U03-3300	0.665	0.212	0.11	0.43	0.46	9.46	6.57	1.98	6.92E-01	5.99E-01	6.06E-01	1.90E+00	10	0.0212	537	0.25	2.85E+00	4.74E+00	80	800	0.1	0.01
Lead	U03-3302	0.665	0.212	0.11	0.43	0.46	6.39	5.61	1.60	4.67E-01	5.12E-01	4.89E-01	1.47E+00	10	0.0212	363	0.25	1.92E+00	3.39E+00	80	800	0.04	0.004
Lead	U03-3303	0.665	0.212	0.11	0.43	0.46	5.68	5.35	1.51	4.15E-01	4.88E-01	4.61E-01	1.36E+00	10	0.0212	323	0.25	1.71E+00	3.08E+00	80	800	0.04	0.004
Lead	U03-3305	0.665	0.212	0.11	0.43	0.46	2.42	3.81	1.10	1.77E-01	3.47E-01	3.37E-01	8.61E-01	10	0.0212	138	0.25	7.30E-01	1.59E+00	80	800	0.02	0.002
Lead	U03-3306	0.665	0.212	0.11	0.43	0.46	4.11	4.70	1.31	3.00E-01	4.29E-01	4.01E-01	1.13E+00	10	0.0212	233	0.25	1.24E+00	2.37E+00	80	800	0.03	0.003
Lead	U03-3308	0.665	0.212	0.11	0.43	0.46	1.57	3.20	0.99	1.15E-01	2.92E-01	3.04E-01	7.10E-01	10	0.0212	89.0	0.25	4.71E-01	1.18E+00	80	800	0.01	0.001
Lead	U03-3309	0.665	0.212	0.11	0.43	0.46	0.67	2.28	0.88	4.91E-02	2.08E-01	2.70E-01	5.27E-01	10	0.0212	38.1	0.25	2.02E-01	7.29E-01	80	800	0.01	0.001
Lead	U03-3311	0.665	0.212	0.11	0.43	0.46	0.02	1.62	0.83	1.29E-03	1.48E-01	2.55E-01	4.05E-01	10	0.0212	16.3	0.25	8.66E-02	4.91E-01	80	800	0.01	0.001
Lead	U03-3312	0.665	0.212	0.11	0.43	0.46	2.11	3.60	1.06	1.54E-01	3.29E-01	3.25E-01	8.08E-01	10	0.0212	120	0.25	6.35E-01	1.44E+00	80	800	0.02	0.002
Lead	U03-3314	0.665	0.212	0.11	0.43	0.46	2.03	3.55	1.05	1.49E-01	3.24E-01	3.22E-01	7.94E-01	10	0.0212	116	0.25	6.12E-01	1.41E+00	80	800	0.02	0.002
Lead	U03-3316	0.665	0.212	0.11	0.43	0.46	1.94	3.49	1.04	1.42E-01	3.18E-01	3.19E-01	7.79E-01	10	0.0212	110	0.25	5.85E-01	1.36E+00	80	800	0.02	0.002
Lead	U03-3317	0.665	0.212	0.11	0.43	0.46	1.11	2.79	0.94	8.15E-02	2.54E-01	2.87E-01	6.23E-01	10	0.0212	63.3	0.25	3.35E-01	9.58E-01	80	800	0.01	0.001
Lead	U03-3318	0.665	0.212	0.11	0.43	0.46	2.35	3.76	1.09	1.72E-01	3.43E-01	3.34E-01	8.48E-01	10	0.0212	133	0.25	7.07E-01	1.56E+00	80	800	0.02	0.002
Lead	U03-3320	0.665	0.212	0.11	0.43	0.46	3.39	4.36	1.22	2.48E-01	3.97E-01	3.74E-01	1.02E+00	10	0.0212	193	0.25	1.02E+00	2.04E+00	80	800	0.03	0.003
Lead	U03-3321	0.665	0.212	0.11	0.43	0.46	0.58	2.15	0.87	4.26E-02	1.96E-01	2.67E-01	5.05E-01	10	0.0212	33.1	0.25	1.75E-01	6.81E-01	80	800	0.01	0.001
Lead	U03-3322	0.665	0.212	0.11	0.43	0.46	2.31	3.74	1.09	1.69E-01	3.41E-01	3.33E-01	8.43E-01	10	0.0212	131	0.25	6.96E-01	1.54E+00	80	800	0.02	0.002
Lead	U03-4306	0.665	0.212	0.11	0.43	0.46	5.65	5.34	1.51	4.13E-01	4.87E-01	4.60E-01	1.36E+00	10	0.0212	321	0.25	1.70E+00	3.06E+00	80	800	0.04	0.004
Lead	U03-4308	0.665	0.212	0.11	0.43	0.46	2.35	3.76	1.09	1.72E-01	3.43E-01	3.34E-01	8.49E-01	10	0.0212	133	0.25	7.07E-01	1.56E+00	80	800	0.02	0.002
Lead	U03-4309	0.665	0.212	0.11	0.43	0.46	1.69	3.30	1.01	1.24E-01	3.01E-01	3.09E-01	7.34E-01	10	0.0212	96.2	0.25	5.10E-01	1.24E+00	80	800	0.02	0.002
Lead	U03-4311	0.665	0.212	0.11	0.43	0.46	2.25	3.70	1.08	1.65E-01	3.37E-01	3.30E-01	8.33E-01	10	0.0212	128	0.25	6.79E-01	1.51E+00	80	800	0.02	0.002
Lead	U03-4313	0.665	0.212	0.11	0.43	0.46	2.60	3.92	1.12	1.90E-01	3.57E-01	3.44E-01	8.90E-01	10	0.0212	148	0.25	7.82E-01	1.67E+00	80	800	0.02	0.002
Lead	U03-4314	0.665	0.212	0.11	0.43	0.46	5.52	5.29	1.49	4.03E-01	4.82E-01	4.55E-01	1.34E+00	10	0.0212	313	0.25	1.66E+00	3.00E+00	80	800	0.04	0.004
Lead	U03-4315	0.665	0.212	0.11	0.43	0.46	1.28	2.95	0.96	9.36E-02	2.69E-01	2.93E-01	6.56E-01	10	0.0212	72.7	0.25	3.86E-01	1.04E+00	80	800	0.01	0.001
Lead	U03-4317	0.665	0.212	0.11	0.43	0.46	6.30	5.58	1.59	4.61E-01	5.09E-01	4.85E-01	1.45E+00	10	0.0212	358	0.25	1.90E+00	3.35E+00	80	800	0.04	0.004
Lead	U03-4319	0.665	0.212	0.11	0.43	0.46	1.67	3.28	1.01	1.22E-01	2.99E-01	3.08E-01	7.29E-01	10	0.0212	94.6	0.25	5.01E-01	1.23E+00	80	800	0.02	0.002
Lead	U03-4320	0.665	0.212	0.11	0.43	0.46	1.49	3.14	0.98	1.09E-01	2.86E-01	3.01E-01	6.96E-01	10	0.0212	84.7	0.25	4.49E-01	1.15E+00	80	800	0.01	0.001
Lead	U03-4321	0.665	0.212	0.11	0.43	0.46	4.08	4.69	1.31	2.98E-01	4.27E-01	4.00E-01	1.13E+00	10	0.0212	232	0.25	1.23E+00	2.35E+00	80	800	0.03	0.003
Lead	U03-4322	0.665	0.212	0.11	0.43	0.46	3.81	4.56	1.27	2.79E-01	4.16E-01	3.90E-01	1.08E+00	10	0.0212	217	0.25	1.15E+00	2.23E+00	80	800	0.03	0.003
Lead	U03-4324	0.665	0.212	0.11	0.43	0.46	2.79	4.03	1.15	2.04E-01	3.67E-01	3.51E-01	9.23E-01	10	0.0212	159	0.25	8.41E-01	1.76E+00	80	800	0.02	0.002
Lead	U03-6300	0.665	0.212	0.11	0.43	0.46	0.81	2.46	0.90	5.94E-02	2.24E-01	2.75E-01	5.59E-01	10	0.0212	46.1	0.25	2.45E-01	8.04E-01	80	800	0.01	0.001
Physical Reach 4																							
Lead	U03-3400	0.665	0.212	0.11	0.43	0.46	0.94	2.60	0.92	6.85E-02	2.37E-01	2.80E-01	5.86E-01	10	0.0212	53.2	0.25	2.82E-01	8.68E-01	80	800	0.01	0.001
Physical Reaches 6 and 7																							
Lead	95% ile	0.665	0.212	0.11	0.43	0.46	0.71	2.33	0.89	5.19E-02	2.12E-01	2.71E-01	5.36E-01	10	0.0212	40	0.25	2.13E-01	7.49E-01	80	800	0.01	0.001
Lead	U03-2600 B	0.665	0.212	0.11	0.43	0.46	0.18	1.33	0.82	1.29E-02	1.22E-01	2.51E-01	3.86E-01	10	0.0212	10.0	0.25	5.30E-02	4.38E-01	80	800	0.01	0.001
Lead	U03-2602 B	0.665	0.212	0.11	0.43	0.46	0.85	2.51	0.90	6.22E-02	2.29E-01	2.77E-01	5.68E-01	10	0.0212	48.3	0.25	2.56E-01	8.24E-01	80	800	0.01	0.001
Lead	U03-3600	0.665	0.212	0.11	0.43	0.46	0.19	1.37	0.82	1.36E-02	1.25E-01	2.51E-01	3.90E-01	10	0.0212	10.6	0.25	5.61E-02	4.46E-01	80	800	0.01	0.001

Table 3.4-4
Hazard Quotient Calculations at Locations Lacking Tissue Data
Lead; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Lead	U03-3602	0.665	0.212	0.11	0.43	0.46	0.16	1.30	0.82	1.19E-02	1.18E-01	2.51E-01	3.81E-01	10	0.0212	9.3	0.25	4.92E-02	4.30E-01	80	800	0.01	0.001
Lead	U03-3604	0.665	0.212	0.11	0.43	0.46	0.28	1.61	0.83	2.07E-02	1.47E-01	2.55E-01	4.23E-01	10	0.0212	16.1	0.25	8.53E-02	5.08E-01	80	800	0.01	0.001
Lead	U03-6600	0.665	0.212	0.11	0.43	0.46	0.14	1.23	0.82	1.05E-02	1.12E-01	2.50E-01	3.73E-01	10	0.0212	8.2	0.25	4.34E-02	4.16E-01	80	800	0.01	0.001
Physical Reaches 8 and 9																							
Lead	95% ile	0.665	0.212	0.11	0.43	0.46	0.66	2.27	0.88	4.86E-02	2.07E-01	2.70E-01	5.25E-01	10	0.0212	38	0.25	2.00E-01	7.25E-01	80	800	0.01	0.001
Lead	95th UCL	0.665	0.212	0.11	0.43	0.46	0.56	2.13	0.87	4.12E-02	1.94E-01	2.66E-01	5.01E-01	10	0.0212	32	0.25	1.70E-01	6.70E-01	80	800	0.01	0.001
Lead	ERA 27	0.665	0.212	0.11	0.43	0.46	0.61	2.19	0.87	4.46E-02	2.00E-01	2.68E-01	5.12E-01	10	0.0212	34.6	0.25	1.84E-01	6.96E-01	80	800	0.01	0.001
Lead	U03-2800	0.665	0.212	0.11	0.43	0.46	0.30	1.65	0.84	2.18E-02	1.50E-01	2.56E-01	4.28E-01	10	0.0212	16.9	0.25	8.96E-02	5.17E-01	80	800	0.01	0.001
Lead	U03-3800	0.665	0.212	0.11	0.43	0.46	0.69	2.31	0.89	5.07E-02	2.10E-01	2.71E-01	5.32E-01	10	0.0212	39.4	0.25	2.09E-01	7.41E-01	80	800	0.01	0.001
Lead	U03-3900	0.665	0.212	0.11	0.43	0.46	0.27	1.59	0.83	2.00E-02	1.45E-01	2.55E-01	4.20E-01	10	0.0212	15.5	0.25	8.22E-02	5.02E-01	80	800	0.01	0.001
Lead	U03-2900 B	0.665	0.212	0.11	0.43	0.46	0.34	1.74	0.84	2.50E-02	1.59E-01	2.57E-01	4.41E-01	10	0.0212	19.4	0.25	1.03E-01	5.44E-01	80	800	0.01	0.001
Lead	U03-2901 B	0.665	0.212	0.11	0.43	0.46	0.43	1.90	0.85	3.11E-02	1.73E-01	2.61E-01	4.65E-01	10	0.0212	24.2	0.25	1.28E-01	5.93E-01	80	800	0.01	0.001
Lead	U03-3901	0.665	0.212	0.11	0.43	0.46	0.62	2.21	0.88	4.54E-02	2.01E-01	2.68E-01	5.15E-01	10	0.0212	35.2	0.25	1.87E-01	7.02E-01	80	800	0.01	0.001
Lead	U03-3902	0.665	0.212	0.11	0.43	0.46	0.53	2.07	0.86	3.87E-02	1.89E-01	2.64E-01	4.92E-01	10	0.0212	30.1	0.25	1.59E-01	6.52E-01	80	800	0.01	0.001
Lead	U03-6900	0.665	0.212	0.11	0.43	0.46	0.43	1.90	0.85	3.12E-02	1.73E-01	2.61E-01	4.65E-01	10	0.0212	24.2	0.25	1.28E-01	5.94E-01	80	800	0.01	0.001
Bayard Canyon																							
Lead	ERA 33	0.665	0.212	0.11	0.43	0.46	9.70	6.63	2.01	7.10E-01	6.05E-01	6.15E-01	1.93E+00	10	0.0212	551	0.25	2.92E+00	4.85E+00	80	800	0.1	0.01
Lead	U03-3003	0.665	0.212	0.11	0.43	0.46	5.57	5.31	1.49	4.07E-01	4.84E-01	4.57E-01	1.35E+00	10	0.0212	316	0.25	1.68E+00	3.03E+00	80	800	0.04	0.004
Lead	U03-3004	0.665	0.212	0.11	0.43	0.46	32.31	10.73	4.84	2.36E+00	9.78E-01	1.48E+00	4.82E+00	10	0.0212	1836	0.25	9.73E+00	1.45E+01	80	800	0.2	0.02
Lower Whitewater Creek																							
Lead	95% ile	0.665	0.212	0.11	0.43	0.46	1.02	2.70	0.93	7.47E-02	2.46E-01	2.83E-01	6.04E-01	10	0.0212	58	0.25	3.08E-01	9.12E-01	80	800	0.01	0.001
Lead	95th UCL	0.665	0.212	0.11	0.43	0.46	0.73	2.35	0.89	5.30E-02	2.14E-01	2.72E-01	5.39E-01	10	0.0212	41	0.25	2.18E-01	7.58E-01	80	800	0.01	0.001
Lead	U03-31152	0.665	0.212	0.11	0.43	0.46	0.57	2.13	0.87	4.16E-02	1.94E-01	2.66E-01	5.02E-01	10	0.0212	32.3	0.25	1.71E-01	6.73E-01	80	800	0.01	0.001
Lead	U03-31259	0.665	0.212	0.11	0.43	0.46	0.44	1.93	0.85	3.22E-02	1.76E-01	2.61E-01	4.69E-01	10	0.0212	25.0	0.25	1.33E-01	6.01E-01	80	800	0.01	0.001
Lead	U03-31264	0.665	0.212	0.11	0.43	0.46	0.73	2.35	0.89	5.30E-02	2.14E-01	2.72E-01	5.39E-01	10	0.0212	41.2	0.25	2.18E-01	7.58E-01	80	800	0.01	0.001
Lead	U03-31368	0.665	0.212	0.11	0.43	0.46	0.75	2.38	0.89	5.48E-02	2.17E-01	2.73E-01	5.45E-01	10	0.0212	42.6	0.25	2.26E-01	7.71E-01	80	800	0.01	0.001
Lead	U03-31578	0.665	0.212	0.11	0.43	0.46	0.53	2.07	0.86	3.85E-02	1.89E-01	2.64E-01	4.91E-01	10	0.0212	29.9	0.25	1.58E-01	6.50E-01	80	800	0.01	0.001
Lead	U03-61153	0.665	0.212	0.11	0.43	0.46	1.29	2.96	0.96	9.46E-02	2.70E-01	2.94E-01	6.59E-01	10	0.0212	73.5	0.25	3.90E-01	1.05E+00	80	800	0.01	0.001
Lead	U03-61258	0.665	0.212	0.11	0.43	0.46	0.51	2.03	0.86	3.69E-02	1.86E-01	2.64E-01	4.86E-01	10	0.0212	28.7	0.25	1.52E-01	6.38E-01	80	800	0.01	0.001
Lead	U03-61265	0.665	0.212	0.11	0.43	0.46	0.52	2.05	0.86	3.77E-02	1.87E-01	2.64E-01	4.89E-01	10	0.0212	29.3	0.25	1.55E-01	6.44E-01	80	800	0.01	0.001
Lead	U03-61369	0.665	0.212	0.11	0.43	0.46	0.46	1.95	0.86	3.33E-02	1.78E-01	2.62E-01	4.73E-01	10	0.0212	25.9	0.25	1.37E-01	6.10E-01	80	800	0.01	0.001
Lead	U03-61474	0.665	0.212	0.11	0.43	0.46	0.24	1.52	0.83	1.79E-02	1.39E-01	2.54E-01	4.10E-01	10	0.0212	13.9	0.25	7.37E-02	4.84E-01	80	800	0.01	0.001
Lead	U03-61575	0.665	0.212	0.11	0.43	0.46	0.54	2.08	0.87	3.91E-02	1.90E-01	2.65E-01	4.94E-01	10	0.0212	30.4	0.25	1.61E-01	6.55E-01	80	800	0.01	0.001

Table 3.4-4
Hazard Quotient Calculations at Locations Lacking Tissue Data
Lead; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Side Channel																							
Lead	Geometric Mean	0.665	0.212	0.11	0.43	0.46	0.42	1.89	0.85	3.05E-02	1.72E-01	2.60E-01	4.63E-01	10	0.0212	23.7	0.25	1.26E-01	5.88E-01	80	800	0.01	0.001

Notes:

Calculation details are provided in Appendix A.

Tissue concentration models are provided in Appendix B.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

BW - Body we BW - Body weight

DW - Dry wei DW - Dry weight

kg/kg - kilogra kg/kg - kilograms per kilogram

mg/kg - milligr mg/kg - milligrams per kilogram

NOAEL - No- NOAEL - No-Observed-Adverse-Effects-Level

LOAEL - Low LOAEL - Lowest-Observed-Adverse-Effects-Level

Table 3.4-5
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Zinc	95% ile	0.918	0.287	0	0.3	0.7	214	77.00	92.17	0.00E+00	6.63E+00	5.92E+01	6.59E+01	10	0.0287	3148	1.00	9.03E+01	1.56E+02	10	210	15.6	0.7
Zinc	95th UCL	0.918	0.287	0	0.3	0.7	190	74.12	88.10	0.00E+00	6.38E+00	5.66E+01	6.30E+01	10	0.0287	2338	1.00	6.71E+01	1.30E+02	10	210	13.0	0.6
Zinc	ERA 29	0.918	0.287	0	0.3	0.7	187	73.71	87.53	0.00E+00	6.35E+00	5.62E+01	6.26E+01	10	0.0287	2240	1.00	6.43E+01	1.27E+02	10	210	12.7	0.6
Zinc	U02-2100	0.918	0.287	0	0.3	0.7	181	73.00	86.52	0.00E+00	6.28E+00	5.56E+01	6.19E+01	10	0.0287	2076	1.00	5.96E+01	1.21E+02	10	210	12.1	0.6
Zinc	U02-2102	0.918	0.287	0	0.3	0.7	155	69.38	81.46	0.00E+00	5.97E+00	5.23E+01	5.83E+01	10	0.0287	1396	1.00	4.01E+01	9.84E+01	10	210	9.8	0.5
Zinc	U02-3100	0.918	0.287	0	0.3	0.7	249	80.92	97.76	0.00E+00	6.97E+00	6.28E+01	6.98E+01	10	0.0287	4637	1.00	1.33E+02	2.03E+02	10	210	20.3	0.9
Zinc	U02-3102	0.918	0.287	0	0.3	0.7	145	67.83	79.31	0.00E+00	5.84E+00	5.10E+01	5.68E+01	10	0.0287	1171	1.00	3.36E+01	9.04E+01	10	210	9.0	0.4
Zinc	U02-5003	0.918	0.287	0	0.3	0.7	107	61.54	70.67	0.00E+00	5.30E+00	4.54E+01	5.07E+01	10	0.0287	548	1.00	1.57E+01	6.64E+01	10	210	6.6	0.3
Zinc	U02-ER001	0.918	0.287	0	0.3	0.7	176	72.32	85.57	0.00E+00	6.23E+00	5.50E+01	6.12E+01	10	0.0287	1930	1.00	5.54E+01	1.17E+02	10	210	11.7	0.6
Zinc	U02-ER002	0.918	0.287	0	0.3	0.7	195	74.80	89.06	0.00E+00	6.44E+00	5.72E+01	6.37E+01	10	0.0287	2510	1.00	7.20E+01	1.36E+02	10	210	13.6	0.6
Zinc	U02-ER003	0.918	0.287	0	0.3	0.7	195	74.76	89.00	0.00E+00	6.44E+00	5.72E+01	6.36E+01	10	0.0287	2500	1.00	7.18E+01	1.35E+02	10	210	13.5	0.6
Zinc	U02-ER004	0.918	0.287	0	0.3	0.7	180	72.83	86.29	0.00E+00	6.27E+00	5.55E+01	6.17E+01	10	0.0287	2040	1.00	5.85E+01	1.20E+02	10	210	12.0	0.6
Zinc	U02-ER005	0.918	0.287	0	0.3	0.7	167	71.04	83.78	0.00E+00	6.12E+00	5.38E+01	6.00E+01	10	0.0287	1680	1.00	4.82E+01	1.08E+02	10	210	10.8	0.5
Zinc	U02-ER006	0.918	0.287	0	0.3	0.7	153		81.14	0.00E+00	0.00E+00	5.21E+01	5.21E+01	10	0.0287	1360	1.00	3.90E+01	9.12E+01	10	210	9.1	0.4
Zinc	U02-ER007	0.918	0.287	0	0.3	0.7	147	68.19	79.81	0.00E+00	5.87E+00	5.13E+01	5.72E+01	10	0.0287	1220	1.00	3.50E+01	9.22E+01	10	210	9.2	0.4
Zinc	U02-ER009	0.918	0.287	0	0.3	0.7	158	69.78	82.01	0.00E+00	6.01E+00	5.27E+01	5.87E+01	10	0.0287	1460	1.00	4.19E+01	1.01E+02	10	210	10.1	0.5
Zinc	U02-ER010	0.918	0.287	0	0.3	0.7	130	65.45	76.02	0.00E+00	5.64E+00	4.88E+01	5.45E+01	10	0.0287	886	1.00	2.54E+01	7.99E+01	10	210	8.0	0.4
Physical Reach 2																							
Zinc	95% ile*	0.918	0.287	0	0.3	0.7	135	66.35	77.26	0.00E+00	5.71E+00	4.97E+01	5.54E+01	10	0.0287	986	1.00	2.83E+01	8.37E+01	10	210	8.4	0.4
Zinc	95th UCL*	0.918	0.287	0	0.3	0.7	120	63.82	73.78	0.00E+00	5.49E+00	4.74E+01	5.29E+01	10	0.0287	728	1.00	2.09E+01	7.38E+01	10	210	7.4	0.4
Zinc	ERA 32*	0.918	0.287	0	0.3	0.7	144	67.75	79.20	0.00E+00	5.83E+00	5.09E+01	5.67E+01	10	0.0287	1160	1.00	3.33E+01	9.00E+01	10	210	9.0	0.4
Zinc	U03-2200	0.918	0.287	0	0.3	0.7	116	63.07	72.75	0.00E+00	5.43E+00	4.68E+01	5.22E+01	10	0.0287	664	1.00	1.91E+01	7.12E+01	10	210	7.1	0.3
Zinc	U03-3200	0.918	0.287	0	0.3	0.7	86	57.37	65.03	0.00E+00	4.94E+00	4.18E+01	4.67E+01	10	0.0287	317	1.00	9.10E+00	5.58E+01	10	210	5.6	0.3
Zinc	U03-4202	0.918	0.287	0	0.3	0.7	92	58.52	66.58	0.00E+00	5.04E+00	4.28E+01	4.78E+01	10	0.0287	370	1.00	1.06E+01	5.85E+01	10	210	5.8	0.3
Zinc	U03-4203	0.918	0.287	0	0.3	0.7	86	57.34	64.98	0.00E+00	4.94E+00	4.18E+01	4.67E+01	10	0.0287	316	1.00	9.06E+00	5.58E+01	10	210	5.6	0.3
Zinc	U03-4205	0.918	0.287	0	0.3	0.7	101	60.43	69.15	0.00E+00	5.20E+00	4.44E+01	4.96E+01	10	0.0287	475	1.00	1.36E+01	6.33E+01	10	210	6.3	0.3
Zinc	U03-4206	0.918	0.287	0	0.3	0.7	86	57.36	65.02	0.00E+00	4.94E+00	4.18E+01	4.67E+01	10	0.0287	317	1.00	9.09E+00	5.58E+01	10	210	5.6	0.3
Zinc	U03-4207	0.918	0.287	0	0.3	0.7	73	54.26	60.87	0.00E+00	4.67E+00	3.91E+01	4.38E+01	10	0.0287	205	1.00	5.89E+00	4.97E+01	10	210	5.0	0.2
Physical Reach 3																							
Zinc	95% ile	0.918	0.287	0	0.3	0.7	159	70.01	82.34	0.00E+00	6.03E+00	5.29E+01	5.89E+01	10	0.0287	1498	1.00	4.30E+01	1.02E+02	10	210	10.2	0.5
Zinc	95th UCL	0.918	0.287	0	0.3	0.7	127	65.09	75.53	0.00E+00	5.60E+00	4.85E+01	5.41E+01	10	0.0287	849	1.00	2.44E+01	7.85E+01	10	210	7.9	0.4
Zinc	ERA 22	0.918	0.287	0	0.3	0.7	160	70.14	82.52	0.00E+00	6.04E+00	5.30E+01	5.91E+01	10	0.0287	1520	1.00	4.36E+01	1.03E+02	10	210	10.3	0.5
Zinc	ERA 28	0.918	0.287	0	0.3	0.7	145	67.91	79.42	0.00E+00	5.85E+00	5.10E+01	5.69E+01	10	0.0287	1182	1.00	3.39E+01	9.08E+01	10	210	9.1	0.4
Zinc	U03-2300	0.918	0.287	0	0.3	0.7	130	65.52	76.12	0.00E+00	5.64E+00	4.89E+01	5.46E+01	10	0.0287	894	1.00	2.57E+01	8.02E+01	10	210	8.0	0.4
Zinc	U03-2302	0.918	0.287	0	0.3	0.7	96	59.35	67.70	0.00E+00	5.11E+00	4.35E+01	4.86E+01	10	0.0287	413	1.00	1.19E+01	6.05E+01	10	210	6.0	0.3
Zinc	U03-2303	0.918	0.287	0	0.3	0.7	137	66.67	77.70	0.00E+00	5.74E+00	4.99E+01	5.57E+01	10	0.0287	1023	1.00	2.94E+01	8.50E+01	10	210	8.5	0.4
Zinc	U03-2305	0.918	0.287	0	0.3	0.7	139	66.93	78.06	0.00E+00	5.76E+00	5.02E+01	5.59E+01	10	0.0287	1055	1.00	3.03E+01	8.62E+01	10	210	8.6	0.4

Table 3.4-5
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Zinc	U03-2306	0.918	0.287	0	0.3	0.7	119	63.70	73.61	0.00E+00	5.48E+00	4.73E+01	5.28E+01	10	0.0287	717	1.00	2.06E+01	7.34E+01	10	210	7.3	0.3
Zinc	U03-2307	0.918	0.287	0	0.3	0.7	101	60.32	69.01	0.00E+00	5.19E+00	4.43E+01	4.95E+01	10	0.0287	469	1.00	1.35E+01	6.30E+01	10	210	6.3	0.3
Zinc	U03-2309	0.918	0.287	0	0.3	0.7	127	65.12	75.56	0.00E+00	5.61E+00	4.86E+01	5.42E+01	10	0.0287	852	1.00	2.44E+01	7.86E+01	10	210	7.9	0.4
Zinc	U03-2311	0.918	0.287	0	0.3	0.7	150	68.67	80.48	0.00E+00	5.91E+00	5.17E+01	5.76E+01	10	0.0287	1289	1.00	3.70E+01	9.46E+01	10	210	9.5	0.5
Zinc	U03-2312	0.918	0.287	0	0.3	0.7	90	58.16	66.08	0.00E+00	5.01E+00	4.25E+01	4.75E+01	10	0.0287	353	1.00	1.01E+01	5.76E+01	10	210	5.8	0.3
Zinc	U03-2313	0.918	0.287	0	0.3	0.7	89	57.87	65.70	0.00E+00	4.98E+00	4.22E+01	4.72E+01	10	0.0287	339	1.00	9.73E+00	5.69E+01	10	210	5.7	0.3
Zinc	U03-2315	0.918	0.287	0	0.3	0.7	89	57.94	65.79	0.00E+00	4.99E+00	4.23E+01	4.73E+01	10	0.0287	342	1.00	9.83E+00	5.71E+01	10	210	5.7	0.3
Zinc	U03-2316	0.918	0.287	0	0.3	0.7	91	58.36	66.36	0.00E+00	5.02E+00	4.26E+01	4.77E+01	10	0.0287	362	1.00	1.04E+01	5.81E+01	10	210	5.8	0.3
Zinc	U03-2318	0.918	0.287	0	0.3	0.7	96	59.29	67.61	0.00E+00	5.10E+00	4.34E+01	4.86E+01	10	0.0287	410	1.00	1.18E+01	6.03E+01	10	210	6.0	0.3
Zinc	U03-2320	0.918	0.287	0	0.3	0.7	83	56.66	64.08	0.00E+00	4.88E+00	4.12E+01	4.61E+01	10	0.0287	288	1.00	8.26E+00	5.43E+01	10	210	5.4	0.3
Zinc	U03-2321	0.918	0.287	0	0.3	0.7	85	57.15	64.74	0.00E+00	4.92E+00	4.16E+01	4.65E+01	10	0.0287	308	1.00	8.84E+00	5.54E+01	10	210	5.5	0.3
Zinc	U03-2322	0.918	0.287	0	0.3	0.7	83	56.56	63.94	0.00E+00	4.87E+00	4.11E+01	4.60E+01	10	0.0287	284	1.00	8.15E+00	5.41E+01	10	210	5.4	0.3
Zinc	U03-3300	0.918	0.287	0	0.3	0.7	120	63.88	73.87	0.00E+00	5.50E+00	4.75E+01	5.30E+01	10	0.0287	733	1.00	2.11E+01	7.40E+01	10	210	7.4	0.4
Zinc	U03-3302	0.918	0.287	0	0.3	0.7	196	74.86	89.15	0.00E+00	6.45E+00	5.73E+01	6.37E+01	10	0.0287	2528	1.00	7.26E+01	1.36E+02	10	210	13.6	0.6
Zinc	U03-3303	0.918	0.287	0	0.3	0.7	147	68.25	79.89	0.00E+00	5.88E+00	5.13E+01	5.72E+01	10	0.0287	1228	1.00	3.52E+01	9.25E+01	10	210	9.2	0.4
Zinc	U03-3305	0.918	0.287	0	0.3	0.7	122	64.12	74.20	0.00E+00	5.52E+00	4.77E+01	5.32E+01	10	0.0287	755	1.00	2.17E+01	7.49E+01	10	210	7.5	0.4
Zinc	U03-3306	0.918	0.287	0	0.3	0.7	147	68.15	79.75	0.00E+00	5.87E+00	5.12E+01	5.71E+01	10	0.0287	1215	1.00	3.49E+01	9.20E+01	10	210	9.2	0.4
Zinc	U03-3308	0.918	0.287	0	0.3	0.7	93	58.79	66.94	0.00E+00	5.06E+00	4.30E+01	4.81E+01	10	0.0287	384	1.00	1.10E+01	5.91E+01	10	210	5.9	0.3
Zinc	U03-3309	0.918	0.287	0	0.3	0.7	63	51.85	57.68	0.00E+00	4.46E+00	3.71E+01	4.15E+01	10	0.0287	144	1.00	4.13E+00	4.57E+01	10	210	4.6	0.2
Zinc	U03-3311	0.918	0.287	0	0.3	0.7	53	49.10	54.07	0.00E+00	4.23E+00	3.47E+01	3.90E+01	10	0.0287	94.1	1.00	2.70E+00	4.17E+01	10	210	4.2	0.2
Zinc	U03-3312	0.918	0.287	0	0.3	0.7	101	60.29	68.97	0.00E+00	5.19E+00	4.43E+01	4.95E+01	10	0.0287	467	1.00	1.34E+01	6.29E+01	10	210	6.3	0.3
Zinc	U03-3314	0.918	0.287	0	0.3	0.7	103	60.73	69.57	0.00E+00	5.23E+00	4.47E+01	4.99E+01	10	0.0287	494	1.00	1.42E+01	6.41E+01	10	210	6.4	0.3
Zinc	U03-3316	0.918	0.287	0	0.3	0.7	100	60.21	68.85	0.00E+00	5.18E+00	4.42E+01	4.94E+01	10	0.0287	462	1.00	1.33E+01	6.27E+01	10	210	6.3	0.3
Zinc	U03-3317	0.918	0.287	0	0.3	0.7	80	56.07	63.28	0.00E+00	4.83E+00	4.07E+01	4.55E+01	10	0.0287	265	1.00	7.61E+00	5.31E+01	10	210	5.3	0.3
Zinc	U03-3318	0.918	0.287	0	0.3	0.7	129	65.39	75.93	0.00E+00	5.63E+00	4.88E+01	5.44E+01	10	0.0287	879	1.00	2.52E+01	7.97E+01	10	210	8.0	0.4
Zinc	U03-3320	0.918	0.287	0	0.3	0.7	158	69.76	81.99	0.00E+00	6.01E+00	5.27E+01	5.87E+01	10	0.0287	1457	1.00	4.18E+01	1.01E+02	10	210	10.1	0.5
Zinc	U03-3321	0.918	0.287	0	0.3	0.7	79	55.77	62.88	0.00E+00	4.80E+00	4.04E+01	4.52E+01	10	0.0287	254	1.00	7.30E+00	5.25E+01	10	210	5.3	0.3
Zinc	U03-3322	0.918	0.287	0	0.3	0.7	142	67.49	78.84	0.00E+00	5.81E+00	5.07E+01	5.65E+01	10	0.0287	1126	1.00	3.23E+01	8.88E+01	10	210	8.9	0.4
Zinc	U03-4306	0.918	0.287	0	0.3	0.7	215	77.19	92.45	0.00E+00	6.65E+00	5.94E+01	6.61E+01	10	0.0287	3209	1.00	9.21E+01	1.58E+02	10	210	15.8	0.8
Zinc	U03-4308	0.918	0.287	0	0.3	0.7	90	58.23	66.18	0.00E+00	5.01E+00	4.25E+01	4.75E+01	10	0.0287	356	1.00	1.02E+01	5.78E+01	10	210	5.8	0.3
Zinc	U03-4309	0.918	0.287	0	0.3	0.7	97	59.49	67.88	0.00E+00	5.12E+00	4.36E+01	4.87E+01	10	0.0287	421	1.00	1.21E+01	6.08E+01	10	210	6.1	0.3
Zinc	U03-4311	0.918	0.287	0	0.3	0.7	109	61.94	71.21	0.00E+00	5.33E+00	4.58E+01	5.11E+01	10	0.0287	576	1.00	1.65E+01	6.76E+01	10	210	6.8	0.3
Zinc	U03-4313	0.918	0.287	0	0.3	0.7	109	61.84	71.07	0.00E+00	5.32E+00	4.57E+01	5.10E+01	10	0.0287	569	1.00	1.63E+01	6.73E+01	10	210	6.7	0.3
Zinc	U03-4314	0.918	0.287	0	0.3	0.7	91	58.45	66.47	0.00E+00	5.03E+00	4.27E+01	4.77E+01	10	0.0287	367	1.00	1.05E+01	5.83E+01	10	210	5.8	0.3
Zinc	U03-4315	0.918	0.287	0	0.3	0.7	74	54.54	61.24	0.00E+00	4.70E+00	3.94E+01	4.41E+01	10	0.0287	214	1.00	6.13E+00	5.02E+01	10	210	5.0	0.2
Zinc	U03-4317	0.918	0.287	0	0.3	0.7	120	63.89	73.88	0.00E+00	5.50E+00	4.75E+01	5.30E+01	10	0.0287	734	1.00	2.11E+01	7.40E+01	10	210	7.4	0.4
Zinc	U03-4319	0.918	0.287	0	0.3	0.7	89	57.95	65.81	0.00E+00	4.99E+00	4.23E+01	4.73E+01	10	0.0287	343	1.00	9.84E+00	5.71E+01	10	210	5.7	0.3
Zinc	U03-4320	0.918	0.287	0	0.3	0.7	76	55.14	62.04	0.00E+00	4.75E+00	3.99E+01	4.46E+01	10	0.0287	233	1.00	6.68E+00	5.13E+01	10	210	5.1	0.2
Zinc	U03-4321	0.918	0.287	0	0.3	0.7	82	56.32	63.62	0.00E+00	4.85E+00	4.09E+01	4.57E+01	10	0.0287	275	1.00	7.88E+00	5.36E+01	10	210	5.4	0.3
Zinc	U03-4322	0.918	0.287	0	0.3	0.7	81	56.25	63.52	0.00E+00	4.84E+00	4.08E+01	4.57E+01	10	0.0287	272	1.00	7.80E+00	5.35E+01	10	210	5.3	0.3
Zinc	U03-4324	0.918	0.287	0	0.3	0.7	114	62.82	72.41	0.00E+00	5.41E+00	4.65E+01	5.19E+01	10	0.0287	643	1.00	1.85E+01	7.04E+01	10	210	7.0	0.3
Zinc	U03-6300	0.918	0.287	0	0.3	0.7	73	54.22	60.82	0.00E+00	4.67E+00	3.91E+01	4.38E+01	10	0.0287	204	1.00	5.86E+00	4.96E+01	10	210	5.0	0.2

Table 3.4-5
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 4																							
Zinc	U03-3400	0.918	0.287	0	0.3	0.7	68	53.16	59.40	0.00E+00	4.58E+00	3.82E+01	4.27E+01	10	0.0287	175	1.00	5.02E+00	4.78E+01	10	210	4.8	0.2
Physical Reaches 6 and 7																							
Zinc	95% ile	0.918	0.287	0	0.3	0.7	58	50.35	55.71	0.00E+00	4.34E+00	3.58E+01	4.01E+01	10	0.0287	115	1.00	3.29E+00	4.34E+01	10	210	4.3	0.2
Zinc	U03-2600 B	0.918	0.287	0	0.3	0.7	23	37.24	38.95	0.00E+00	3.21E+00	2.50E+01	2.82E+01	10	0.0287	10.9	1.00	3.13E-01	2.85E+01	10	210	2.9	0.1
Zinc	U03-2602 B	0.918	0.287	0	0.3	0.7	63	51.70	57.48	0.00E+00	4.45E+00	3.69E+01	4.14E+01	10	0.0287	141	1.00	4.04E+00	4.54E+01	10	210	4.5	0.2
Zinc	U03-3600	0.918	0.287	0	0.3	0.7	35	42.78	45.91	0.00E+00	3.68E+00	2.95E+01	3.32E+01	10	0.0287	32.1	1.00	9.22E-01	3.41E+01	10	210	3.4	0.2
Zinc	U03-3602	0.918	0.287	0	0.3	0.7	34	42.22	45.21	0.00E+00	3.64E+00	2.91E+01	3.27E+01	10	0.0287	29.0	1.00	8.33E-01	3.35E+01	10	210	3.4	0.2
Zinc	U03-3604	0.918	0.287	0	0.3	0.7	25	38.42	40.42	0.00E+00	3.31E+00	2.60E+01	2.93E+01	10	0.0287	13.9	1.00	3.99E-01	2.97E+01	10	210	3.0	0.1
Zinc	U03-6600	0.918	0.287	0	0.3	0.7	37	43.42	46.73	0.00E+00	3.74E+00	3.00E+01	3.38E+01	10	0.0287	36.1	1.00	1.04E+00	3.48E+01	10	210	3.5	0.2
Physical Reach 8 and 9																							
Zinc	95% ile	0.918	0.287	0	0.3	0.7	64	52.04	57.92	0.00E+00	4.48E+00	3.72E+01	4.17E+01	10	0.0287	148	1.00	4.25E+00	4.60E+01	10	210	4.6	0.2
Zinc	95th UCL	0.918	0.287	0	0.3	0.7	58	50.38	55.74	0.00E+00	4.34E+00	3.58E+01	4.02E+01	10	0.0287	115	1.00	3.30E+00	4.35E+01	10	210	4.3	0.2
Zinc	ERA 27	0.918	0.287	0	0.3	0.7	56	49.96	55.20	0.00E+00	4.30E+00	3.55E+01	3.98E+01	10	0.0287	108	1.00	3.10E+00	4.29E+01	10	210	4.3	0.2
Zinc	U03-2800	0.918	0.287	0	0.3	0.7	37	43.43	46.74	0.00E+00	3.74E+00	3.00E+01	3.38E+01	10	0.0287	36.1	1.00	1.04E+00	3.48E+01	10	210	3.5	0.2
Zinc	U03-3800	0.918	0.287	0	0.3	0.7	51	48.36	53.10	0.00E+00	4.16E+00	3.41E+01	3.83E+01	10	0.0287	83.6	1.00	2.40E+00	4.07E+01	10	210	4.1	0.2
Zinc	U03-3900	0.918	0.287	0	0.3	0.7	39	44.50	48.11	0.00E+00	3.83E+00	3.09E+01	3.47E+01	10	0.0287	43.7	1.00	1.25E+00	3.60E+01	10	210	3.6	0.2
Zinc	U03-2900 B	0.918	0.287	0	0.3	0.7	45	46.35	50.50	0.00E+00	3.99E+00	3.24E+01	3.64E+01	10	0.0287	60.1	1.00	1.72E+00	3.82E+01	10	210	3.8	0.2
Zinc	U03-2901 B	0.918	0.287	0	0.3	0.7	54	49.31	54.34	0.00E+00	4.25E+00	3.49E+01	3.92E+01	10	0.0287	97.3	1.00	2.79E+00	4.20E+01	10	210	4.2	0.2
Zinc	U03-3901	0.918	0.287	0	0.3	0.7	68	53.12	59.36	0.00E+00	4.57E+00	3.81E+01	4.27E+01	10	0.0287	174	1.00	4.99E+00	4.77E+01	10	210	4.8	0.2
Zinc	U03-3902	0.918	0.287	0	0.3	0.7	57	50.04	55.29	0.00E+00	4.31E+00	3.55E+01	3.98E+01	10	0.0287	109	1.00	3.13E+00	4.30E+01	10	210	4.3	0.2
Zinc	U03-6900	0.918	0.287	0	0.3	0.7	52	48.69	53.53	0.00E+00	4.19E+00	3.44E+01	3.86E+01	10	0.0287	88.1	1.00	2.53E+00	4.11E+01	10	210	4.1	0.2
Bayard Canyon																							
Zinc	ERA 33	0.918	0.287	0	0.3	0.7	78	55.44	62.44	0.00E+00	4.77E+00	4.01E+01	4.49E+01	10	0.0287	243	1.00	6.96E+00	5.19E+01	10	210	5.2	0.2
Zinc	U03-3003	0.918	0.287	0	0.3	0.7	62	51.50	57.22	0.00E+00	4.43E+00	3.68E+01	4.12E+01	10	0.0287	137	1.00	3.92E+00	4.51E+01	10	210	4.5	0.2
Zinc	U03-3004	0.918	0.287	0	0.3	0.7	94	58.96	67.17	0.00E+00	5.08E+00	4.32E+01	4.82E+01	10	0.0287	393	1.00	1.13E+01	5.95E+01	10	210	6.0	0.3
Lower Whitewater Creek																							
Zinc	95% ile	0.918	0.287	0	0.3	0.7	68	53.08	59.31	0.00E+00	4.57E+00	3.81E+01	4.27E+01	10	0.0287	173	1.00	4.97E+00	4.76E+01	10	210	4.8	0.2
Zinc	95th UCL	0.918	0.287	0	0.3	0.7	59	50.76	56.24	0.00E+00	4.37E+00	3.61E+01	4.05E+01	10	0.0287	122	1.00	3.50E+00	4.40E+01	10	210	4.4	0.2
Zinc	U03-31152	0.918	0.287	0	0.3	0.7	57	50.26	55.59	0.00E+00	4.33E+00	3.57E+01	4.00E+01	10	0.0287	113	1.00	3.24E+00	4.33E+01	10	210	4.3	0.2
Zinc	U03-31259	0.918	0.287	0	0.3	0.7	49	47.85	52.44	0.00E+00	4.12E+00	3.37E+01	3.78E+01	10	0.0287	77	1.00	2.21E+00	4.00E+01	10	210	4.0	0.2
Zinc	U03-31264	0.918	0.287	0	0.3	0.7	61	51.37	57.05	0.00E+00	4.42E+00	3.67E+01	4.11E+01	10	0.0287	134	1.00	3.85E+00	4.49E+01	10	210	4.5	0.2
Zinc	U03-31368	0.918	0.287	0	0.3	0.7	68	53.08	59.31	0.00E+00	4.57E+00	3.81E+01	4.27E+01	10	0.0287	173	1.00	4.97E+00	4.76E+01	10	210	4.8	0.2
Zinc	U03-31578	0.918	0.287	0	0.3	0.7	58	50.54	55.95	0.00E+00	4.35E+00	3.60E+01	4.03E+01	10	0.0287	118	1.00	3.39E+00	4.37E+01	10	210	4.4	0.2
Zinc	U03-61153	0.918	0.287	0	0.3	0.7	72	54.11	60.67	0.00E+00	4.66E+00	3.90E+01	4.36E+01	10	0.0287	201	1.00	5.77E+00	4.94E+01	10	210	4.9	0.2
Zinc	U03-61258	0.918	0.287	0	0.3	0.7	57	50.09	55.36	0.00E+00	4.31E+00	3.56E+01	3.99E+01	10	0.0287	110	1.00	3.16E+00	4.30E+01	10	210	4.3	0.2
Zinc	U03-61265	0.918	0.287	0	0.3	0.7	56	49.79	54.97	0.00E+00	4.29E+00	3.53E+01	3.96E+01	10	0.0287	105	1.00	3.01E+00	4.26E+01	10	210	4.3	0.2
Zinc	U03-61369	0.918	0.287	0	0.3	0.7	55	49.47	54.56	0.00E+00	4.26E+00	3.51E+01	3.93E+01	10	0.0287	99.9	1.00	2.87E+00	4.22E+01	10	210	4.2	0.2
Zinc	U03-61474	0.918	0.287	0	0.3	0.7	43	45.68	49.63	0.00E+00	3.93E+00	3.19E+01	3.58E+01	10	0.0287	53.6	1.00	1.54E+00	3.74E+01	10	210	3.7	0.2
Zinc	U03-61575	0.918	0.287	0	0.3	0.7	58	50.38	55.74	0.00E+00	4.34E+00	3.58E+01	4.02E+01	10	0.0287	115	1.00	3.30E+00	4.35E+01	10	210	4.3	0.2

Table 3.4-5
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Side Channel																							
Zinc	Geometric Mean	0.918	0.287	0	0.3	0.7	55	49.47	54.56	0.00E+00	4.26E+00	3.51E+01	3.93E+01	10	0.0287	99.9	1.00	2.87E+00	4.22E+01	10	210	4.2	0.2

Notes:

Calculation details are provided in Appendix A.

Tissue concentration models are provided in Appendix B.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

BW - Body weight

DW - Dry weight

kg/kg - kilograms per kilogram

mg/kg - milligrams per kilogram

NOAEL - No-Observed-Adverse-Effects-Level

LOAEL - Lowest-Observed-Adverse-Effects-Level

Hazard Quotient (HQ) greater than 1.0

Table 3.4-6
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Zinc	95%ile	0.665	0.212	0.11	0.43	0.46	214	77.00	92.17	1.56E+01	7.02E+00	2.82E+01	5.08E+01	10	0.0212	3148	1.00	6.67E+01	1.18E+02	120	240	1.0	0.5
Zinc	95th UCL	0.665	0.212	0.11	0.43	0.46	190	74.12	88.10	1.39E+01	6.76E+00	2.69E+01	4.76E+01	10	0.0212	2338	1.00	4.96E+01	9.72E+01	120	240	0.8	0.4
Zinc	ERA 29	0.665	0.212	0.11	0.43	0.46	187	73.71	87.53	1.37E+01	6.72E+00	2.68E+01	4.72E+01	10	0.0212	2240	1.00	4.75E+01	9.46E+01	120	240	0.8	0.4
Zinc	U02-2100	0.665	0.212	0.11	0.43	0.46	181	73.00	86.52	1.33E+01	6.65E+00	2.65E+01	4.64E+01	10	0.0212	2076	1.00	4.40E+01	9.04E+01	120	240	0.8	0.4
Zinc	U02-2102	0.665	0.212	0.11	0.43	0.46	155	69.38	81.46	1.13E+01	6.32E+00	2.49E+01	4.26E+01	10	0.0212	1396	1.00	2.96E+01	7.22E+01	120	240	0.6	0.3
Zinc	U02-3100	0.665	0.212	0.11	0.43	0.46	249	80.92	97.76	1.82E+01	7.38E+00	2.99E+01	5.55E+01	10	0.0212	4637	1.00	9.83E+01	1.54E+02	120	240	1.3	0.6
Zinc	U02-3102	0.665	0.212	0.11	0.43	0.46	145	67.83	79.31	1.06E+01	6.18E+00	2.43E+01	4.10E+01	10	0.0212	1171	1.00	2.48E+01	6.59E+01	120	240	0.5	0.3
Zinc	U02-5003	0.665	0.212	0.11	0.43	0.46	107	61.54	70.67	7.84E+00	5.61E+00	2.16E+01	3.51E+01	10	0.0212	548	1.00	1.16E+01	4.67E+01	120	240	0.4	0.2
Zinc	U02-ER001	0.665	0.212	0.11	0.43	0.46	176	72.32	85.57	1.29E+01	6.59E+00	2.62E+01	4.56E+01	10	0.0212	1930	1.00	4.09E+01	8.66E+01	120	240	0.7	0.4
Zinc	U02-ER002	0.665	0.212	0.11	0.43	0.46	195	74.80	89.06	1.43E+01	6.82E+00	2.72E+01	4.83E+01	10	0.0212	2510	1.00	5.32E+01	1.02E+02	120	240	0.8	0.4
Zinc	U02-ER003	0.665	0.212	0.11	0.43	0.46	195	74.76	89.00	1.43E+01	6.81E+00	2.72E+01	4.83E+01	10	0.0212	2500	1.00	5.30E+01	1.01E+02	120	240	0.8	0.4
Zinc	U02-ER004	0.665	0.212	0.11	0.43	0.46	180	72.83	86.29	1.32E+01	6.64E+00	2.64E+01	4.62E+01	10	0.0212	2040	1.00	4.32E+01	8.95E+01	120	240	0.7	0.4
Zinc	U02-ER005	0.665	0.212	0.11	0.43	0.46	167	71.04	83.78	1.22E+01	6.48E+00	2.56E+01	4.43E+01	10	0.0212	1680	1.00	3.56E+01	7.99E+01	120	240	0.7	0.3
Zinc	U02-ER006	0.665	0.212	0.11	0.43	0.46	153	69.14	81.14	1.12E+01	6.30E+00	2.48E+01	4.23E+01	10	0.0212	1360	1.00	2.88E+01	7.12E+01	120	240	0.6	0.3
Zinc	U02-ER007	0.665	0.212	0.11	0.43	0.46	147	68.19	79.81	1.07E+01	6.22E+00	2.44E+01	4.14E+01	10	0.0212	1220	1.00	2.59E+01	6.72E+01	120	240	0.6	0.3
Zinc	U02-ER009	0.665	0.212	0.11	0.43	0.46	158	69.78	82.01	1.15E+01	6.36E+00	2.51E+01	4.30E+01	10	0.0212	1460	1.00	3.10E+01	7.39E+01	120	240	0.6	0.3
Zinc	U02-ER010	0.665	0.212	0.11	0.43	0.46	130	65.45	76.02	9.47E+00	5.97E+00	2.33E+01	3.87E+01	10	0.0212	886	1.00	1.88E+01	5.75E+01	120	240	0.5	0.2
Physical Reach 2																							
Zinc	95%ile*	0.665	0.212	0.11	0.43	0.46	135	66.35	77.26	9.88E+00	6.05E+00	2.36E+01	3.96E+01	10	0.0212	986	1.00	2.09E+01	6.05E+01	120	240	0.5	0.3
Zinc	95th UCL*	0.665	0.212	0.11	0.43	0.46	120	63.82	73.78	8.77E+00	5.82E+00	2.26E+01	3.72E+01	10	0.0212	728	1.00	1.54E+01	5.26E+01	120	240	0.4	0.2
Zinc	ERA 32*	0.665	0.212	0.11	0.43	0.46	144	67.75	79.20	1.05E+01	6.18E+00	2.42E+01	4.09E+01	10	0.0212	1160	1.00	2.46E+01	6.55E+01	120	240	0.5	0.3
Zinc	U03-2200	0.665	0.212	0.11	0.43	0.46	116	63.07	72.75	8.45E+00	5.75E+00	2.23E+01	3.65E+01	10	0.0212	664	1.00	1.41E+01	5.05E+01	120	240	0.4	0.2
Zinc	U03-3200	0.665	0.212	0.11	0.43	0.46	86	57.37	65.03	6.32E+00	5.23E+00	1.99E+01	3.14E+01	10	0.0212	317	1.00	6.73E+00	3.82E+01	120	240	0.3	0.2
Zinc	U03-4202	0.665	0.212	0.11	0.43	0.46	92	58.52	66.58	6.71E+00	5.34E+00	2.04E+01	3.24E+01	10	0.0212	370	1.00	7.85E+00	4.03E+01	120	240	0.3	0.2
Zinc	U03-4203	0.665	0.212	0.11	0.43	0.46	86	57.34	64.98	6.30E+00	5.23E+00	1.99E+01	3.14E+01	10	0.0212	316	1.00	6.69E+00	3.81E+01	120	240	0.3	0.2
Zinc	U03-4205	0.665	0.212	0.11	0.43	0.46	101	60.43	69.15	7.41E+00	5.51E+00	2.12E+01	3.41E+01	10	0.0212	475	1.00	1.01E+01	4.41E+01	120	240	0.4	0.2
Zinc	U03-4206	0.665	0.212	0.11	0.43	0.46	86	57.36	65.02	6.31E+00	5.23E+00	1.99E+01	3.14E+01	10	0.0212	317	1.00	6.72E+00	3.81E+01	120	240	0.3	0.2
Zinc	U03-4207	0.665	0.212	0.11	0.43	0.46	73	54.26	60.87	5.32E+00	4.95E+00	1.86E+01	2.89E+01	10	0.0212	205	1.00	4.35E+00	3.32E+01	120	240	0.3	0.1
Physical Reach 3																							
Zinc	95%ile	0.665	0.212	0.11	0.43	0.46	159	70.01	82.34	1.17E+01	6.38E+00	2.52E+01	4.32E+01	10	0.0212	1498	1.00	3.18E+01	7.50E+01	120	240	0.6	0.3
Zinc	95th UCL	0.665	0.212	0.11	0.43	0.46	127	65.09	75.53	9.32E+00	5.93E+00	2.31E+01	3.84E+01	10	0.0212	849	1.00	1.80E+01	5.64E+01	120	240	0.5	0.2
Zinc	ERA 22	0.665	0.212	0.11	0.43	0.46	160	70.14	82.52	1.17E+01	6.39E+00	2.52E+01	4.34E+01	10	0.0212	1520	1.00	3.22E+01	7.56E+01	120	240	0.6	0.3
Zinc	ERA 28	0.665	0.212	0.11	0.43	0.46	145	67.91	79.42	1.06E+01	6.19E+00	2.43E+01	4.11E+01	10	0.0212	1182	1.00	2.51E+01	6.62E+01	120	240	0.6	0.3
Zinc	U03-2300	0.665	0.212	0.11	0.43	0.46	130	65.52	76.12	9.51E+00	5.97E+00	2.33E+01	3.88E+01	10	0.0212	894	1.00	1.89E+01	5.77E+01	120	240	0.5	0.2
Zinc	U03-2302	0.665	0.212	0.11	0.43	0.46	96	59.35	67.70	7.01E+00	5.41E+00	2.07E+01	3.31E+01	10	0.0212	413	1.00	8.76E+00	4.19E+01	120	240	0.3	0.2
Zinc	U03-2303	0.665	0.212	0.11	0.43	0.46	137	66.67	77.70	1.00E+01	6.08E+00	2.38E+01	3.99E+01	10	0.0212	1023	1.00	2.17E+01	6.16E+01	120	240	0.5	0.3
Zinc	U03-2305	0.665	0.212	0.11	0.43	0.46	139	66.93	78.06	1.01E+01	6.10E+00	2.39E+01	4.01E+01	10	0.0212	1055	1.00	2.24E+01	6.25E+01	120	240	0.5	0.3
Zinc	U03-2306	0.665	0.212	0.11	0.43	0.46	119	63.70	73.61	8.71E+00	5.81E+00	2.25E+01	3.70E+01	10	0.0212	717	1.00	1.52E+01	5.22E+01	120	240	0.4	0.2
Zinc	U03-2307	0.665	0.212	0.11	0.43	0.46	101	60.32	69.01	7.37E+00	5.50E+00	2.11E+01	3.40E+01	10	0.0212	469	1.00	9.94E+00	4.39E+01	120	240	0.4	0.2
Zinc	U03-2309	0.665	0.212	0.11	0.43	0.46	127	65.12	75.56	9.33E+00	5.94E+00	2.31E+01	3.84E+01	10	0.0212	852	1.00	1.81E+01	5.64E+01	120	240	0.5	0.2
Zinc	U03-2311	0.665	0.212	0.11	0.43	0.46	150	68.67	80.48	1.10E+01	6.26E+00	2.46E+01	4.19E+01	10	0.0212	1289	1.00	2.73E+01	6.92E+01	120	240	0.6	0.3
Zinc	U03-2312	0.665	0.212	0.11	0.43	0.46	90	58.16	66.08	6.59E+00	5.30E+00	2.02E+01	3.21E+01	10	0.0212	353	1.00	7.48E+00	3.96E+01	120	240	0.3	0.2
Zinc	U03-2313	0.665	0.212	0.11	0.43	0.46	89	57.87	65.70	6.48E+00	5.28E+00	2.01E+01	3.19E+01	10	0.0212	339	1.00	7.19E+00	3.90E+01	120	240	0.3	0.2
Zinc	U03-2315	0.665	0.212	0.11	0.43	0.46	89	57.94	65.79	6.51E+00	5.28E+00	2.01E+01	3.19E+01	10	0.0212	342	1.00	7.26E+00	3.92E+01	120	240	0.3	0.2

Table 3.4-6
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concen tration (mg/kg)	Bioavaila bility Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Zinc	U03-2316	0.665	0.212	0.11	0.43	0.46	91	58.36	66.36	6.66E+00	5.32E+00	2.03E+01	3.23E+01	10	0.0212	362	1.00	7.68E+00	4.00E+01	120	240	0.3	0.2
Zinc	U03-2318	0.665	0.212	0.11	0.43	0.46	96	59.29	67.61	6.99E+00	5.40E+00	2.07E+01	3.31E+01	10	0.0212	410	1.00	8.69E+00	4.18E+01	120	240	0.3	0.2
Zinc	U03-2320	0.665	0.212	0.11	0.43	0.46	83	56.66	64.08	6.08E+00	5.17E+00	1.96E+01	3.08E+01	10	0.0212	288	1.00	6.10E+00	3.69E+01	120	240	0.3	0.2
Zinc	U03-2321	0.665	0.212	0.11	0.43	0.46	85	57.15	64.74	6.24E+00	5.21E+00	1.98E+01	3.13E+01	10	0.0212	308	1.00	6.53E+00	3.78E+01	120	240	0.3	0.2
Zinc	U03-2322	0.665	0.212	0.11	0.43	0.46	83	56.56	63.94	6.05E+00	5.16E+00	1.96E+01	3.08E+01	10	0.0212	284	1.00	6.02E+00	3.68E+01	120	240	0.3	0.2
Zinc	U03-3300	0.665	0.212	0.11	0.43	0.46	120	63.88	73.87	8.79E+00	5.82E+00	2.26E+01	3.72E+01	10	0.0212	733	1.00	1.56E+01	5.28E+01	120	240	0.4	0.2
Zinc	U03-3302	0.665	0.212	0.11	0.43	0.46	196	74.86	89.15	1.43E+01	6.82E+00	2.73E+01	4.84E+01	10	0.0212	2528	1.00	5.36E+01	1.02E+02	120	240	0.9	0.4
Zinc	U03-3303	0.665	0.212	0.11	0.43	0.46	147	68.25	79.89	1.08E+01	6.22E+00	2.44E+01	4.14E+01	10	0.0212	1228	1.00	2.60E+01	6.75E+01	120	240	0.6	0.3
Zinc	U03-3305	0.665	0.212	0.11	0.43	0.46	122	64.12	74.20	8.89E+00	5.85E+00	2.27E+01	3.74E+01	10	0.0212	755	1.00	1.60E+01	5.34E+01	120	240	0.4	0.2
Zinc	U03-3306	0.665	0.212	0.11	0.43	0.46	147	68.15	79.75	1.07E+01	6.21E+00	2.44E+01	4.13E+01	10	0.0212	1215	1.00	2.58E+01	6.71E+01	120	240	0.6	0.3
Zinc	U03-3308	0.665	0.212	0.11	0.43	0.46	93	58.79	66.94	6.81E+00	5.36E+00	2.05E+01	3.26E+01	10	0.0212	384	1.00	8.13E+00	4.08E+01	120	240	0.3	0.2
Zinc	U03-3309	0.665	0.212	0.11	0.43	0.46	63	51.85	57.68	4.63E+00	4.73E+00	1.76E+01	2.70E+01	10	0.0212	144	1.00	3.05E+00	3.00E+01	120	240	0.3	0.1
Zinc	U03-3311	0.665	0.212	0.11	0.43	0.46	53	49.10	54.07	3.91E+00	4.48E+00	1.65E+01	2.49E+01	10	0.0212	94.1	1.00	2.00E+00	2.69E+01	120	240	0.2	0.1
Zinc	U03-3312	0.665	0.212	0.11	0.43	0.46	101	60.29	68.97	7.36E+00	5.50E+00	2.11E+01	3.40E+01	10	0.0212	467	1.00	9.90E+00	4.39E+01	120	240	0.4	0.2
Zinc	U03-3314	0.665	0.212	0.11	0.43	0.46	103	60.73	69.57	7.52E+00	5.54E+00	2.13E+01	3.43E+01	10	0.0212	494	1.00	1.05E+01	4.48E+01	120	240	0.4	0.2
Zinc	U03-3316	0.665	0.212	0.11	0.43	0.46	100	60.21	68.85	7.33E+00	5.49E+00	2.11E+01	3.39E+01	10	0.0212	462	1.00	9.79E+00	4.37E+01	120	240	0.4	0.2
Zinc	U03-3317	0.665	0.212	0.11	0.43	0.46	80	56.07	63.28	5.88E+00	5.11E+00	1.94E+01	3.04E+01	10	0.0212	265	1.00	5.62E+00	3.60E+01	120	240	0.3	0.1
Zinc	U03-3318	0.665	0.212	0.11	0.43	0.46	129	65.39	75.93	9.45E+00	5.96E+00	2.32E+01	3.86E+01	10	0.0212	879	1.00	1.86E+01	5.73E+01	120	240	0.5	0.2
Zinc	U03-3320	0.665	0.212	0.11	0.43	0.46	158	69.76	81.99	1.15E+01	6.36E+00	2.51E+01	4.30E+01	10	0.0212	1457	1.00	3.09E+01	7.39E+01	120	240	0.6	0.3
Zinc	U03-3321	0.665	0.212	0.11	0.43	0.46	79	55.77	62.88	5.79E+00	5.08E+00	1.92E+01	3.01E+01	10	0.0212	254	1.00	5.39E+00	3.55E+01	120	240	0.3	0.1
Zinc	U03-3322	0.665	0.212	0.11	0.43	0.46	142	67.49	78.84	1.04E+01	6.15E+00	2.41E+01	4.07E+01	10	0.0212	1126	1.00	2.39E+01	6.46E+01	120	240	0.5	0.3
Zinc	U03-4306	0.665	0.212	0.11	0.43	0.46	215	77.19	92.45	1.57E+01	7.04E+00	2.83E+01	5.11E+01	10	0.0212	3209	1.00	6.80E+01	1.19E+02	120	240	1.0	0.5
Zinc	U03-4308	0.665	0.212	0.11	0.43	0.46	90	58.23	66.18	6.61E+00	5.31E+00	2.02E+01	3.22E+01	10	0.0212	356	1.00	7.55E+00	3.97E+01	120	240	0.3	0.2
Zinc	U03-4309	0.665	0.212	0.11	0.43	0.46	97	59.49	67.88	7.06E+00	5.42E+00	2.08E+01	3.32E+01	10	0.0212	421	1.00	8.92E+00	4.22E+01	120	240	0.4	0.2
Zinc	U03-4311	0.665	0.212	0.11	0.43	0.46	109	61.94	71.21	7.99E+00	5.65E+00	2.18E+01	3.54E+01	10	0.0212	576	1.00	1.22E+01	4.76E+01	120	240	0.4	0.2
Zinc	U03-4313	0.665	0.212	0.11	0.43	0.46	109	61.84	71.07	7.95E+00	5.64E+00	2.17E+01	3.53E+01	10	0.0212	569	1.00	1.21E+01	4.74E+01	120	240	0.4	0.2
Zinc	U03-4314	0.665	0.212	0.11	0.43	0.46	91	58.45	66.47	6.69E+00	5.33E+00	2.03E+01	3.23E+01	10	0.0212	367	1.00	7.77E+00	4.01E+01	120	240	0.3	0.2
Zinc	U03-4315	0.665	0.212	0.11	0.43	0.46	74	54.54	61.24	5.40E+00	4.97E+00	1.87E+01	2.91E+01	10	0.0212	214	1.00	4.53E+00	3.36E+01	120	240	0.3	0.1
Zinc	U03-4317	0.665	0.212	0.11	0.43	0.46	120	63.89	73.88	8.80E+00	5.82E+00	2.26E+01	3.72E+01	10	0.0212	734	1.00	1.56E+01	5.28E+01	120	240	0.4	0.2
Zinc	U03-4319	0.665	0.212	0.11	0.43	0.46	89	57.95	65.81	6.51E+00	5.28E+00	2.01E+01	3.19E+01	10	0.0212	343	1.00	7.27E+00	3.92E+01	120	240	0.3	0.2
Zinc	U03-4320	0.665	0.212	0.11	0.43	0.46	76	55.14	62.04	5.59E+00	5.03E+00	1.90E+01	2.96E+01	10	0.0212	233	1.00	4.93E+00	3.45E+01	120	240	0.3	0.1
Zinc	U03-4321	0.665	0.212	0.11	0.43	0.46	82	56.32	63.62	5.97E+00	5.13E+00	1.95E+01	3.06E+01	10	0.0212	275	1.00	5.82E+00	3.64E+01	120	240	0.3	0.2
Zinc	U03-4322	0.665	0.212	0.11	0.43	0.46	81	56.25	63.52	5.94E+00	5.13E+00	1.94E+01	3.05E+01	10	0.0212	272	1.00	5.76E+00	3.63E+01	120	240	0.3	0.2
Zinc	U03-4324	0.665	0.212	0.11	0.43	0.46	114	62.82	72.41	8.35E+00	5.73E+00	2.22E+01	3.62E+01	10	0.0212	643	1.00	1.36E+01	4.99E+01	120	240	0.4	0.2
Zinc	U03-6300	0.665	0.212	0.11	0.43	0.46	73	54.22	60.82	5.31E+00	4.94E+00	1.86E+01	2.89E+01	10	0.0212	204	1.00	4.33E+00	3.32E+01	120	240	0.3	0.1
Physical Reach 4																							
Zinc	U03-3400	0.665	0.212	0.11	0.43	0.46	68	53.16	59.40	4.99E+00	4.85E+00	1.82E+01	2.80E+01	10	0.0212	175	1.00	3.71E+00	3.17E+01	120	240	0.3	0.1
Physical Reaches 6 and 7																							
Zinc	95%ile	0.665	0.212	0.11	0.43	0.46	58	50.35	55.71	4.23E+00	4.59E+00	1.70E+01	2.59E+01	10	0.0212	114.6	1.00	2.43E+00	2.83E+01	120	240	0.2	0.1
Zinc	U03-2600 B	0.665	0.212	0.11	0.43	0.46	23	37.24	38.95	1.67E+00	3.39E+00	1.19E+01	1.70E+01	10	0.0212	10.9	1.00	2.31E-01	1.72E+01	120	240	0.1	0.1
Zinc	U03-2602 B	0.665	0.212	0.11	0.43	0.46	63	51.70	57.48	4.58E+00	4.71E+00	1.76E+01	2.69E+01	10	0.0212	141	1.00	2.99E+00	2.99E+01	120	240	0.2	0.1
Zinc	U03-3600	0.665	0.212	0.11	0.43	0.46	35	42.78	45.91	2.56E+00	3.90E+00	1.40E+01	2.05E+01	10	0.0212	32.1	1.00	6.81E-01	2.12E+01	120	240	0.2	0.1
Zinc	U03-3602	0.665	0.212	0.11	0.43	0.46	34	42.22	45.21	2.46E+00	3.85E+00	1.38E+01	2.01E+01	10	0.0212	29.0	1.00	6.15E-01	2.08E+01	120	240	0.2	0.1
Zinc	U03-3604	0.665	0.212	0.11	0.43	0.46	25	38.42	40.42	1.84E+00	3.50E+00	1.24E+01	1.77E+01	10	0.0212	13.9	1.00	2.95E-01	1.80E+01	120	240	0.1	0.1
Zinc	U03-6600	0.665	0.212	0.11	0.43	0.46	37	43.42	46.73	2.68E+00	3.96E+00	1.43E+01	2.09E+01	10	0.0212	36.1	1.00	7.65E-01	2.17E+01	120	240	0.2	0.1

Table 3.4-6
Hazard Quotient Calculations at Locations Lacking Tissue Data
Zinc; Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reaches 8 and 9																							
Zinc	95%ile	0.665	0.212	0.11	0.43	0.46	64	52.04	57.92	4.68E+00	4.74E+00	1.77E+01	2.71E+01	10	0.0212	148	1.00	3.14E+00	3.03E+01	120	240	0.3	0.1
Zinc	95th UCL	0.665	0.212	0.11	0.43	0.46	58	50.38	55.74	4.23E+00	4.59E+00	1.70E+01	2.59E+01	10	0.0212	115	1.00	2.44E+00	2.83E+01	120	240	0.2	0.1
Zinc	ERA 27	0.665	0.212	0.11	0.43	0.46	56	49.96	55.20	4.13E+00	4.55E+00	1.69E+01	2.56E+01	10	0.0212	108	1.00	2.29E+00	2.79E+01	120	240	0.2	0.1
Zinc	U03-2800	0.665	0.212	0.11	0.43	0.46	37	43.43	46.74	2.68E+00	3.96E+00	1.43E+01	2.09E+01	10	0.0212	36.1	1.00	7.66E-01	2.17E+01	120	240	0.2	0.1
Zinc	U03-3800	0.665	0.212	0.11	0.43	0.46	51	48.36	53.10	3.73E+00	4.41E+00	1.62E+01	2.44E+01	10	0.0212	83.6	1.00	1.77E+00	2.62E+01	120	240	0.2	0.1
Zinc	U03-3900	0.665	0.212	0.11	0.43	0.46	39	44.50	48.11	2.89E+00	4.06E+00	1.47E+01	2.17E+01	10	0.0212	43.7	1.00	9.27E-01	2.26E+01	120	240	0.2	0.1
Zinc	U03-2900 B	0.665	0.212	0.11	0.43	0.46	45	46.35	50.50	3.27E+00	4.23E+00	1.54E+01	2.29E+01	10	0.0212	60.1	1.00	1.27E+00	2.42E+01	120	240	0.2	0.1
Zinc	U03-2901 B	0.665	0.212	0.11	0.43	0.46	54	49.31	54.34	3.96E+00	4.49E+00	1.66E+01	2.51E+01	10	0.0212	97.3	1.00	2.06E+00	2.71E+01	120	240	0.2	0.1
Zinc	U03-3901	0.665	0.212	0.11	0.43	0.46	68	53.12	59.36	4.98E+00	4.84E+00	1.82E+01	2.80E+01	10	0.0212	174	1.00	3.69E+00	3.17E+01	120	240	0.3	0.1
Zinc	U03-3902	0.665	0.212	0.11	0.43	0.46	57	50.04	55.29	4.15E+00	4.56E+00	1.69E+01	2.56E+01	10	0.0212	109	1.00	2.31E+00	2.79E+01	120	240	0.2	0.1
Zinc	U03-6900	0.665	0.212	0.11	0.43	0.46	52	48.69	53.53	3.81E+00	4.44E+00	1.64E+01	2.46E+01	10	0.0212	88.1	1.00	1.87E+00	2.65E+01	120	240	0.2	0.1
Bayard Canyon																							
Zinc	ERA 33	0.665	0.212	0.11	0.43	0.46	78	55.44	62.44	5.68E+00	5.05E+00	1.91E+01	2.98E+01	10	0.0212	243	1.00	5.14E+00	3.50E+01	120	240	0.3	0.1
Zinc	U03-3003	0.665	0.212	0.11	0.43	0.46	62	51.50	57.22	4.53E+00	4.70E+00	1.75E+01	2.67E+01	10	0.0212	137	1.00	2.90E+00	2.96E+01	120	240	0.2	0.1
Zinc	U03-3004	0.665	0.212	0.11	0.43	0.46	94	58.96	67.17	6.87E+00	5.37E+00	2.05E+01	3.28E+01	10	0.0212	393	1.00	8.32E+00	4.11E+01	120	240	0.3	0.2
Lower Whitewater Creek																							
Zinc	95%ile	0.665	0.212	0.11	0.43	0.46	68	53.08	59.31	4.97E+00	4.84E+00	1.81E+01	2.80E+01	10	0.0212	173	1.00	3.67E+00	3.16E+01	120	240	0.3	0.1
Zinc	95th UCL	0.665	0.212	0.11	0.43	0.46	59	50.76	56.24	4.33E+00	4.63E+00	1.72E+01	2.62E+01	10	0.0212	122	1.00	2.59E+00	2.87E+01	120	240	0.2	0.1
Zinc	U03-31152	0.665	0.212	0.11	0.43	0.46	57	50.26	55.59	4.20E+00	4.58E+00	1.70E+01	2.58E+01	10	0.0212	113	1.00	2.40E+00	2.82E+01	120	240	0.2	0.1
Zinc	U03-31259	0.665	0.212	0.11	0.43	0.46	49	47.85	52.44	3.61E+00	4.36E+00	1.60E+01	2.40E+01	10	0.0212	77	1.00	1.63E+00	2.56E+01	120	240	0.2	0.1
Zinc	U03-31264	0.665	0.212	0.11	0.43	0.46	61	51.37	57.05	4.49E+00	4.68E+00	1.75E+01	2.66E+01	10	0.0212	134	1.00	2.84E+00	2.95E+01	120	240	0.2	0.1
Zinc	U03-31368	0.665	0.212	0.11	0.43	0.46	68	53.08	59.31	4.97E+00	4.84E+00	1.81E+01	2.80E+01	10	0.0212	173	1.00	3.67E+00	3.16E+01	120	240	0.3	0.1
Zinc	U03-31578	0.665	0.212	0.11	0.43	0.46	58	50.54	55.95	4.27E+00	4.61E+00	1.71E+01	2.60E+01	10	0.0212	118	1.00	2.50E+00	2.85E+01	120	240	0.2	0.1
Zinc	U03-61153	0.665	0.212	0.11	0.43	0.46	72	54.11	60.67	5.27E+00	4.93E+00	1.86E+01	2.88E+01	10	0.0212	201	1.00	4.26E+00	3.30E+01	120	240	0.3	0.1
Zinc	U03-61258	0.665	0.212	0.11	0.43	0.46	57	50.09	55.36	4.16E+00	4.57E+00	1.69E+01	2.57E+01	10	0.0212	110	1.00	2.33E+00	2.80E+01	120	240	0.2	0.1
Zinc	U03-61265	0.665	0.212	0.11	0.43	0.46	56	49.79	54.97	4.08E+00	4.54E+00	1.68E+01	2.54E+01	10	0.0212	105	1.00	2.23E+00	2.77E+01	120	240	0.2	0.1
Zinc	U03-61369	0.665	0.212	0.11	0.43	0.46	55	49.47	54.56	4.00E+00	4.51E+00	1.67E+01	2.52E+01	10	0.0212	99.9	1.00	2.12E+00	2.73E+01	120	240	0.2	0.1
Zinc	U03-61474	0.665	0.212	0.11	0.43	0.46	43	45.68	49.63	3.13E+00	4.16E+00	1.52E+01	2.25E+01	10	0.0212	53.6	1.00	1.14E+00	2.36E+01	120	240	0.2	0.1
Zinc	U03-61575	0.665	0.212	0.11	0.43	0.46	58	50.38	55.74	4.23E+00	4.59E+00	1.70E+01	2.59E+01	10	0.0212	115	1.00	2.44E+00	2.83E+01	120	240	0.2	0.1
Side Channel																							
Zinc	Geometric Mean	0.665	0.212	0.11	0.43	0.46	55	49.47	54.56	4.00E+00	4.51E+00	1.67E+01	2.52E+01	10	0.0212	99.9	1.00	2.12E+00	2.73E+01	120	240	0.2	0.1

Notes:

Calculation details are provided in Appendix A.

Tissue concentration models are provided in Appendix B.

*Data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009)

Side Channel soil data represent the geometric mean of Golder (2002).

BW - Body we BW - Body weight

DW - Dry weiç DW - Dry weight

kg/kg - kilogra kg/kg - kilograms per kilogram

mg/kg - milligi mg/kg - milligrams per kilogram

NOAEL - No-(NOAEL - No-Observed-Adverse-Effects-Level

LOAEL - Low LOAEL - Lowest-Observed-Adverse-Effects-Level

Hazard Quotient (HQ) greater than 1.0

Table 3.4-7
Hazard Quotient Calculations at Locations With Tissue Data
Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Cadmium	B45.8W	0.918	0.287	0	0.3	0.7	0.70	0.23	0.88	0.00E+00	1.98E-02	5.65E-01	5.85E-01	10	0.0287	3.0	1.00	8.47E-02	6.70E-01	1.7	24	0.4	0.03
Cadmium	B47.2E	0.918	0.287	0	0.3	0.7	0.50	0.17	0.22	0.00E+00	1.46E-02	1.41E-01	1.56E-01	10	0.0287	4.8	1.00	1.36E-01	2.92E-01	1.7	24	0.2	0.01
Cadmium	O43.5W	0.918	0.287	0	0.3	0.7	2.53	0.13	0.61	0.00E+00	1.12E-02	3.92E-01	4.03E-01	10	0.0287	4.7	1.00	1.35E-01	5.38E-01	1.7	24	0.3	0.02
Cadmium	O44.2E	0.918	0.287	0	0.3	0.7	0.74	0.10	0.81	0.00E+00	8.61E-03	5.21E-01	5.29E-01	10	0.0287	6.0	1.00	1.72E-01	7.01E-01	1.7	24	0.4	0.03
Cadmium	O48.8E	0.918	0.287	0	0.3	0.7	0.92	0.11	0.32	0.00E+00	9.47E-03	2.06E-01	2.15E-01	10	0.0287	4.6	1.00	1.32E-01	3.47E-01	1.7	24	0.2	0.01
Cadmium	ERA-29	0.918	0.287	0	0.3	0.7	0.69	1.16	1.90	0.00E+00	1.00E-01	1.22E+00	1.32E+00	10	0.0287	6.0	1.00	1.72E-01	1.49E+00	1.7	24	0.9	0.1
Lead	B45.8W	0.918	0.287	0	0.3	0.7	0.73	11.10	2.24	0.00E+00	9.56E-01	1.44E+00	2.40E+00	10	0.0287	145.5	0.25	1.04E+00	3.44E+00	4	9	0.9	0.4
Lead	B47.2E	0.918	0.287	0	0.3	0.7	1.38	3.02	1.85	0.00E+00	2.60E-01	1.19E+00	1.45E+00	10	0.0287	233.0	0.25	1.67E+00	3.12E+00	4	9	0.8	0.3
Lead	O43.5W	0.918	0.287	0	0.3	0.7	1.18	2.90	5.76	0.00E+00	2.50E-01	3.70E+00	3.95E+00	10	0.0287	571.0	0.25	4.10E+00	8.05E+00	4	9	2.0	0.9
Lead	O44.2E	0.918	0.287	0	0.3	0.7	3.41	5.87	2.57	0.00E+00	5.05E-01	1.65E+00	2.16E+00	10	0.0287	458.0	0.25	3.29E+00	5.44E+00	4	9	1.4	0.6
Lead	O48.8E	0.918	0.287	0	0.3	0.7	1.60	3.96	1.52	0.00E+00	3.41E-01	9.77E-01	1.32E+00	10	0.0287	312.0	0.25	2.24E+00	3.56E+00	4	9	0.9	0.4
Lead	ERA-29	0.918	0.287	0	0.3	0.7	1.60	7.09	0.84	0.00E+00	6.10E-01	5.40E-01	1.15E+00	10	0.0287	365.7	0.25	2.62E+00	3.77E+00	4	9	0.9	0.4
Zinc	B45.8W	0.918	0.287	0	0.3	0.7	101.00	77.00	94.30	0.00E+00	6.63E+00	6.06E+01	6.72E+01	10	0.0287	1340.0	1.00	3.85E+01	1.06E+02	10	210	10.6	0.5
Zinc	B47.2E	0.918	0.287	0	0.3	0.7	112.00	23.60	42.90	0.00E+00	2.03E+00	2.76E+01	2.96E+01	10	0.0287	2095.0	1.00	6.01E+01	8.97E+01	10	210	9.0	0.4
Zinc	O43.5W	0.918	0.287	0	0.3	0.7	98.00	68.00	102.00	0.00E+00	5.85E+00	6.55E+01	7.14E+01	10	0.0287	2040.0	1.00	5.85E+01	1.30E+02	10	210	13.0	0.6
Zinc	O44.2E	0.918	0.287	0	0.3	0.7	152.00	28.70	90.40	0.00E+00	2.47E+00	5.81E+01	6.06E+01	10	0.0287	2500.0	1.00	7.18E+01	1.32E+02	10	210	13.2	0.6
Zinc	O48.8E	0.918	0.287	0	0.3	0.7	123.00	24.20	85.00	0.00E+00	2.08E+00	5.46E+01	5.67E+01	10	0.0287	1930.0	1.00	5.54E+01	1.12E+02	10	210	11.2	0.5
Zinc	ERA-29	0.918	0.287	0	0.3	0.7	250.80	216.20	83.80	0.00E+00	1.86E+01	5.38E+01	7.25E+01	10	0.0287	2240.0	1.00	6.43E+01	1.37E+02	10	210	13.7	0.7
Physical Reach 2																							
Cadmium	ERA-32*	0.918	0.287	0	0.3	0.7	1.70	1.47	0.49	0.00E+00	1.26E-01	3.15E-01	4.41E-01	10	0.0287	2.7	1.00	7.84E-02	5.20E-01	1.7	24	0.3	0.02
Lead	ERA-32*	0.918	0.287	0	0.3	0.7	40.60	17.17	4.60	0.00E+00	1.48E+00	2.96E+00	4.43E+00	10	0.0287	1890.0	0.25	1.36E+01	1.80E+01	4	9	4.5	2.0
Zinc	ERA-32*	0.918	0.287	0	0.3	0.7	446.00	250.67	89.60	0.00E+00	2.16E+01	5.76E+01	7.92E+01	10	0.0287	1160.0	1.00	3.33E+01	1.12E+02	10	210	11.2	0.5
Physical Reach 3																							
Cadmium	ERA-22	0.918	0.287	0	0.3	0.7	0.85	1.05	0.29	0.00E+00	9.01E-02	1.86E-01	2.76E-01	10	0.0287	4.9	1.00	1.42E-01	4.18E-01	1.7	24	0.2	0.02
Cadmium	ERA-28	0.918	0.287	0	0.3	0.7	0.87	0.18	0.24	0.00E+00	1.58E-02	1.54E-01	1.70E-01	10	0.0287	3.5	1.00	9.95E-02	2.70E-01	1.7	24	0.2	0.01
Lead	ERA-22	0.918	0.287	0	0.3	0.7	3.40	1.15	0.76	0.00E+00	9.87E-02	4.88E-01	5.87E-01	10	0.0287	161.3	0.25	1.16E+00	1.74E+00	4	9	0.4	0.2
Lead	ERA-28	0.918	0.287	0	0.3	0.7	9.50	4.17	0.34	0.00E+00	3.59E-01	2.18E-01	5.77E-01	10	0.0287	223.0	0.25	1.60E+00	2.18E+00	4	9	0.5	0.2
Zinc	ERA-22	0.918	0.287	0	0.3	0.7	258.00	77.90	74.50	0.00E+00	6.71E+00	4.79E+01	5.46E+01	10	0.0287	1520.0	1.00	4.36E+01	9.82E+01	10	210	9.8	0.5
Zinc	ERA-28	0.918	0.287	0	0.3	0.7	254.00	85.37	98.70	0.00E+00	7.35E+00	6.34E+01	7.08E+01	10	0.0287	1181.7	1.00	3.39E+01	1.05E+02	10	210	10.5	0.5
Physical Reach 8																							
Cadmium	ERA-27	0.918	0.287	0	0.3	0.7	0.22	0.16	0.08	0.00E+00	1.38E-02	5.14E-02	6.52E-02	10	0.0287	0.7	1.00	2.02E-02	8.54E-02	1.7	24	0.1	0.004
Lead	ERA-27	0.918	0.287	0	0.3	0.7	1.97	1.70	0.12	0.00E+00	1.46E-01	7.71E-02	2.23E-01	10	0.0287	34.6	0.25	2.48E-01	4.72E-01	4	9	0.1	0.1
Zinc	ERA-27	0.918	0.287	0	0.3	0.7	59.70	61.03	41.00	0.00E+00	5.25E+00	2.63E+01	3.16E+01	10	0.0287	107.9	1.00	3.10E+00	3.47E+01	10	210	3.5	0.2
Side Channel Area																							
Cadmium	SC-1	0.918	0.287	0	0.3	0.7	0.98	*0.98*	0.11	0.00E+00	8.44E-02	7.07E-02	1.55E-01	10	0.0287	0.2	1.00	5.91E-03	1.61E-01	1.7	24	0.1	0.01
Cadmium	SC-2	0.918	0.287	0	0.3	0.7	1.95	*1.95*	0.20	0.00E+00	1.68E-01	1.29E-01	2.96E-01	10	0.0287	0.2	1.00	5.91E-03	3.02E-01	1.7	24	0.2	0.01
Cadmium	SC-3	0.918	0.287	0	0.3	0.7	3.18	*3.18*	0.11	0.00E+00	2.74E-01	7.07E-02	3.44E-01	10	0.0287	0.2	1.00	5.91E-03	3.50E-01	1.7	24	0.2	0.01
Cadmium	ERA-31	0.918	0.287	0	0.3	0.7	0.09	*0.08*	0.12	0.00E+00	6.60E-03	7.71E-02	8.37E-02	10	0.0287	0.9	1.00	2.46E-02	1.08E-01	1.7	24	0.1	0.005
Lead	SC-1	0.918	0.287	0	0.3	0.7	0.86	*0.86*	0.60	0.00E+00	7.40E-02	3.86E-01	4.60E-01	10	0.0287	23.6	0.25	1.69E-01	6.29E-01	4	9	0.2	0.07
Lead	SC-2	0.918	0.287	0	0.3	0.7	1.57	*1.57*	0.05	0.00E+00	1.35E-01	3.21E-02	1.67E-01	10	0.0287	23.6	0.25	1.69E-01	3.36E-01	4	9	0.1	0.04
Lead	SC-3	0.918	0.287	0	0.3	0.7	5.68	*5.68*	0.30	0.00E+00	4.89E-01	1.93E-01	6.82E-01	10	0.0287	23.6	0.25	1.69E-01	8.51E-01	4	9	0.2	0.09
Lead	ERA-31	0.918	0.287	0	0.3	0.7	0.93	*0.87*	0.19	0.00E+00	7.48E-02	1.22E-01	1.97E-01	10	0.0287	11.7	0.25	8.38E-02	2.81E-01	4	9	0.1	0.03
Zinc	SC-1	0.918	0.287	0	0.3	0.7	65.00	*65.00*	42.40	0.00E+00	5.60E+00	2.72E+01	3.28E+01	10	0.0287	94.2	1.00	2.70E+00	3.55E+01	10	210	3.6	0.2
Zinc	SC-2	0.918	0.287	0	0.3	0.7	90.00	*90.00*	58.20	0.00E+00	7.75E+00	3.74E+01	4.51E+01	10	0.0287	94.2	1.00	2.70E+00	4.79E+01	10	210	4.8	0.2
Zinc	SC-3	0.918	0.287	0	0.3	0.7	123.00	*123.00*	40.70	0.00E+00	1.06E+01	2.62E+01	3.67E+01	10	0.0287	94.2	1.00	2.70E+00	3.94E+01	10	210	3.9	0.2
Zinc	ERA-31	0.918	0.287	0	0.3	0.7	21.20	38.97	42.40	0.00E+00	3.36E+00	2.72E+01	3.06E+01	10	0.0287	37.9	1.00	1.09E+00	3.17E+01	10	210	3.2	0.2
Lower Whitewater Creek																							
Cadmium	LW-03-A	0.918	0.287	0	0.3	0.7	0.12	*0.12*	0.30	0.00E+00	1.03E-02	1.93E-01	2.03E-01	10	0.0287	0.84	1.00	2.41E-02	2.27E-01	1.7	24	0.1	0.01
Cadmium	LW-03E-A	0.918	0.287	0	0.3	0.7	0.56	*0.56*	0.17	0.00E+00	4.82E-02	1.09E-01	1.57E-01	10	0.0287	0.84	1.00	2.41E-02	1.82E-01	1.7	24	0.1	0.01
Cadmium	LW-04-A	0.918	0.287	0	0.3	0.7	0.31	*0.31*	0.09	0.00E+00	2.67E-02	5.78E-02	8.45E-02	10	0.0287	0.3	1.00	9.61E-03	9.41E-02	1.7	24	0.1	0.004
Cadmium	LW-05-A	0.918	0.287	0	0.3	0.7	0.03	*0.03*	N/A	0.00E+00	2.15E-03	N/A	2.15E-03	10	0.0287	0.3	1.00	9.61E-03	1.18E-02	1.7	24	0.01	0.0005
Cadmium	LW-06-A	0.918	0.287	0	0.3	0.7	0.10	*0.10*	0.15	0.00E+00	8.61E-03	9.64E-02	1.05E-01	10	0.0287	0.4	1.00	1.12E-02	1.16E-01	1.7	24	0.1	0.005
Cadmium	LW-07-A	0.918	0.287	0	0.3	0.7	0.39	*0.39*	1.20	0.00E+00	3.36E-02	7.71E-01	8.05E-01	10	0.0287	0.5	1.00	1.32E-02	8.18E-01	1.7	24	0.5	0.03

Table 3.4-7
Hazard Quotient Calculations at Locations With Tissue Data
Small Ground-Feeding Bird
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentration (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (0%)	Seed (30%)	Invertebrate (70%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Lead	LW-03-A	0.918	0.287	0	0.3	0.7	0.24	*0.24*	2.19	0.00E+00	2.07E-02	1.41E+00	1.43E+00	10	0.0287	31.2	0.25	2.24E-01	1.65E+00	4	9	0.4	0.2
Lead	LW-03E-A	0.918	0.287	0	0.3	0.7	0.67	*0.67*	0.42	0.00E+00	5.77E-02	2.70E-01	3.28E-01	10	0.0287	31.2	0.25	2.24E-01	5.52E-01	4	9	0.1	0.06
Lead	LW-04-A	0.918	0.287	0	0.3	0.7	0.06	*0.06*	0.47	0.00E+00	4.99E-03	3.02E-01	3.07E-01	10	0.0287	35.3	0.25	2.53E-01	5.60E-01	4	9	0.1	0.06
Lead	LW-05-A	0.918	0.287	0	0.3	0.7	0.06	*0.06*	N/A	0.00E+00	5.17E-03	N/A	5.17E-03	10	0.0287	35.3	0.25	2.53E-01	2.58E-01	4	9	0.1	0.03
Lead	LW-06-A	0.918	0.287	0	0.3	0.7	0.03	*0.03*	0.01	0.00E+00	2.15E-03	6.43E-03	8.58E-03	10	0.0287	30.2	0.25	2.16E-01	2.25E-01	4	9	0.1	0.02
Lead	LW-07-A	0.918	0.287	0	0.3	0.7	0.25	*0.25*	2.83	0.00E+00	2.15E-02	1.82E+00	1.84E+00	10	0.0287	52.9	0.25	3.80E-01	2.22E+00	4	9	0.6	0.2
Zinc	LW-03-A	0.918	0.287	0	0.3	0.7	56.00	*56.00*	125.00	0.00E+00	4.82E+00	8.03E+01	8.51E+01	10	0.0287	131.4	1.00	3.77E+00	8.89E+01	10	210	8.9	0.4
Zinc	LW-03E-A	0.918	0.287	0	0.3	0.7	77.00	*77.00*	114.00	0.00E+00	6.63E+00	7.33E+01	7.99E+01	10	0.0287	141.4	1.00	4.06E+00	8.39E+01	10	210	8.4	0.4
Zinc	LW-04-A	0.918	0.287	0	0.3	0.7	89.00	*89.00*	55.50	0.00E+00	7.66E+00	3.57E+01	4.33E+01	10	0.0287	119.5	1.00	3.43E+00	4.68E+01	10	210	4.7	0.2
Zinc	LW-05-A	0.918	0.287	0	0.3	0.7	18.00	*18.00*	N/A	0.00E+00	1.55E+00	N/A	1.55E+00	10	0.0287	119.5	1.00	3.43E+00	4.98E+00	10	210	0.5	0.02
Zinc	LW-06-A	0.918	0.287	0	0.3	0.7	31.00	*31.00*	73.20	0.00E+00	2.67E+00	4.70E+01	4.97E+01	10	0.0287	116.5	1.00	3.34E+00	5.31E+01	10	210	5.3	0.3
Zinc	LW-07-A	0.918	0.287	0	0.3	0.7	81.00	*81.00*	86.10	0.00E+00	6.97E+00	5.53E+01	6.23E+01	10	0.0287	157.0	1.00	4.51E+00	6.68E+01	10	210	6.7	0.3
Bayard Canyon																							
Cadmium	ERA-33	0.918	0.287	0	0.3	0.7	0.21	*0.24*	0.17	0.00E+00	2.07E-02	1.09E-01	1.30E-01	10	0.0287	1.3	1.00	3.72E-02	1.67E-01	1.7	24	0.1	0.01
Lead	ERA-33	0.918	0.287	0	0.3	0.7	14.70	*15.33*	1.90	0.00E+00	1.32E+00	1.22E+00	2.54E+00	10	0.0287	551.3	0.25	3.96E+00	6.50E+00	4	9	1.6	0.7
Zinc	ERA-33	0.918	0.918	0	0.3	0.7	0.70	*108.63*	58.00	0.00E+00	2.99E+01	3.73E+01	6.72E+01	10	0.0918	242.7	1.00	2.23E+01	8.95E+01	10	210	8.9	0.4

Notes:

N/A: Not analyzed.

Italicized: Concentrations found in foliage were used as seed tissue concentrations.

Invertebrate exposure calculated using fresh weight ingestion rate because invertebrate tissue data were reported in fresh weight in the BERA.

Seed and soil exposure calculated using dry weight ingestion rate since data were reported in dry weight in the BERA.

Hazard Quotient (HQ) greater than 1.0

* Soil data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009). No post-remediation tissue data were available. Conclusions for ERA-32 may no longer be relevant due to the remediation of the area.

Table 3.4-8
Hazard Quotient Calculations at Locations With Tissue Data
Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentation (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (11%)	Seed (43%)	Invertebrate (46%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Physical Reach 1																							
Cadmium	B45.8W	0.665	0.212	0.11	0.43	0.46	0.7	0.2	0.9	1.63E-02	2.10E-02	2.69E-01	3.06E-01	2	0.00424	3.0	1	1.25E-02	3.19E-01	2.5	5	0.1	0.06
Cadmium	B47.2E	0.665	0.212	0.11	0.43	0.46	0.5	0.2	0.2	1.17E-02	4.86E-02	6.73E-02	1.28E-01	2	0.00424	4.8	1	2.01E-02	1.48E-01	2.5	5	0.06	0.03
Cadmium	O43.5W	0.665	0.212	0.11	0.43	0.46	2.5	0.1	0.6	5.90E-02	1.19E-02	1.87E-01	2.57E-01	2	0.00424	4.7	1	1.99E-02	2.77E-01	2.5	5	0.1	0.06
Cadmium	O44.2E	0.665	0.212	0.11	0.43	0.46	0.7	0.1	0.8	1.73E-02	9.12E-03	2.48E-01	2.74E-01	2	0.00424	6.0	1	2.54E-02	3.00E-01	2.5	5	0.1	0.06
Cadmium	O48.8E	0.665	0.212	0.11	0.43	0.46	0.9	0.1	0.3	2.15E-02	1.00E-02	9.79E-02	1.29E-01	2	0.00424	4.6	1	1.95E-02	1.49E-01	2.5	5	0.06	0.03
Cadmium	ERA-29	0.665	0.212	0.11	0.43	0.46	0.7	1.2	1.9	1.61E-02	1.06E-01	5.81E-01	7.03E-01	2	0.00424	6.0	1	2.54E-02	7.29E-01	2.5	5	0.3	0.1
Lead	B45.8W	0.665	0.212	0.11	0.43	0.46	0.73	11.1	2.2	1.70E-02	1.01E+00	6.85E-01	1.71E+00	2	0.00424	145.5	0.25	1.54E-01	1.87E+00	80	800	0.02	0.002
Lead	B47.2E	0.665	0.212	0.11	0.43	0.46	1.4	3.02	1.9	3.22E-02	2.75E-01	5.66E-01	8.73E-01	2	0.00424	233.0	0.25	2.47E-01	1.12E+00	80	800	0.01	0.001
Lead	O43.5W	0.665	0.212	0.11	0.43	0.46	1.2	2.9	5.8	2.75E-02	2.64E-01	1.76E+00	2.05E+00	2	0.00424	571.0	0.25	6.05E-01	2.66E+00	80	800	0.03	0.003
Lead	O44.2E	0.665	0.212	0.11	0.43	0.46	3.4	5.9	2.6	7.95E-02	5.35E-01	7.86E-01	1.40E+00	2	0.00424	458.0	0.25	4.85E-01	1.89E+00	80	800	0.02	0.002
Lead	O48.8E	0.665	0.212	0.11	0.43	0.46	1.6	4	1.5	3.73E-02	3.61E-01	4.65E-01	8.63E-01	2	0.00424	312.0	0.25	3.31E-01	1.19E+00	80	800	0.01	0.001
Lead	ERA-29	0.665	0.212	0.11	0.43	0.46	1.6	7.1	0.8	3.73E-02	6.46E-01	2.57E-01	9.40E-01	2	0.00424	365.7	0.25	3.88E-01	1.33E+00	80	800	0.02	0.002
Zinc	B45.8W	0.665	0.212	0.11	0.43	0.46	101	77	94.3	2.36E+00	7.02E+00	2.88E+01	3.82E+01	2	0.00424	1340.0	1	5.68E+00	4.39E+01	120	240	0.4	0.2
Zinc	B47.2E	0.665	0.212	0.11	0.43	0.46	112	23.6	42.9	2.61E+00	2.15E+00	1.31E+01	1.79E+01	2	0.00424	2095.0	1	8.88E+00	2.68E+01	120	240	0.2	0.1
Zinc	O43.5W	0.665	0.212	0.11	0.43	0.46	98	68	102	2.29E+00	6.20E+00	3.12E+01	3.97E+01	2	0.00424	2040.0	1	8.65E+00	4.83E+01	120	240	0.4	0.2
Zinc	O44.2E	0.665	0.212	0.11	0.43	0.46	152	28.7	90.4	3.54E+00	2.62E+00	2.77E+01	3.38E+01	2	0.00424	2500.0	1	1.06E+01	4.44E+01	120	240	0.4	0.2
Zinc	O48.8E	0.665	0.212	0.11	0.43	0.46	123	24.2	85	2.87E+00	2.21E+00	2.60E+01	3.11E+01	2	0.00424	1930.0	1	8.18E+00	3.93E+01	120	240	0.3	0.2
Zinc	ERA-29	0.665	0.212	0.11	0.43	0.46	250.8	216.2	83.8	5.85E+00	1.97E+01	2.56E+01	5.12E+01	2	0.00424	2240.0	1	9.50E+00	6.07E+01	120	240	0.5	0.3
Physical Reach 2																							
Cadmium	ERA-32*	0.665	0.212	0.11	0.43	0.46	1.7	1.5	0.5	3.96E-02	1.34E-01	1.50E-01	3.23E-01	2	0.00424	2.7	1	1.16E-02	3.35E-01	2.5	5	0.1	0.07
Lead	ERA-32*	0.665	0.212	0.11	0.43	0.46	40.6	17.2	4.6	9.47E-01	1.56E+00	1.41E+00	3.92E+00	2	0.00424	1890	0.25	2.00E+00	5.92E+00	80	800	0.1	0.01
Zinc	ERA-32*	0.665	0.212	0.11	0.43	0.46	446	250.7	89.6	1.04E+01	2.29E+01	2.74E+01	6.07E+01	2	0.00424	1160.0	1	4.92E+00	6.56E+01	120	240	0.5	0.3
Physical Reach 3																							
Cadmium	ERA-22	0.665	0.212	0.11	0.43	0.46	0.9	1.0	0.3	1.98E-02	9.54E-02	8.87E-02	2.04E-01	2	0.00424	4.9	1	2.09E-02	2.25E-01	2.5	5	0.1	0.04
Cadmium	ERA-28	0.665	0.212	0.11	0.43	0.46	0.9	0.2	0.2	2.03E-02	1.67E-02	7.34E-02	1.10E-01	2	0.00424	3.5	1	1.47E-02	1.25E-01	2.5	5	0.05	0.03
Lead	ERA-22	0.665	0.212	0.11	0.43	0.46	3.4	1.1	0.8	7.93E-02	1.05E-01	2.32E-01	4.16E-01	2	0.00424	161.3	0.25	1.71E-01	5.87E-01	80	800	0.01	0.001
Lead	ERA-28	0.665	0.212	0.11	0.43	0.46	9.5	4.2	0.3	2.22E-01	3.80E-01	1.04E-01	7.05E-01	2	0.00424	223	0.25	2.36E-01	9.42E-01	80	800	0.01	0.001
Zinc	ERA-22	0.665	0.212	0.11	0.43	0.46	258	77.9	74.5	6.02E+00	7.10E+00	2.28E+01	3.59E+01	2	0.00424	1520	1	6.44E+00	4.24E+01	120	240	0.4	0.2
Zinc	ERA-28	0.665	0.212	0.11	0.43	0.46	254	85.4	98.7	5.92E+00	7.78E+00	3.02E+01	4.39E+01	2	0.00424	1181.7	1	5.01E+00	4.89E+01	120	240	0.4	0.2
Physical Reach 8																							
Cadmium	ERA-27	0.665	0.212	0.11	0.43	0.46	0.2	0.2	0.1	5.13E-03	1.46E-02	2.45E-02	4.42E-02	2	0.00424	0.7	1	2.98E-03	4.72E-02	2.5	5	0.02	0.009
Lead	ERA-27	0.665	0.212	0.11	0.43	0.46	2.0	1.7	0.1	4.59E-02	1.55E-01	3.67E-02	2.38E-01	2	0.00424	34.6	0.25	3.67E-02	2.74E-01	80	800	0.003	0.0003
Zinc	ERA-27	0.665	0.212	0.11	0.43	0.46	59.7	61.0	41.0	1.39E+00	5.56E+00	1.25E+01	1.95E+01	2	0.00424	107.9	1	4.57E-01	2.00E+01	120	240	0.2	0.1
Side Channel Area																							
Cadmium	SC-1	0.665	0.212	0.11	0.43	0.46	1.0	*1.0*	0.1	2.29E-02	8.93E-02	3.36E-02	1.46E-01	2	0.00424	0.2	1	8.73E-04	1.47E-01	2.5	5	0.1	0.03
Cadmium	SC-2	0.665	0.212	0.11	0.43	0.46	2.0	*2.0*	0.2	4.55E-02	1.78E-01	6.12E-02	2.84E-01	2	0.00424	0.2	1	8.73E-04	2.85E-01	2.5	5	0.1	0.06
Cadmium	SC-3	0.665	0.212	0.11	0.43	0.46	3.2	*3.2*	0.1	7.42E-02	2.90E-01	3.36E-02	3.98E-01	2	0.00424	0.2	1	8.73E-04	3.99E-01	2.5	5	0.2	0.08
Cadmium	ERA-31	0.665	0.212	0.11	0.43	0.46	0.1	0.1	0.1	2.10E-03	6.99E-03	3.67E-02	4.58E-02	2	0.00424	0.9	1	3.63E-03	4.94E-02	2.5	5	0.02	0.01
Lead	SC-1	0.665	0.212	0.11	0.43	0.46	0.9	*0.9*	0.6	2.01E-02	7.84E-02	1.84E-01	2.82E-01	2	0.00424	23.6	0.25	2.50E-02	3.07E-01	80	800	0.004	0.0004
Lead	SC-2	0.665	0.212	0.11	0.43	0.46	1.6	*1.6*	0.1	3.66E-02	1.43E-01	1.53E-02	1.95E-01	2	0.00424	23.6	0.25	2.50E-02	2.20E-01	80	800	0.003	0.0003
Lead	SC-3	0.665	0.212	0.11	0.43	0.46	5.7	*5.7*	0.3	1.32E-01	5.18E-01	9.18E-02	7.42E-01	2	0.00424	23.6	0.25	2.50E-02	7.67E-01	80	800	0.01	0.001
Lead	ERA-31	0.665	0.212	0.11	0.43	0.46	0.9	0.9	0.2	2.17E-02	7.92E-02	5.81E-02	1.59E-01	2	0.00424	11.7	0.25	1.24E-02	1.71E-01	80	800	0.002	0.0002
Zinc	SC-1	0.665	0.212	0.11	0.43	0.46	65	*65*	42.4	1.52E+00	5.93E+00	1.30E+01	2.04E+01	2	0.00424	94.2	1	3.99E-01	2.08E+01	120	240	0.2	0.1
Zinc	SC-2	0.665	0.212	0.11	0.43	0.46	90	*90*	58.2	2.10E+00	8.20E+00	1.78E+01	2.81E+01	2	0.00424	94.2	1	3.99E-01	2.85E+01	120	240	0.2	0.1
Zinc	SC-3	0.665	0.212	0.11	0.43	0.46	123	*123*	40.7	2.87E+00	1.12E+01	1.25E+01	2.65E+01	2	0.00424	94.2	1	3.99E-01	2.69E+01	120	240	0.2	0.1
Zinc	ERA-31	0.665	0.212	0.11	0.43	0.46	21.2	39.0	42.4	4.94E-01	3.55E+00	1.30E+01	1.70E+01	2	0.00424	37.9	1	1.61E-01	1.72E+01	120	240	0.1	0.1
Lower Whitewater Creek																							
Cadmium	LW-03-A	0.665	0.212	0.11	0.43	0.46	0.1	*0.1*	0.3	2.80E-03	1.09E-02	9.18E-02	1.06E-01	2	0.00424	0.84	1	3.56E-03	1.09E-01	2.5	5	0.04	0.02
Cadmium	LW-03E-A	0.665	0.212	0.11	0.43	0.46	0.6	*0.6*	0.2	1.31E-02	5.10E-02	5.20E-02	1.16E-01	2	0.00424	0.84	1	3.56E-03	1.20E-01	2.5	5	0.05	0.02
Cadmium	LW-04-A	0.665	0.212	0.11	0.43	0.46	0.3	*0.3*	0.1	7.23E-03	2.83E-02	2.75E-02	6.30E-02	2	0.00424	0.3	1	1.42E-03	6.44E-02	2.5	5	0.03	0.01
Cadmium	LW-05-A	0.665	0.212	0.11	0.43	0.46	0.03	*0.03*	N/A	5.83E-04	2.28E-03	N/A	2.86E-03	2	0.00424	0.3	1	1.42E-03	4.28E-03	2.5	5	0.002	0.001
Cadmium	LW-06-A	0.665	0.212	0.11	0.43	0.46	0.1	*0.1*	0.2	2.33E-03	9.12E-03	4.59E-02	5.73E-02	2	0.00424	0.4	1	1.65E-03	5.90E-02	2.5	5	0.02	0.01
Cadmium	LW-07-A	0.665	0.212	0.11	0.43	0.46	0.4	*0.4*	1.2	9.09E-03	3.56E-02	3.67E-01	4.12E-01	2	0.00424	0.5	1	1.95E-03	4.14E-01	2.5	5	0.2	0.1

Table 3.4-8
Hazard Quotient Calculations at Locations With Tissue Data
Small Mammal
H/WCIU ERA

Analyte	Location	Ingestion Rate Food (WW kg/kg BW/day)	Ingestion Rate Food (DW kg/kg BW/day)	Diet Composition			Tissue Concentation (mg/kg)			Food Exposure (mg/kg/day)				Percent of Diet as Soil	Ingestion Rate Soil (DW kg/kg BW/day)	Soil Concentration (mg/kg)	Bioavailability Factor	Soil Exposure	Total Dose	Toxicity Reference Value		Hazard Quotient	
				Foliage (11%)	Seed (43%)	Invertebrate (46%)	Foliage	Seed	Invertebrate	Foliage	Seed	Invertebrate	Total							NOAEL	LOAEL	NOAEL	LOAEL
Lead	LW-03-A	0.665	0.212	0.11	0.43	0.46	0.2	*0.2*	2.2	5.60E-03	2.19E-02	6.70E-01	6.97E-01	2	0.00424	31.2	0.25	3.31E-02	7.31E-01	80	800	0.01	0.001
Lead	LW-03E-A	0.665	0.212	0.11	0.43	0.46	0.7	*0.7*	0.4	1.56E-02	6.11E-02	1.28E-01	2.05E-01	2	0.00424	31.2	0.25	3.31E-02	2.38E-01	80	800	0.003	0.0003
Lead	LW-04-A	0.665	0.212	0.11	0.43	0.46	0.1	*0.1*	0.5	1.35E-03	5.29E-03	1.44E-01	1.50E-01	2	0.00424	35.3	0.25	3.74E-02	1.88E-01	80	800	0.002	0.0002
Lead	LW-05-A	0.665	0.212	0.11	0.43	0.46	0.1	*0.1*	N/A	1.40E-03	5.47E-03	N/A	N/A	2	0.00424	35.3	0.25	3.74E-02	N/A	80	800	N/A	N/A
Lead	LW-06-A	0.665	0.212	0.11	0.43	0.46	0.03	*0.03*	0.01	5.83E-04	2.28E-03	3.06E-03	5.92E-03	2	0.00424	30.2	0.25	3.20E-02	3.79E-02	80	800	0.0005	0.00005
Lead	LW-07-A	0.665	0.212	0.11	0.43	0.46	0.25	*0.25*	2.83	5.83E-03	2.28E-02	8.66E-01	8.94E-01	2	0.00424	52.9	0.25	5.61E-02	9.50E-01	80	800	0.01	0.001
Zinc	LW-03-A	0.665	0.212	0.11	0.43	0.46	56	*56*	125	1.31E+00	5.10E+00	3.82E+01	4.46E+01	2	0.00424	131.4	1	5.57E-01	4.52E+01	120	240	0.4	0.2
Zinc	LW-03E-A	0.665	0.212	0.11	0.43	0.46	77	*77*	114	1.80E+00	7.02E+00	3.49E+01	4.37E+01	2	0.00424	141.4	1	6.00E-01	4.43E+01	120	240	0.4	0.2
Zinc	LW-04-A	0.665	0.212	0.11	0.43	0.46	89	*89*	55.5	2.08E+00	8.11E+00	1.70E+01	2.72E+01	2	0.00424	119.5	1	5.07E-01	2.77E+01	120	240	0.2	0.12
Zinc	LW-05-A	0.665	0.212	0.11	0.43	0.46	18	*18*	N/A	4.20E-01	1.64E+00	N/A	N/A	2	0.00424	119.5	1	5.07E-01	N/A	120	240	N/A	N/A
Zinc	LW-06-A	0.665	0.212	0.11	0.43	0.46	31	*31*	73.2	7.23E-01	2.83E+00	2.24E+01	2.59E+01	2	0.00424	116.5	1	4.94E-01	2.64E+01	120	240	0.2	0.1
Zinc	LW-07-A	0.665	0.212	0.11	0.43	0.46	81	*81*	86.1	1.89E+00	7.38E+00	2.63E+01	3.56E+01	2	0.00424	157.0	1	6.66E-01	3.63E+01	120	240	0.3	0.2
Bayard Canyon																							
Cadmium	ERA-33	0.665	0.212	0.11	0.43	0.46	0.2	0.2	0.2	4.90E-03	2.19E-02	5.20E-02	7.88E-02	2	0.00424	1.3	1	5.50E-03	8.43E-02	2.5	5	0.03	0.02
Lead	ERA-33	0.665	0.212	0.11	0.43	0.46	14.7	15.3	1.9	3.43E-01	1.40E+00	5.81E-01	2.32E+00	2	0.00424	551.3	0.25	5.84E-01	2.91E+00	80	800	0.04	0.004
Zinc	ERA-33	0.665	0.212	0.11	0.43	0.46	152.0	108.6	58	3.54E+00	9.90E+00	1.77E+01	3.12E+01	2	0.00424	242.7	1	1.03E+00	3.22E+01	120	240	0.3	0.1

Notes:

N/A: Not analyzed.

Italicized: Concentrations found in foliage were used as seed tissue concentrations.

Hazard Quotient (HQ) greater than 1.0

* Soil data from sampling location ERA-32 (Physical Reach 2) were replaced by the 95% UCL of post-removal composite samples (Golder 2009). No post-remediation tissue data were available. Conclusions for ERA-32 may no longer be relevant due to the remediation of the area.

Table 4.1-1
Comparison of Summer Rainfall Pool Data to Amphibian TRVs and NMWQCs
H/WCIU ERA

Parameter	HC-51.6	U02-9100	WWC-38.1	U03-9200	U03-9000	Lucky Bill U/S No.5	Lucky Bill At No.5	Lucky Bill Mouth	Bayard/LB Con	Bayard Canyon D/S	Bayard Canyon U/S	Bayard Canyon MID	U03-9001	U03-9002	BFT-1	BC-1	U03-9300	WWC-29.7	U03-9302	WWC-28.6
Year	**2006**	**1999**	**2006**	**1999**	**1999**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**2007**	**1999**	**1999**	**2006**	**2007**	**1999**	**2006**	**1999**	**2006**
Hardness (Calculated - mg/L)	**1,450**	**1,740**	**1,600**	**1,314**	**86**	**126**	**158**	**180**	**172**	**155**	**179**	**143**	**168.4**	**35.9**	**22.9**	**169**	**75.7**	**515**	**740.7**	**1460**
Cadmium																				
Concentration (dissolved)	0.0043	0.013	0.01	0.007	N/D	N/D	0.0002	0.0001	0.0004	0.003	0.004	0.003	0.0044	N/D	N/D	0.001	0.000	0.0013	0.013	0.009
Amphibian (1)	**0.004**	**0.004**	**0.004**	**0.004**	0.004	0.004	0.004	0.004	0.004	0.004	**0.004**	0.004	**0.004**	0.004	0.004	0.004	0.004	0.004	**0.004**	**0.004**
Leopard Frog NOEC (1a)	0.111	0.111	0.111	0.111	0.034	0.046	0.055	0.06	0.058	0.054	0.06	0.051	0.057	0.0181	0.012	0.058	0.031	0.111	0.111	0.111
Leopard Frog LOAEC (1b)	0.311	0.311	0.311	0.311	0.096	0.128	0.153	0.169	0.163	0.151	0.168	0.142	0.16	0.049	0.035	0.161	0.087	0.311	0.311	0.311
Acute Criteria (2)	0.033	0.033	0.033	0.033	0.010	0.013	0.016	0.018	0.017	0.016	0.018	0.015	0.017	0.005	0.003	0.017	0.009	0.033	0.033	0.033
Chronic Criteria (2)	0.012	**0.012**	0.012	0.012	**0.005**	**0.006**	0.007	0.008	0.007	0.007	0.008	0.007	0.007	**0.003**	**0.002**	0.007	0.005	0.012	**0.012**	0.012
NMAC Acute Criteria (3)	0.0054	**0.0054**	**0.0054**	**0.0054**	**0.0015**	**0.0020**	0.0024	0.0027	0.0026	**0.0024**	**0.0027**	**0.0022**	**0.0026**	**0.0007**	**0.0005**	0.0026	0.0013	0.0054	**0.0054**	**0.0054**
NAMC Chronic Criteria (3)	**0.0013**	**0.0013**	**0.0013**	**0.0013**	**0.0004**	**0.0006**	0.0007	0.0007	0.0007	**0.0006**	**0.0007**	**0.0006**	**0.0007**	**0.0002**	**0.0002**	0.0007	0.0004	**0.0013**	**0.0013**	**0.0013**
Chromium																				
Concentration (dissolved)	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Amphibian (1)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Acute Criteria (3)	1.77	1.77	1.77	1.77	0.50	0.83	0.69	0.92	0.89	0.82	0.92	0.76	0.87	0.25	0.17	0.88	0.5	2.2	1.77	1.77
Chronic Criteria (3)	0.23	0.23	0.23	0.23	0.07	0.11	0.09	0.12	0.12	0.11	0.12	0.10	0.11	0.03	0.02	0.11	0.06	0.28	0.23	0.23
Copper																				
Concentration (dissolved)	0.01	0.014	0.21	0.01	0.009	0.002	0.003	0.002	0.004	0.03	0.03	0.03	0.05	0.02	0.02	0.03	0.05	0.31	0.84	0.14
Amphibian (1)	0.02	0.02	**0.02**	0.02	0.02	0.02	0.02	0.02	0.02	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
Leopard Frog NOEC (1a)	0.03	0.03	**0.03**	0.03	**0.01**	0.01	0.01	0.02	0.01	**0.01**	**0.02**	**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**	**0.03**	**0.03**	**0.03**
Leopard Frog LOAEC (1b)	0.13	0.13	**0.13**	0.13	0.03	0.05	0.06	0.07	0.06	0.06	0.06	0.05	0.06	**0.02**	**0.01**	0.06	**0.03**	**0.13**	**0.13**	**0.13**
Leopard Frog LC100 (1c)	0.53	0.53	0.53	0.53	0.14	0.17	0.24	0.27	0.26	0.24	0.27	0.22	0.26	0..063	0.05	0.25	0.13	0.53	**0.53**	0.53
Acute Criteria (2)	0.065	0.065	**0.065**	0.065	0.014	0.021	0.026	0.030	0.029	**0.026**	**0.030**	**0.024**	**0.028**	**0.006**	**0.004**	**0.028**	**0.013**	**0.065**	**0.065**	**0.065**
Chronic Criteria (2)	0.020	0.020	**0.020**	0.020	**0.008**	0.010	0.012	0.012	0.012	**0.011**	**0.012**	**0.011**	**0.012**	**0.005**	**0.004**	**0.012**	**0.007**	**0.020**	**0.020**	**0.020**
NMAC Acute Criteria (3)	0.050	0.050	**0.050**	0.050	0.012	0.017	0.021	0.023	0.022	**0.020**	**0.023**	**0.019**	**0.022**	**0.005**	**0.003**	**0.022**	**0.010**	**0.050**	**0.050**	**0.050**
NMAC Chronic Criteria (3)	0.029	0.029	**0.029**	0.029	**0.008**	0.011	0.013	0.015	0.014	**0.013**	**0.015**	**0.012**	**0.014**	**0.004**	**0.003**	**0.014**	**0.007**	**0.029**	**0.029**	**0.029**
Lead																				
Concentration (dissolved)	0.0002	N/D	0.0006	N/D	N/D	N/D	N/D	N/D	0.002	0.002	0.004	0.003	0.011	N/D	0.00017	0.0014	N/D	0.0003	N/D	0.0004
Amphibian (1)	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Acute Criteria (3)	0.28	0.28	0.28	0.28	0.05	0.11	0.08	0.12	0.12	0.10	0.12	0.10	0.11	0.02	0.01	0.11	0.05	0.28	0.28	0.28
Chronic Criteria (3)	0.01	0.011	0.01	0.011	0.002	0.004	0.003	0.005	0.01	0.004	0.01	0.004	**0.004**	0.001	0.0005	0.004	0.002	0.01	0.011	0.01
Molybdenum																				
Concentration (dissolved)	0.04	0.03	0.01	N/D	N/D	0.011	0.01	0.01	0.01	0.01	0.01	0.01	N/D	N/D	N/D	0.008	N/D	0.008	N/D	0.003
Amphibian (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acute Criteria (4)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chronic Criteria (4)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium																				
Concentration (dissolved)	0.002	N/D	0.002	N/D	N/D	0.0004	0.0003	0.0005	0.0004	0.001	0.0006	0.0005	N/D	N/D	0.0006	0.001	N/D	0.002	N/D	0.003
Amphibian (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acute Criteria (4)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Chronic Criteria (4)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Zinc																				
Concentration (dissolved)	1.38	2.16	1.72	0.48	N/D	N/D	0.089	0.015	0.14	0.28	0.37	0.35	0.36	N/D	N/D	0.1	0.03	0.21	3.42	1.67
Amphibian (1)	**0.2**	**0.2**	**0.2**	**0.2**	0.2	0.2	0.2	0.2	0.2	**0.2**	**0.2**	**0.2**	**0.2**	0.2	0.2	0.2	0.2	**0.2**	**0.2**	**0.2**
Leopard Frog NOEC (1a)	**0.3**	**0.3**	**0.3**	**0.3**	0.068	0.096	0.1	0.1	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.031	0.020	0.1	0.1	0.3	**0.3**	**0.3**
Leopard Frog LOAEC (1b)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acute Criteria (2)	**0.58**	**0.58**	**0.58**	0.58	0.16	0.22	0.26	0.29	0.28	**0.26**	**0.29**	**0.24**	**0.28**	0.07	0.05	0.28	0.14	0.58	**0.58**	**0.58**
Chronic Criteria (2)	**0.49**	**0.49**	**0.49**	0.49	**0.13**	**0.18**	0.22	0.25	0.24	**0.22**	**0.25**	**0.20**	**0.24**	**0.06**	**0.04**	0.24	0.12	0.49	**0.49**	**0.49**
NMAC Acute Criteria (3)	**0.56**	**0.56**	**0.56**	0.56	**0.14**	**0.20**	0.24	0.27	0.26	**0.24**	**0.27**	**0.22**	**0.26**	**0.06**	**0.04**	0.26	0.12	0.56	**0.56**	**0.56**
NMAC Chronic Criteria (3)	**0.43**	**0.43**	**0.43**	**0.43**	**0.11**	**0.15**	0.18	0.21	0.20	**0.18**	**0.21**	**0.17**	**0.19**	**0.05**	**0.03**	0.20	0.09	0.43	**0.43**	**0.43**

Notes:

J: Result estimated

N/A: No comparable benchmark available.

N/D: Result non-detected

(1) No-Effect Concentration based on data presented in Harfenist et al. 1989 or derived in TM-1 (Schafer and Associates 1999).

(1a) Hardness adjusted geometric mean of no-effect concentrations observed in the Chirichaua leopard frog (Little and Calfee 2008).

(1b) Hardness adjusted geometric mean of lowest effect concentrations observed in the Chirichaua leopard frog (Little and Calfee 2008).

(1c) Concentration at which 100% mortality observed in the endangered Chirichaua leopard frog (Little and Calfee 2008).

(2) Hardness-based screening level calculated based on approach outlined in Arid West Water Quality Reserch Project. See Appendix D.

(3) Hardness based standard calculated with equation 1b or 2a of 20.6.4.900(I) NMAC; As Amended thorugh July 17, 2005.

(4) Criterion from 20.6.4.900(I) NMAC; As Amended thorugh July 17, 2005.

Shaded Cells indicate concentration is greater than risk-based concentration.

Table 4.1-1
Comparison of Summer Rainfall Pool Data to Amphibian TRVs and NMWQCs
H/WCIU ERA

Parameter	U03-9301	Grunerud-1	B-Ranch	U03-9500	U03-9600	WWC-H180	U03-9900	LWWC-1	LWWCR. Ranchers Pond
Year	1999	2006	2006	1999	1999	2006	1999	2006	2007
Hardness (Calculated - mg/L)	79	1,820	1,770	109	431.5	725	225.1	347	228
Cadmium									
Concentration (filtered)	N/D	0.027	0.034	0.002	0.037	0.011	0.0012	0.005	0.0001
Amphibian (1)	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Leopard Frog NOEC (1a)	0.032	0.111	0.111	0.041	0.111	0.111	0.072	0.1	0.072
Leopard Frog LOAEC (1b)	0.09	0.311	0.311	0.115	0.311	0.311	0.2	0.279	0.202
Acute Criteria (2)	0.009	0.033	0.033	0.012	0.033	0.033	0.021	0.030	0.021
Chronic Criteria (2)	0.005	0.012	0.012	0.006	0.012	0.012	0.009	0.011	0.009
NMAC Acute Criteria (3)	0.0014	0.0054	0.0054	0.0018	0.0054	0.0054	0.0033	0.0048	0.0033
NAMC Chronic Criteria (3)	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Chromium									
Concentration (dissolved)	N/D	N/D	0.00042	N/D	N/D	N/D	0.008	N/D	N/D
Amphibian (1)	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.003
Acute Criteria (2)	0.47	1.77	1.77	0.61	1.77	1.77	1.11	1.58	1.12
Chronic Criteria (2)	0.06	0.23	0.23	0.08	0.23	0.23	0.14	0.21	0.15
Copper									
Concentration (dissolved)	0.03	1.22	2.34	0.09	0.6	0.48	0.05	0.55	0.02
Amphibian (1)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Leopard Frog NOEC (1a)	0.01	0.03	0.03	0.10	0.03	0.03	0.02	0.03	0.02
Leopard Frog LOAEC (1b)	0.03	0.13	0.13	0.04	0.13	0.13	0.08	0.11	0.08
Leopard Frog LC100 (1c)	0.13	0.53	0.53	0.17	0.53	0.53	0.32	0.47	0.33
Acute Criteria (2)	0.013	0.065	0.065	0.018	0.065	0.065	0.037	0.057	0.038
Chronic Criteria (2)	0.008	0.020	0.020	0.009	0.020	0.020	0.014	0.018	0.014
NMAC Acute Criteria (3)	0.011	0.050	0.050	0.015	0.050	0.050	0.029	0.043	0.029
NMAC Chronic Criteria (3)	0.007	0.029	0.029	0.010	0.029	0.029	0.018	0.026	0.018
Lead									
Concentration (dissolved)	N/D	0.0057	0.008	N/D	N/D	0.0001	N/D	0.0001	N/D
Amphibian (1)	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Acute Criteria (2)	0.05	0.28	0.28	0.07	0.28	0.28	0.15	0.24	0.16
Chronic Criteria (2)	0.002	0.01	0.01	0.003	0.011	0.01	0.006	0.01	0.006
Molybdenum									
Concentration (dissolved)	N/D	0.006	0.005	N/D	N/D	0.004	N/D	0.003	0.008
Amphibian (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acute Criteria (2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chronic Criteria (2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium									
Concentration (dissolved)	N/D	0.003	0.004	N/D	N/D	0.002	N/D	0.0009	0.001
Amphibian (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acute Criteria (2)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Chronic Criteria (2)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Zinc									
Concentration (dissolved)	N/D	5.84	7.89	0.02	1.06	1.6	0.04	0.9	N/D
Amphibian (1)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Leopard Frog NOEC (1a)	0.070	0.3	0.3	0.1	0.3	0.3	0.2	0.2	0.2
Leopard Frog LOAEC (1b)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acute Criteria (2)	0.15	0.58	0.58	0.19	0.58	0.58	0.36	0.51	0.36
Chronic Criteria (2)	0.12	0.49	0.49	0.16	0.49	0.49	0.30	0.44	0.31
NMAC Acute Criteria (3)	0.13	0.56	0.56	0.17	0.56	0.56	0.33	0.50	0.34
NMAC Chronic Criteria (3)	0.10	0.43	0.43	0.13	0.43	0.43	0.25	0.38	0.26

Notes:

J: Result estimated

N/A: No comparable benchmark available.

N/D: Result non-detected

(1a) Hardness adjusted geometric mean of all no-effect concentrations observed in the endangered Chirichaua leopard frog (Little and Calfee 2008).

(1b) Hardness adjusted geometric mean of all lowest effect concentrations observed in the endangered Chirichaua leopard frog (Little and Calfee 2008).

(1b) Lowest effect concentration observed in the endangered Chirichaua leopard frog (Little and Calfee 2008).

(1c) 100% mortality observed in the endangered Chirichaua leopard frog (Little and Calfee 2008).

(2) Calculated with equation 1b or 2a of 20.6.4.900(I) NMAC; As Amended thorugh July 17, 2005.

Shaded Cells indicate concentration is greater than risk-based concentration.

Table 4.1-2
Chiricahua Leopard Frog Toxicity Reference Values
H/WCIU ERA

COPC	Mortality		Length		Weight		Developmental (Gosner Stage)		Geometric Mean of All Endpoints	
	NOEC	LOEC	NOEC	LOEC	NOEC	LOEC	NOEC	LOEC	NOEC	LOEC
Cadmium	0.351	N/A	0.019	0.11	0.019	0.11	0.019	0.11	0.039	0.11
Copper	0.047	0.165	0.007	0.047	0.003	0.007	0.007	0.047	0.009	0.041
Zinc	0.165	N/A	0.063	N/A	0.063	N/A	0.063	N/A	0.0801	N/A

Notes:

LOEC: Lowest-Observed-Effect Concentration.

N/A: No comparable benchmark available.

NOEC: No-Observed-Effect Concentration.

units = mg/L dissolved.

Table 4.2-1
Comparison of Sediment Concentrations to Toxicity Reference Values
H/WCIU ERA

	Threshold Values (mg/kg)							Combined TRVs	
TRV Type	**Cadmium**	**Chromium**	**Copper**	**Lead**	**Molybdenum**	**Selenium**	**Zinc**	**Mean PEC-Q**	**Sum $STT_{Cd,Cu,Pb,Zn}$**
PEC	**4.98**	**110**	**149**	**128**	**N/A**	**N/A**	**459**	**0.6**	**3.0**
STT T_{10}	**11.1**	**N/A**	**27.1**	**150**	**N/A**	**N/A**	**2083**		
STT T_{20}	**17.3**	**N/A**	**N/A**	**219**	**N/A**	**N/A**	**2949**		

Sampling Location	Physical Reach	Concentrations at Sampling Locations (mg/kg)								
U02-1100	1	7.55 J	11.00	**297**	***249*** J	5.48	0.185 U	**2934**	**2.4**	14.2
U02-1102	1	6.05 J	14.30	**371**	**215** J	12.16	0.337 U	**2376**	**2.1**	16.4
U02-1103	1	1.59 J	6.35 U	**378**	**189** J	5.86	0.39 U	995	**1.3**	15.4
U02-1105	1	1.79 J	10.30	**366**	**200** J	13.35	0.403 U	1001	**1.3**	15.1
U02-5001	1	7.60	8.80	**926**	145	8.10	0.60	***3600***	**3.4**	37.2
U02-5002	1	1.20	10.70	**257**	61	3.50	0.6	760	**0.8**	10.2
U02-5004	1	4.30	4.90	**820**	***443***	9.50	4.20	1870	**2.8**	33.6
U02-5005	1	4.70	5.70	**670**	**190**	10.00	0.50	1730	**2.1**	26.8
U02-5008	1	3.20	5.20	**725**	**207**	7.90	1.50	1340	**2**	28.6
U02-5100	1	10.90 J	22.25	**279**	***545*** J	5.30	0.54 U	***4144***	**3.5**	15.8
U02-5101	1	3.86 J	20.04	**270**	128 J	16.66	1.28 U	1273	**1.3**	11.5
U02-5102	1	5.15 J	22.69	**251**	**186** J	5.63	0.58 U	1901	**1.7**	11.5
U02-5103	1	5.63 J	22.82	**1833**	***468*** J	9.97	0.79 U	**2124**	**4.4**	71.3
U02-5104	1	2.57 J	14.05	**208**	***387*** J	3.15	0.18 U	857	**1.4**	10.1
U02-5105	1	1.26	11.57	**385**	144 J	8.33	1.26	580	**1.1**	15.3
U02-5108	1	2.13	14.03	**294**	**172** J	9.37	0.37	926	**1.2**	12.3
U02-5109	1	2.75 J	13.89	108	**201** J	4.79	0.13 U	850	**1**	5.6
U02-5110	1	0.41 J	10.10	**153**	147 J	10.49	0.25 U	419	**0.7**	6.6
U02-5111	1	2.98 J	10.59	**2286**	**157**	6.59	0.73 U	536	**3.7**	85.6
U02-ER011	1	2.50	N/A	**249**	71	3.50 J	0.25 J	958	**1**	10.2
U03-1200	2	3.04	6.33	**329**	56 J	2.89	0.138 U	418	**0.8**	12.9
U03-1202	2	3.55	15.20	**479**	59 J	4.07	0.15	382	**1.1**	18.4
U03-5006	2	2.00	6.10	**581**	**218**	15.10	0.60	601	**1.5**	22.9
U03-5007	2	0.20	16.70	**765**	111	31.90	1.30	198	**1.3**	28.8
U03-5009	2	3.50	6.30	**817**	***236***	6.40	0.80	1530	**2.3**	32.3
U03-5010	2	**15.00**	6.50	**1450**	***1030***	4.00	0.5 U	***6000***	**6.8**	62.4
U03-5016	2	2.50	6.00	**623**	**192**	8.10	0.80	1230	**1.8**	24.7
U03-5017	2	3.00	9.80	**759**	***295***	10.70	1.20	1380	**2.2**	30.3
U03-5037	2	0.10 U	5.00	99	18	8.70	0.40	54	0.2	3.8
U03-5200	2	1.22 J	9.39	**759**	***312*** J	9.96	0.45 U	482	**1.8**	29.8
U03-5201	2	8.89	10.42	**1338**	***828*** J	5.70	0.33	***4299***	**5.3**	56
U03-ER001	2	2.90	N/A	**622**	***682***	7.10	0.4 J	335	**2.7**	26.5
U03-ER002	2	2.40	N/A	**307**	134	2.50 J	0.27 J	979	**1.4**	12.6
U03-1300	3	2.07 J	22.60	**469**	***223*** J	8.20	0.23 U	1010	**1.5**	19
U03-1302	3	1.29	17.70	**354**	131 J	6.92	0.21 U	658	**1.1**	14.1
U03-1304	3	0.53 U	20.90	**499**	**203** J	9.11	0.53	404	**1.2**	19.6
U03-1306	3	1.46	21.70	**587**	***260*** J	10.69	0.56	798	**1.6**	23.3
U03-1307	3	1.44	18.90	**453**	**214** J	11.78	0.56 J	650 J	**1.3**	18.1
U03-1309	3	1.80	19.00	**469**	**204** J	6.90	0.41 J	720 J	**1.4**	18.7
U03-1311	3	1.68	15.10	**374**	147 J	5.41	0.26 J	637 J	**1.1**	14.9
U03-1313	3	1.87	15.70	**462**	**173** J	12.43	0.178 U	800	**1.3**	18.4
U03-1315	3	2.64	20.50	**594**	**217**	6.59	0.13 U	1016 J	**1.7**	23.6
U03-1317	3	0.51 U	17.80	**287**	**183**	3.66	0.13 U	345 J	**0.9**	11.6
U03-5023	3	1.50	7.60	**514**	***234***	7.70	1.10	917	**1.5**	20.6
U03-5024	3	3.30	8.40	**602**	***263***	6.80	0.50	1340	**2**	24.4
U03-5026	3	1.10	9.20	**465**	**161**	7.80	0.5 U	719	**1.2**	18.3
U03-5027	3	1.00	12.00	**490**	**201**	4.60	0.20	706	**1.3**	19.4
U03-5028	3	0.80	12.90	**425**	**164**	3.50	0.20	568	**1.1**	16.8
U03-5029	3	0.20 U	13.20	**474**	**152**	4.70	0.5 U	259	**1**	18.3
U03-5030	3	0.70	14.80	**406**	**171**	6.40	0.20	430	**1.1**	16
U03-ER004	3	1.50	N/A	**387**	99	5.30	0.33 J	707	**1.3**	15.2
U03-1400	4	0.84	14.90	**272**	73	1.35 U	0.13 U	198 J	**0.6**	10.5
U03-5031	4	2.00	14.70	**1210**	***340***	16.40	0.90	874	**2.6**	46.8
U03-1500 B	5	3.80	17.20	**2619**	26	50.66	1.98 J	451	**3.9**	97.3
U03-1600 B	6	0.73	6.07	140	13	7.45	0.133 U	191	0.3	5.4
U03-5035	6	0.20	8.20	**297**	14	14.70	0.40	88	0.5	11.1
U03-ER006	6	0.26 J	N/A	**358**	40	1.60 J	0.26 J	43	**0.7**	13.4
U03-1700 B	7	0.32 U	4.47	99	7	4.43	0.154 U	28	0.2	3.7
U03-1702 B	7	0.32 U	5.58	104	11	5.88	0.133 U	45	0.2	3.9
U03-5036	7	0.20 U	5.20	**211**	25	9.80	0.40	58	0.4	7.9
U03-1800	8	0.41 U	11.00	**220**	30	9.69	0.33	66 J	0.4	8.3
GA12	9	0.21 U	8.80	99	11	7.49	0.52	46	0.2	3.7
GA31	9	0.50	19.60	**199**	23	10.50	0.75	97	0.4	7.5
GA50	9	0.75	15.60	**435**	51	5.27	0.36	224	**0.8**	16.5
U03-1900 B	9	1.34	6.07	109	13	4.99	0.128 U	191	0.3	4.3
U03-1901 B	9	0.28 U	13.10	114	24	5.25	0.105 U	81	0.3	4.4
U03-1902 B	9	0.43 U	6.25	143	38	6.56	0.129 U	104	0.3	5.5
U03-1000	Bayard Canyon	1.99	4.32	**318**	***1850***	4.47	0.16 U	540	**3.6**	20.6
U03-1001	Bayard Canyon	2.37	4.81	**257**	***2528***	2.26 U	0.13 U	528	**4.6**	21.5
U03-1002	Bayard Canyon	1.45	11.98	**249**	***522***	1.66 U	0.13 U	313	**1.4**	11.8
U03-3003	Bayard Canyon	0.59	3.62	149	***316***	3.14	0.13	137	**0.8**	7
U03-3004	Bayard Canyon	1.35	6.19	**510**	***1836***	7.10	0.27	393	**3.8**	27.5
U03-5025	Bayard Canyon	4.10	2.70	**305**	***498***	0.60	0.10	1280	**1.9**	14.5
LW-03E-S01-SD	LWW	0.50	10.10	**439**	25	18.50	0.7	90	**0.7**	16.4
LW-03E-S02-SD	LWW	1.06	12.70	**779**	31	16.70	0.25	177	**1.2**	29.1
LW-03E-S03-SD	LWW	0.95	20.60	**756**	41	25.00	0.7	137	**1.2**	28.2
LW-03E-S04-SD	LWW	1.00	12.70	**542**	33	12.20	0.25	163	**0.9**	20.3
LW-03E-S05-SD	LWW	0.69	12.10	**731**	28	22.30	0.7	90	**1.1**	27.2
U03-11150	LWW	0.24 J	5.90 J	**183** J	21	13.50	0.3 J	70	0.3	6.9
U03-11254	LWW	0.02 U	6.50 J	**233** J	21	32.40	0.46 J	69	0.4	8.7
U03-11255	LWW	0.19 J	7.60 J	**281** J	25	20.80	0.81J	66	0.5	10.5
U03-11256	LWW	0.34	4.90	118	19	11.90	0.23 J	56	0.2	4.5
U03-11260	LWW	0.66	23.40	**2360**	43	24J	0.44 J	204	**3.4**	87.4
U03-11261	LWW	0.66	22.40	**2000**	41	20.80 J	0.34 J	227	**2.9**	74.2
U03-11262	LWW	0.49	15.90	**465**	36	8.00 J	0.003 U	158	**0.8**	17.4
U03-11284	LWW	0.49	11.00	**429**	34	16.9J	0.36 J	125	**0.7**	16.1

Table 4.2-1
Comparison of Sediment Concentrations to Toxicity Reference Values
H/WCIU ERA

	Threshold Values (mg/kg)							Combined TRVs	
TRV Type	**Cadmium**	**Chromium**	**Copper**	**Lead**	**Molybdenum**	**Selenium**	**Zinc**	**Mean PEC-Q**	**Sum $STT_{Cd,Cu,Pb,Zn}$**
PEC	**4.98**	**110**	**149**	**128**	**N/A**	**N/A**	**459**	**0.6**	**3.0**
STT T_{10}	**11.1**	**N/A**	**27.1**	**150**	**N/A**	**N/A**	**2083**		
STT T_{20}	**17.3**	**N/A**	**N/A**	**219**	**N/A**	**N/A**	**2949**		

Sampling Location	Physical Reach	Concentrations at Sampling Locations (mg/kg)								
U03-11288	LWW	0.31	11.90	784	39	18.90	0.39 J	148	1.2	29.2
U03-11366	LWW	0.27	8.90	159	34	10.30 J	---	103	0.3	6.1
U03-11471	LWW	0.62	12.50	388	36	9.10	0.16 U	168	0.7	14.6
U03-11576	LWW	0.35	6.40	157	22	6.90 J	0.003 U	89	0.3	6
U03-11579	LWW	0.77 J	14.20 J	463 J	42 J	10.60 J	0.003 U	195 J	0.8	17.4
U03-11586	LWW	1.40	23.40	941	90	11.10 J	0.45 J	378	1.7	35.4
U03-11680	LWW	0.02 U	18.40	43	19	2.00	0.16 U	71	0.2	1.7
U03-11682	LWW	0.19	19.40	41	20	2.00	0.16 U	75	0.2	1.6
U03-51050	SC	0.09 J	9.00	208	23	21.10	0.38 J	51	0.4	7.8
U03-51052	SC	0.60	14.80	335	34	11.30	0.2 U	130	0.6	12.6
U03-51053	SC	0.26	15.20	210	24	4.40	0.2 U	109	0.4	7.9
U03-51055	SC	0.22 J	16.20	171	22	4.40	0.1 U	72	0.3	6.5
U03-51056	SC	0.14 J	19.00	196	25	2.20 J	0.1 U	102	0.4	7.4
U03-51058	SC	0.41 J	20.50	263	24	3.80 J	0.1 U	140	0.5	9.9
U03-51060	SC	0.98	16.00	482	47	11.20	0.10 U	225	0.9	18.2
U03-51062	SC	0.24	15.30	76	11	2.80 J	0.1 U	54	0.2	2.9
U03-51063	SC	0.75	15.40	92	18	1.50 J	0.1 U	110	0.3	3.6

<u>Notes:</u>

Sample results presented as mg/kg.

For STT T_{10} and T_{20}: **100** Value exceeds the T_{10} value, but is less than the
<u>100</u> Value exceeds the T_{20} value. Note that no T_{20} value is available for copper.

For PEC-Q: **100** Value exceeds critical level for the Mean PEC-Q (0.556).
For $STT_{Cd,Cu,Pb,Z}$ **100** Value exceeds critical level for the Sum $STT_{Cd,Cu,Pb,Zn}$ (2.97).

Note: Results include those collected in the Post-Tailing Spill Sampling Event, November, 1999 (Golder 2000).

N/A: No comparable benchmark available.

Qualifiers: U: Result less than MDL. J: Value detected below detection limit.

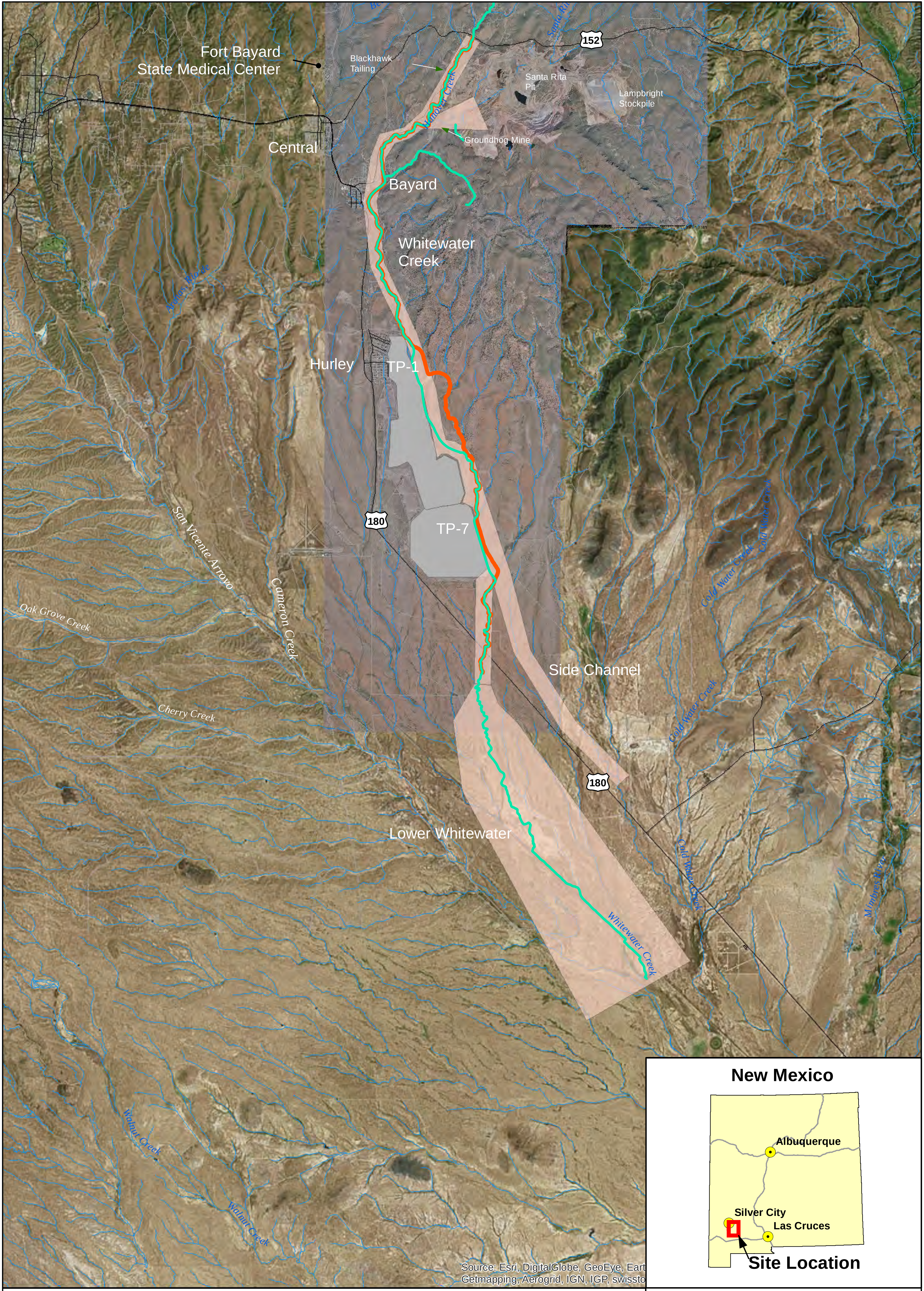
T_{10}, T_{20}: Concentrations corresponding to 10% and 20%, repectively, reduction in survival or biomass from controls. (MacDonald et al., 2009).

PEC: Probable Effects Concentration.

Mean PEC-Q and Sum $STT_{Cd,Cu,Pb,Zn}$ *calculated as described in MacDonald et al., 2009.*

FIGURES

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.0-1-SITELOC.MXD



Source: Esri, DigitalGlobe, GeoEye, Eart
Getmapping, Aerogrid, IGN, IGP, swissto

Legend

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- H/WCIU-Sampled Areas
- Stream or River
- Road
- Railroad
- Smelter/Tailing Operational Area

2014 Natural Color Aerial Photography

Note: Does not necessarily represent width of IU.

0 1 2
Miles

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Chino Mines AOC

H/WCIU
Ecological Risk Assessment

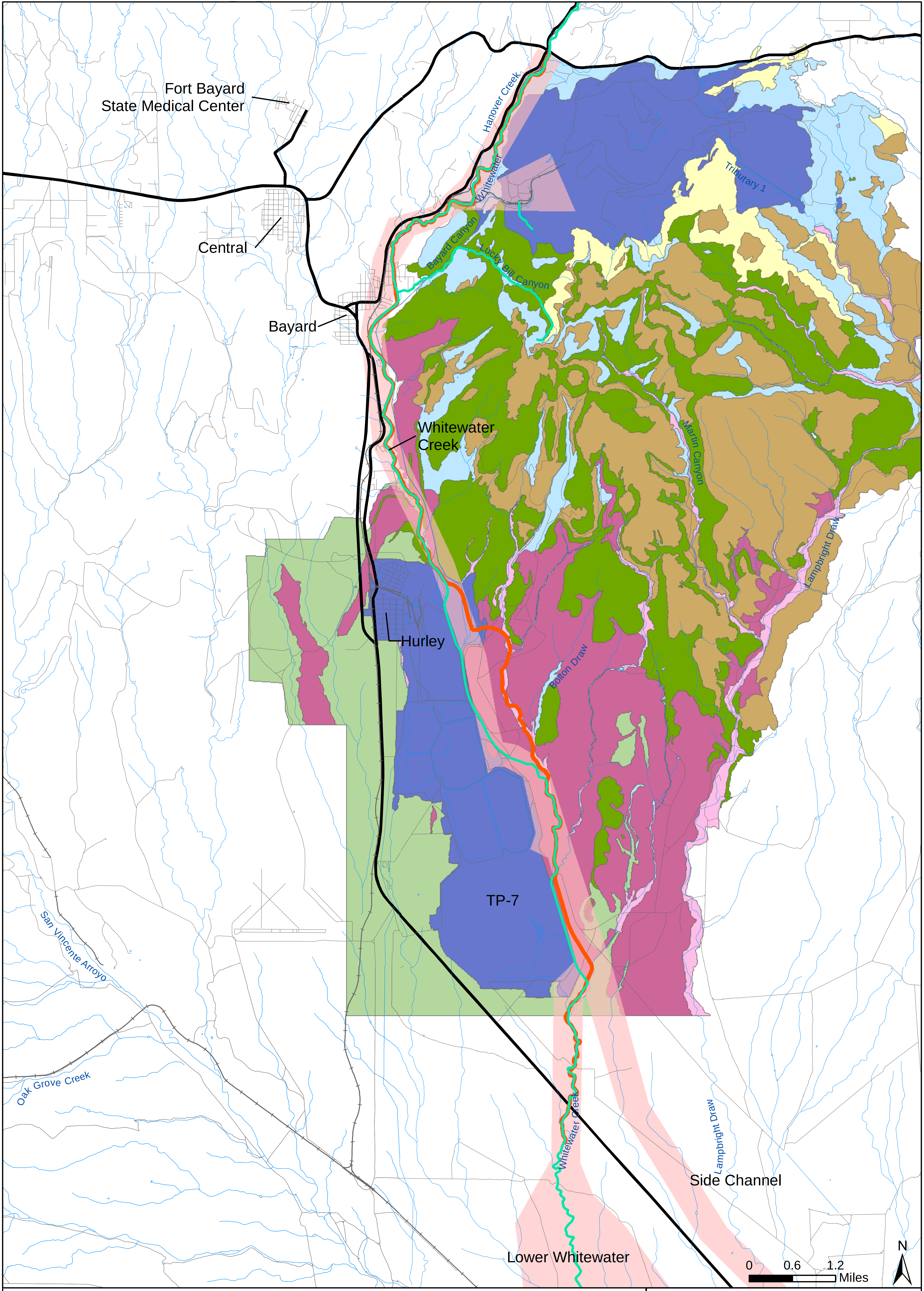
Figure 1.0-1

Chino Mines
Hanover and Whitewater Creeks
Investigation Unit Area

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1_1-01_VEGMAP.MXD



Legend

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
H/WCIU-Sampled Areas

Road
Railroad
River or Pond
Highway

Vegetation
- Fluvial Forest and Shrubland Alliance
- Mesquite/Mixed Grama Shrubland Alliance
- Mine Facilities/Urban
- Pondrosa Pine-Oak Forest Alliance
- Alligator Juniper-Oak Woodland Alliance
- Mountain Mahogany Shrubland Alliance
- Mixed-Grama Herbacious Alliance
- Alligator Juniper-Oak/Grama Woodland Alliance

Note: Does not necessarily represent width of IU.

CHINO MINES AOC
H/WCIU
Ecological Risk Assessment

FIGURE 1.1-1

Vegetation Communities Of The Chino Mine AOC Investigation Area (From DBS&A 2000)

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL FOR: JMA

FORMATION ENVIRONMENTAL

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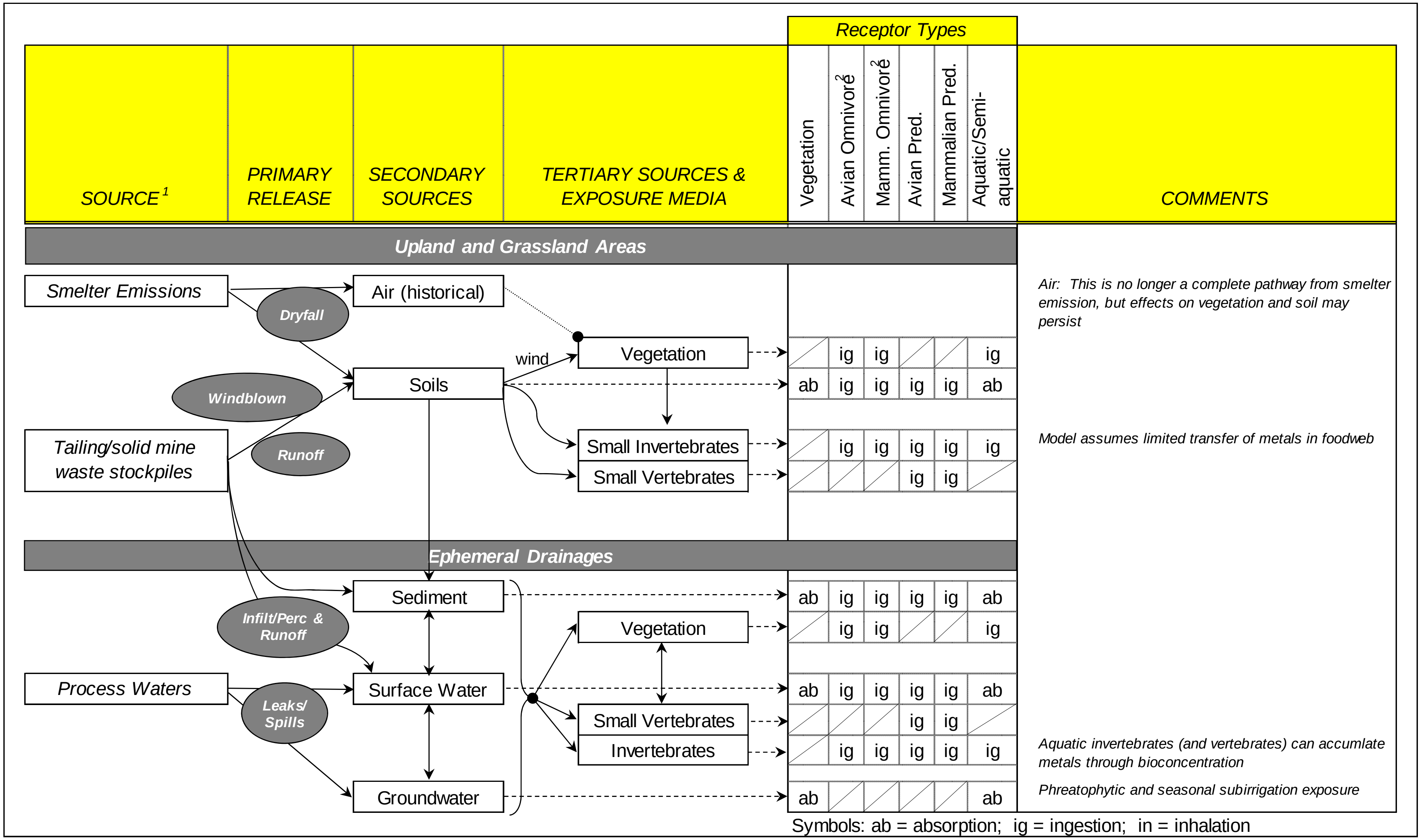


TERTIARY SOURCES & EXPOSURE MEDIA	Vegetation	Avian Omnivore[2]	Mamm. Omnivore[2]	Avian Pred.	Mammalian Pred.	Aquatic/Semi-aquatic	COMMENTS
Upland and Grassland Areas							
Air (historical)							Air: This is no longer a complete pathway from smelter emission, but effects on vegetation and soil may persist
Vegetation	/	ig	ig	/	/	ig	
Soils	ab	ig	ig	ig	ig	ab	
Small Invertebrates	/	ig	ig	ig	ig	ig	Model assumes limited transfer of metals in foodweb
Small Vertebrates	/	/	/	ig	ig	/	
Ephemeral Drainages							
Sediment	ab	ig	ig	ig	ig	ab	
Vegetation	/	ig	ig	/	/	ig	
Surface Water	ab	ig	ig	ig	ig	ab	
Small Vertebrates	/	/	/	ig	ig	/	
Invertebrates	/	ig	ig	ig	ig	ig	Aquatic invertebrates (and vertebrates) can accumlate metals through bioconcentration
Groundwater	ab	/	/	/	/	ab	Phreatophytic and seasonal subirrigation exposure

Symbols: ab = absorption; ig = ingestion; in = inhalation

[1] Includes CMC and non-CMC historical sources as identified in AOC Background Report and RI Proposals

[2] Includes herbivores and assumes most omnivores do not ingest vertebrate prey

Figure 1.1-2. Conceptual Site Model for Exposure of Ecological Receptors Chino Mines ERA

Chino Mines AOC H/WCIU
Ecological Risk Assessment

PRJ: 0473-002-900	Date: June 2012	FORMATION ENVIRONMENTAL
	FOR: JMA	

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1_1-03_SED_PR1.MXD

Legend

Phase I RI (2000)
- ● Channel Transect Comp.
- ✚ Active Channel
- ☐ Overbank
- ⊕ Tributary Transect Comp.
- ◊ Vegetated Bar

Golder (2008)
- ● Channel Transect Comp.
- ■ Overbank Comp.
- ▲ Vegetated Bar Comp.

ECO RI (Arcadis 2001)
- ■ Overbank

BRI (1995)
- ⬠ Background Comp. Transect
- ☐ Overbank
- ⊕ Tributary Transect Comp.
- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek

- Physical Reach Boundary
- Railroad
- Road
- River/Stream

0 590 1,180 Feet

N

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

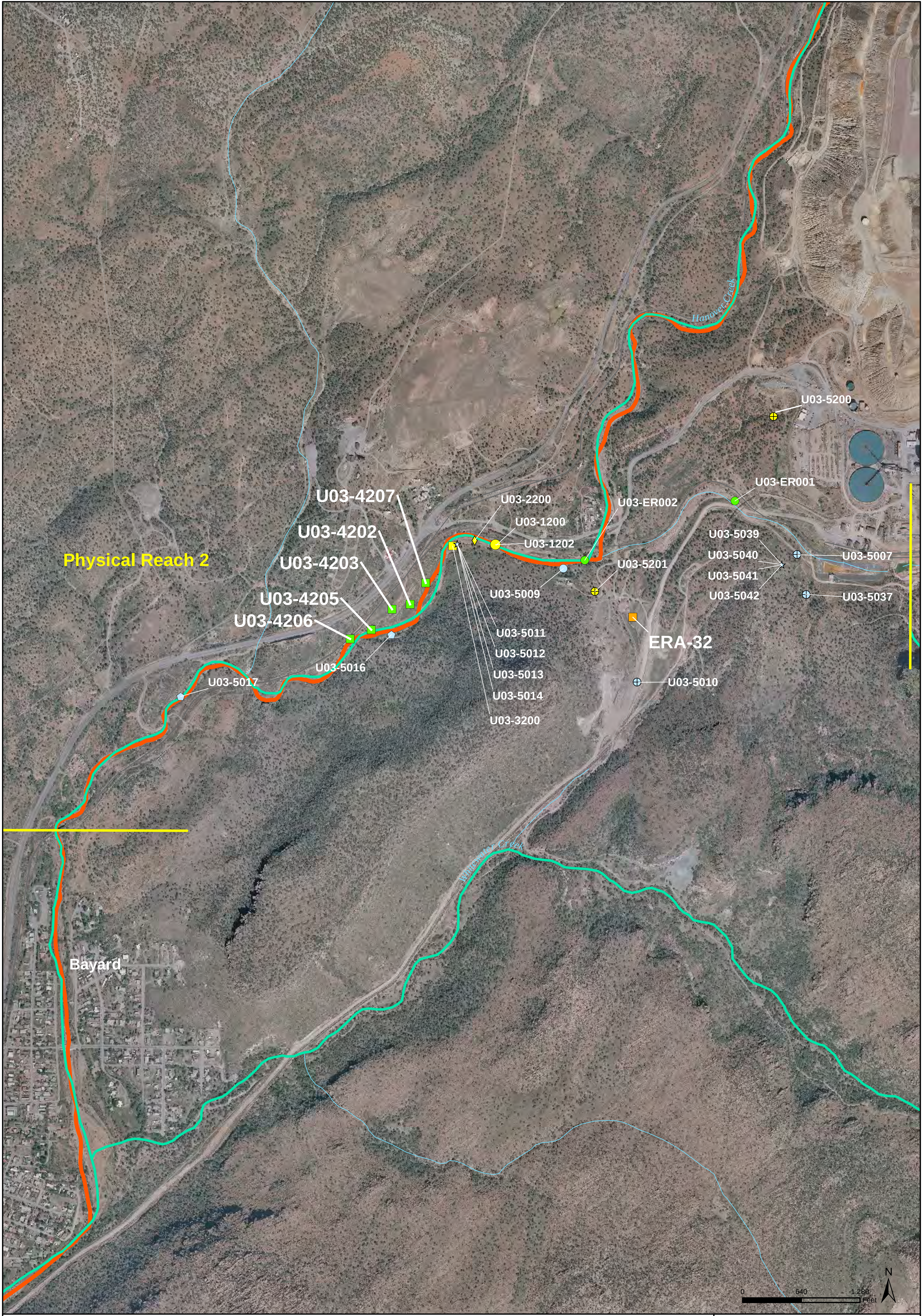
Figure 1.1-3

Sediment/Soil Sampling Locations
Physical Reach 1

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-4_SED_PR2.MXD



Legend

Phase I RI (2000)
- ● Channel Transect Comp.
- ✚ Active Channel
- ■ Overbank
- ⊕ Tributary Transect Comp.
- ◊ Vegetated Bar

Golder (2008)
- ● Channel Transect Comp.

Golder (2005)
- ■ Overbank

ECO RI (Arcadis 2001)
- ■ Overbank

BRI (1995)
- ○ Channel Transect Comp.
- ⬠ Background Channel Transect
- ⊕ Tributary Transect Comp.
- ☆ Tin Can Operation
- ━ Hist. Hanover & Whitewater Cr.
- ━ Current Whitewater Creek

- ┼ Railroad
- ─ Road
- ━ Physical Reach Boundary
- ─ River/Stream

Note: Data from ERA32 replaced with 95%
UCL of post-remediation composite samples from Golder (2009)

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Chino Mines AOC

H/WCIU
Ecological Risk Assessment

Figure 1.1-4

Sediment/Soil Sampling Locations
Physical Reach 2

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL / CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1_1-05_SED_PR3.MXD

Legend

Phase I RI (2000)
- ● Channel Transect Comp.
- ✚ Active Channel
- ■ Overbank
- ◆ Vegetated Bar
- ⊕ Yard Comp.

Golder (2008)
- ● Channel Transect Comp.

ECO RI (Arcadis 2001)
- ■ Overbank

GOLDER (2005)
- ⬟ Terrace
- ■ Overbank

BRI (1995)
- ⬟ Background Channel Transect
- — Hist. Hanover & Whitewater Cr.
- — Current Whitewater Creek

- — River/Stream
- —+— Railroad
- — Road
- — Physical Reach Boundary

0 1,500 3,000
Feet

N

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Chino Mines AOC

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Ecological Risk Assessment

Figure 1.1-5

Sediment/Soil Sampling Locations
Physical Reach 3

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-6 SED PR4 PR5.MXD

Legend

Phase I RI (2000)
○ Channel Transect Comp.
☐ Overbank
▣ Tributary

Golder (2008)
● Channel Transect Comp.

ECO RI (Arcadis 2001)
☐ Overbank

BRI (1995)
⬠ Background Channel Transect
Railroad
Road
Physical Reach Boundary
River/Stream
Hist. Hanover & Whitewater Cr.
Current Whitewater Creek

Notes: Sample locations include those used in the Post-Tailings Spill Sampling Event, November, 1999. (Golder, 2000)
-Physical Reach 5 included with Smelter-Tailings Investigation Unit
-Sampling locations without labels were removed from the assessment as discussed in Section 1.1

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Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 1.1-6
Sediment/Soil Sampling Locations
Physical Reaches 4 and 5

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-7_SED_PR6_PR7.MXD

Legend

Phase I RI (2000)

- ● Channel Transect Comp.
- ■ Overbank
- ⬟ Terrace Comp.
- ◆ Vegetated Bar

Golder (2008)

- ● Channel Transect Comp.

BRI (1995)

- ⬠ Background Channel Transect
- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- Road
- Railroad
- Physical Reach Boundary
- River/Stream

Note:
Sample locations include those used in the
Post-Tailings Spill Sampling Event, November, 1999.
(Golder, 2000)
2014 Natural Color Aerial Photography

Chino Mines AOC
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Ecological Risk Assessment

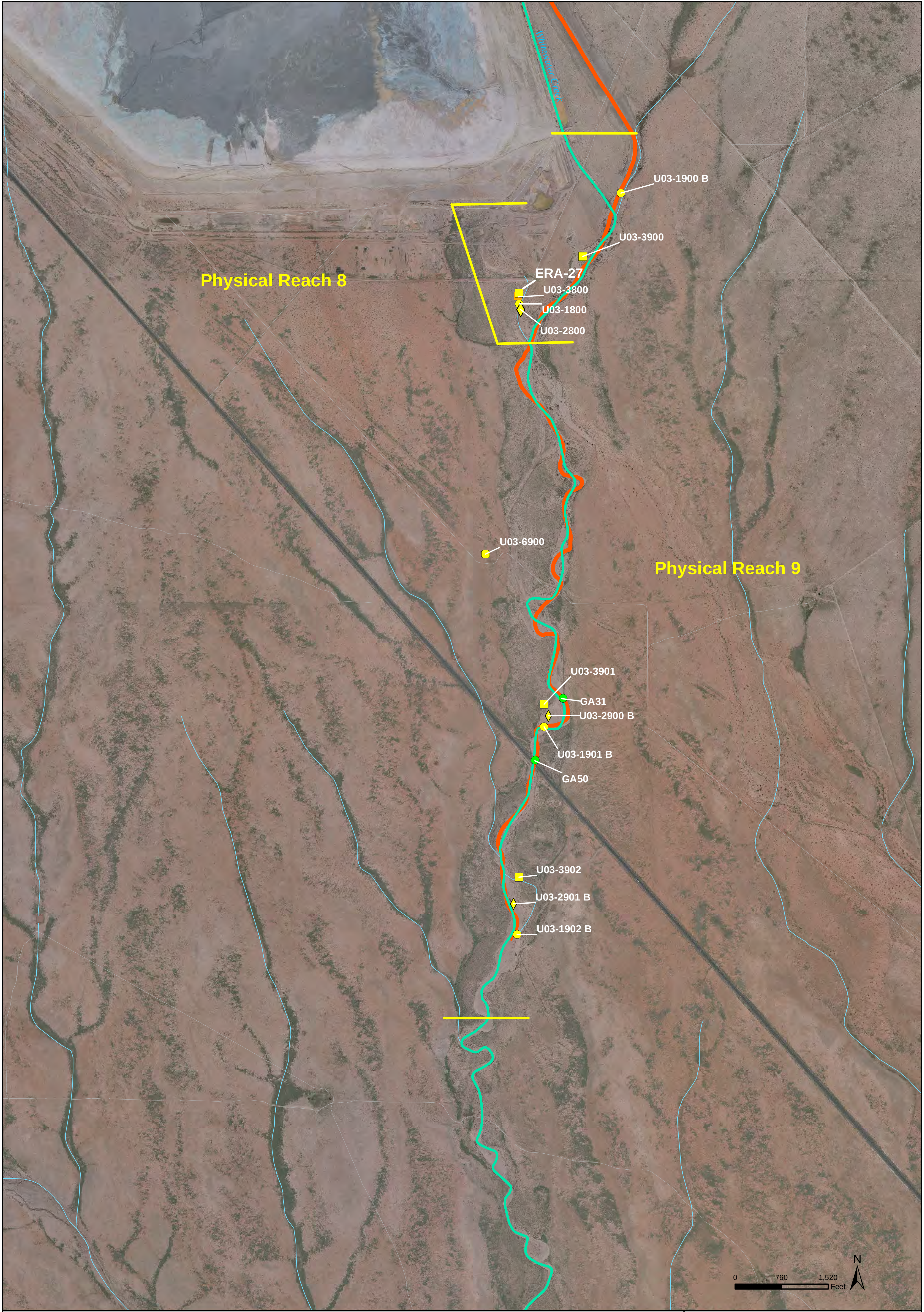
Figure 1.1-7

Sediment/Soil Sampling Locations
Physical Reaches 6 and 7

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-8 SED PR8 PR9.MXD



Legend

Phase I RI (2000)
- ● Channel Transect Comp.
- ■ Overbank
- ● Terrace Comp.
- ◆ Vegetated Bar

ECO RI (Arcadis 2001)
- ■ Overbank

CMC (1995)
- ● Channel Transect Comp.
- — Hist. Hanover & Whitewater Cr.
- — Current Whitewater Creek

- — Physical Reach Boundary
- — Road
- —+— Railroad
- — River/Stream

Note:
Sample locations include those used in the Post-Tailings Spill Sampling Event, November, 1999 (Golder, 2000).
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Chino Mines AOC

H/WCIU

Ecological Risk Assessment

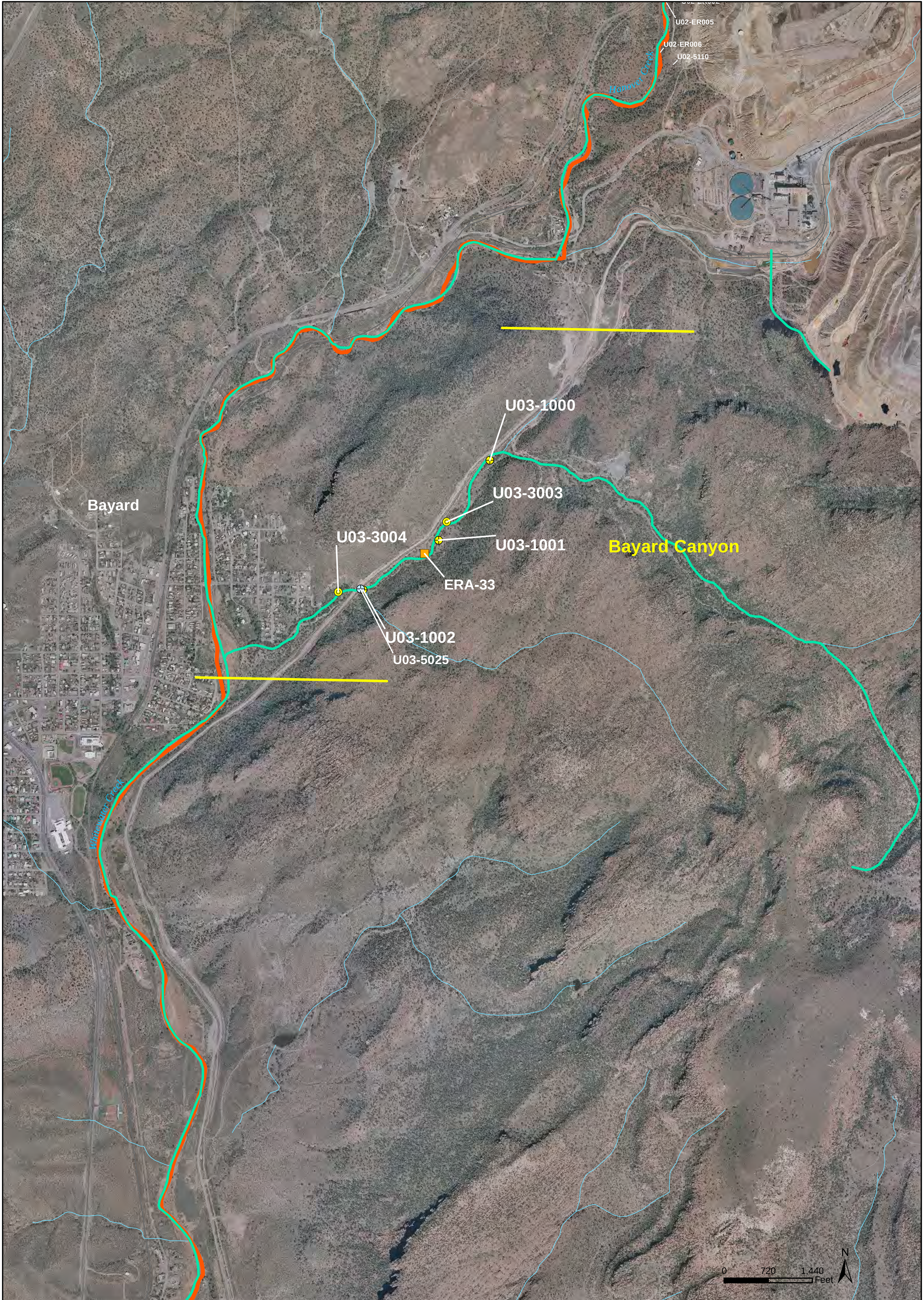
Figure 1.1-8

Sediment/Soil Sampling Locations
Physical Reaches 8 and 9

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-9_SED_PR_BC.MXD



Legend

BRI (1995)
- ⊕ Tributary Transect Composite

Phase I RI (2000)
- ◎ Surface Point
- ⊕ Tributary Transect Comp.

ECO RI (Arcadis 2001)
- 🟧 Overbank

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Physical Reach Boundary
Road
Railroad
River/Stream

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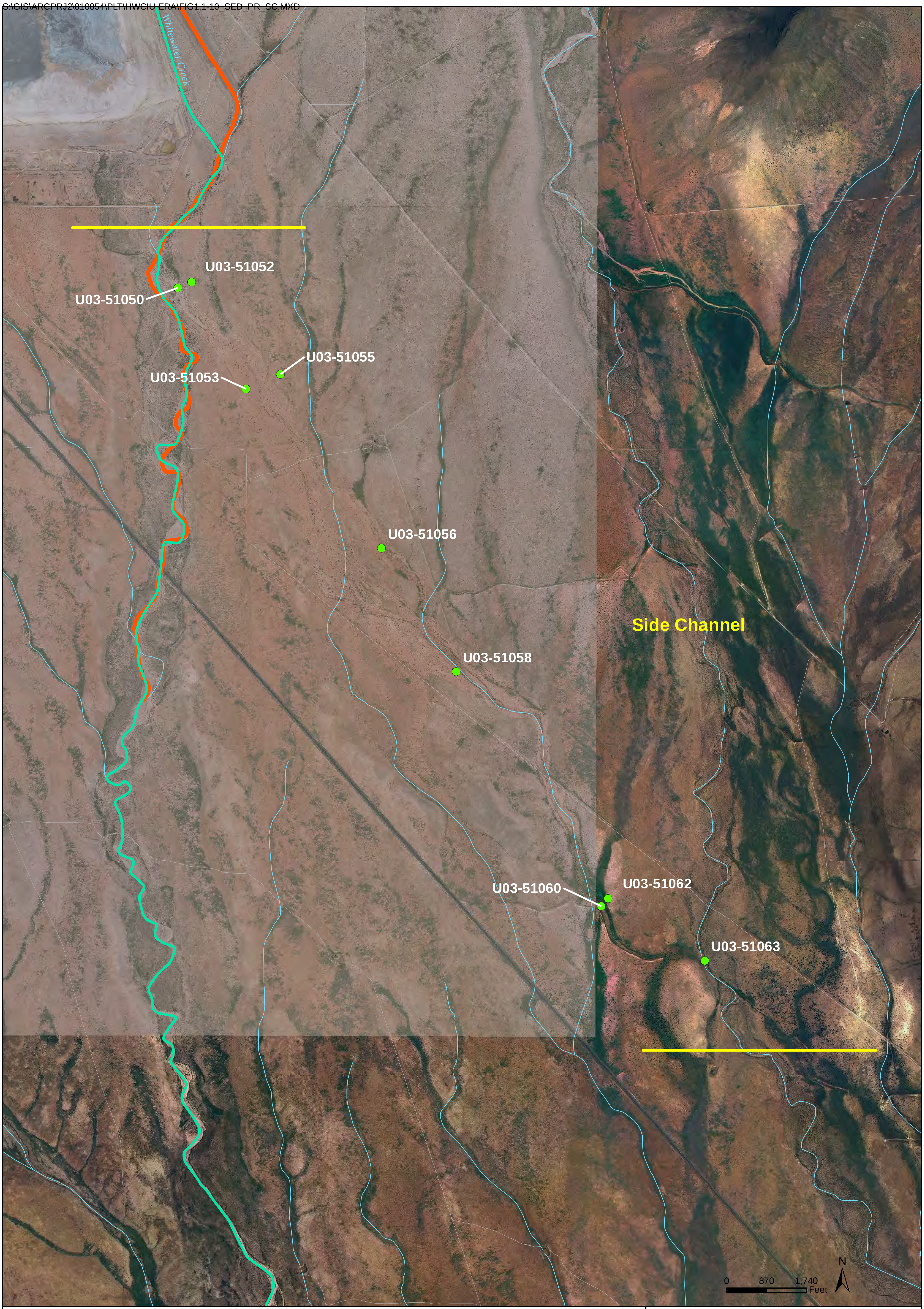
H/WCIU
Ecological Risk Assessment

Figure 1.1-9
Sediment/Soil Sampling Locations
Bayard Canyon

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-10_SED_PR_SC.MXD



Legend

Golder (2002)

● Channel Transect Comp.
— Hist. Hanover & Whitewater Cr.
— Current Whitewater Creek
— Side Channel
— Road
—+— Railroad
— River/Stream

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Chino Mines AOC
H/WCIU
Ecological Risk Assessment

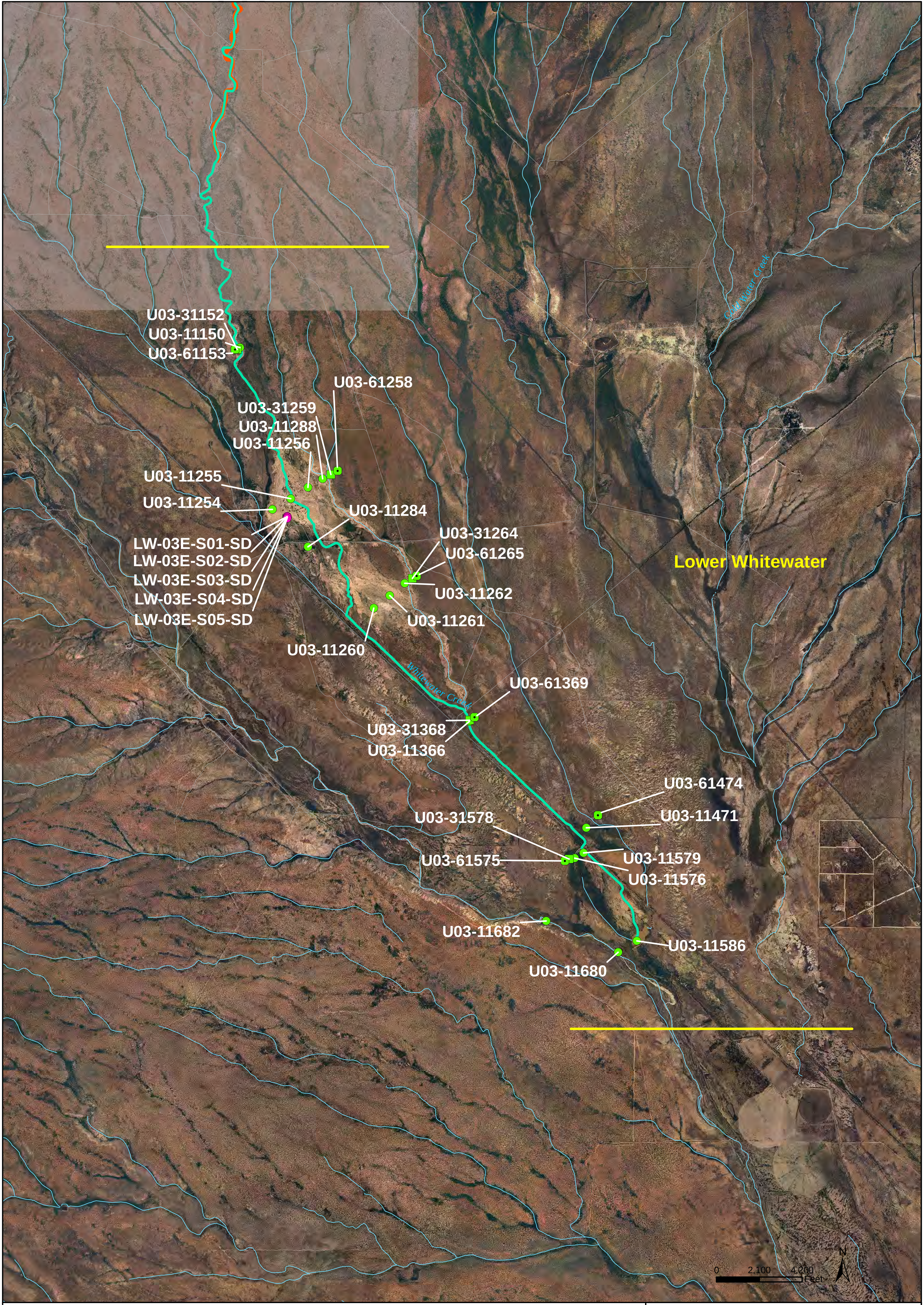
Figure 1.1-10

Sediment/Soil Sampling Locations
Side Channel

PRJ: 0473-002-900	DATE: OCT. 29, 2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-11_SED_PR_LWW.MXD



Legend

Golder (2003)	**Golder (2008)**	
● Channel Transect Comp.	● Grab Sample	River/Stream
■ Overbank Transect Comp.	Hist. Hanover & Whitewater Cr.	Road
⊙ Upland Transect Comp.	Current Whitewater Creek	Railroad
		Lower Whitewater

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Chino Mines AOC
H/WCIU
Ecological Risk Assessment

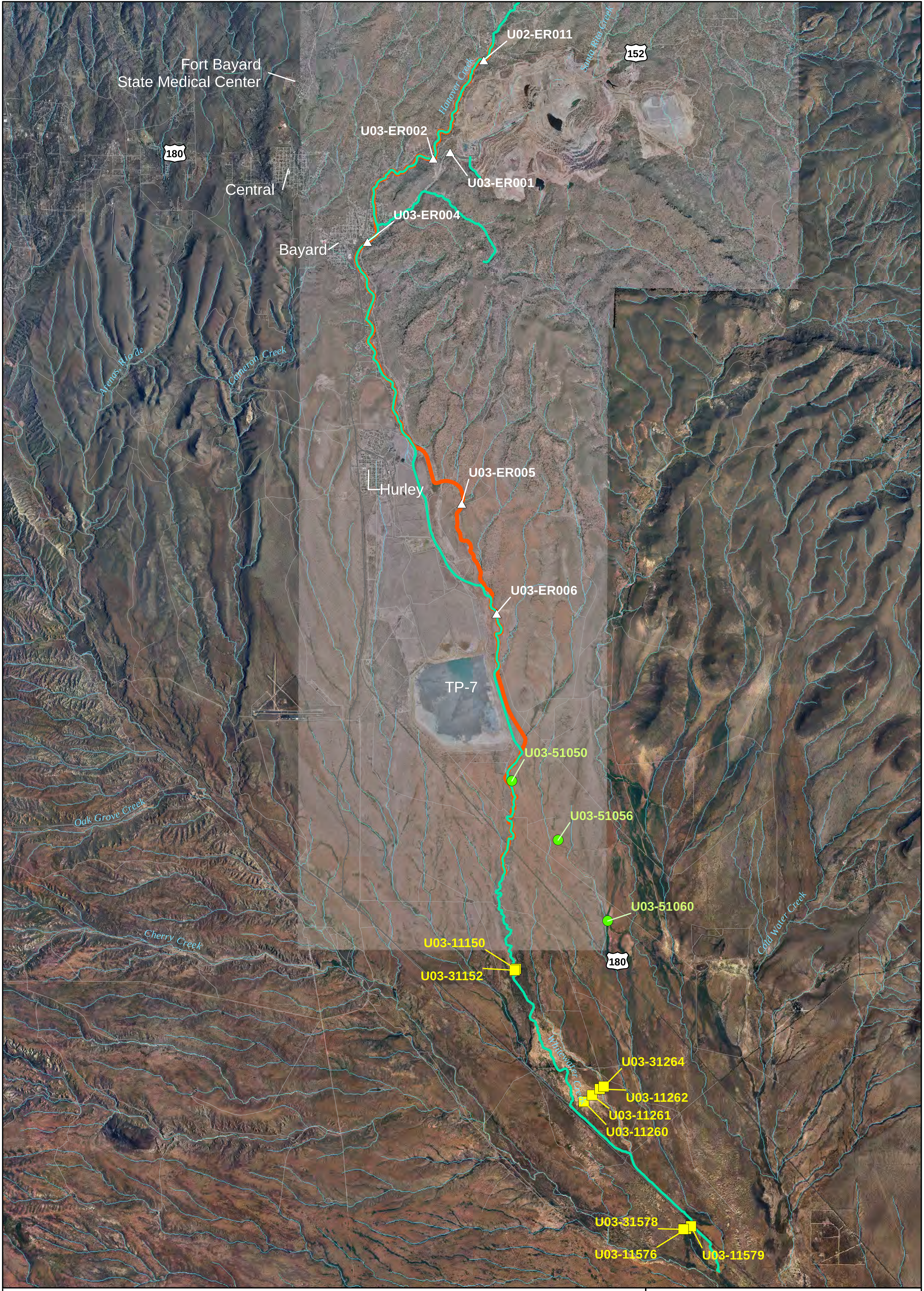
Figure 1.1-11

Sediment/Soil Sampling Locations
Lower Whitewater Creek

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-12_SPLP_SAMPLOCS.MXD



Legend

SPLP Sampling Location

- ● Golder (2002)
- 🟨 Golder (2003)
- △ Golder (2008)

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- Road
- Railroad
- River/Stream

0 1 2 Miles

N

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Chino Mines AOC

H/WCIU

Ecological Risk Assessment

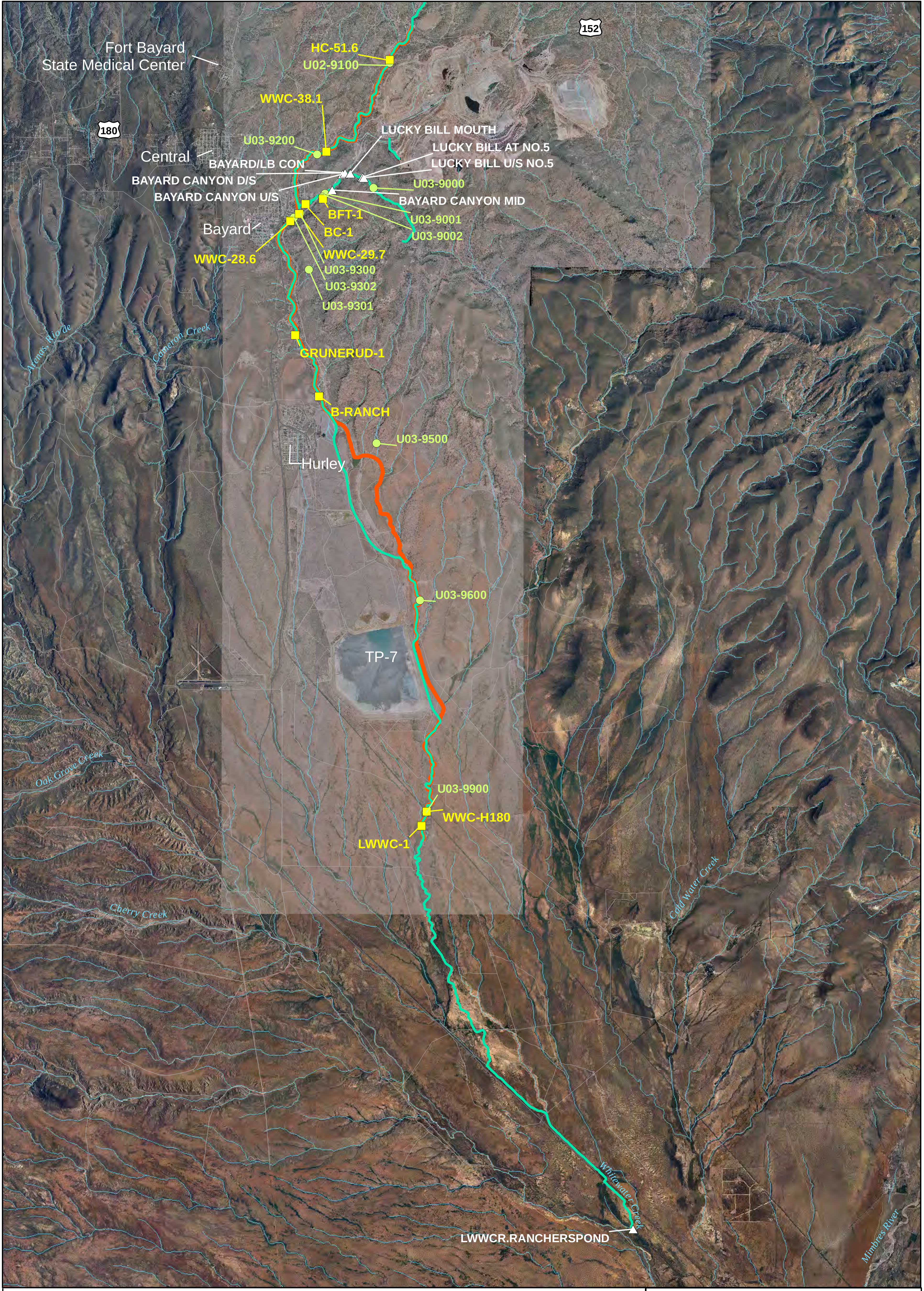
Figure 1.1-12

SPLP Sampling Locations

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG1.1-13_SRFP_SAMPLOCS.MXD



2014 Natural Color Aerial Photography

Legend

Summer Rainfall Pool Sampling Location

- ● Phase I RI (2000)
- 🟨 Golder (2007)
- △ Golder (2008)

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Road
Railroad
River/Stream

0 1 2 Miles

N

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 1.1-13
Summer Rainfall Pool
Sampling Locations

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2_1-1_PCU_PR1.MXD

Legend

Golder (2008)		**ECO RI (2001)**	
🟥	<= 5	▲	<= 5
🟨	5 - 7	▲	5 - 7
🟩	> 7	▲	> 7

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Physical Reach
Road
Railroad
River/Stream

0 660 1,320 Feet

N

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

Figure 2.1-1

Soil pCu^{2+} Results
Physical Reach 1

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2.2-2_PCU_PR2.MXD

Legend

Golder
- 🟥 <= 5
- 🟨 5 - 7
- 🟩 > 7

ECO RI (2001)
- ▲ <= 5
- △ 5 - 7
- ▲ > 7

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- Road
- Railroad
- Physical Reach
- River/Stream

Note: Data from ERA32 replaced with 95%
UCL of post-remediation composite samples from Golder (2009)

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Chino Mines AOC

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Ecological Risk Assessment

Figure 2.1-2
Soil pCu^{2+}Results
Physical Reach 2

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2_1-3_PCU_PR3.MXD

Legend

ECO RI (2001)	**Golder**		
▲ <= 5	● <= 5	Hist. Hanover & Whitewater Cr.	River/Stream
▲ 5 - 7	● 5 - 7	Current Whitewater Creek	Road
▲ > 7	● > 7		Railroad
			Physical Reach

2014 Natural Color Aerial Photography

0 1,300 2,600 Feet

N

Chino Mines AOC
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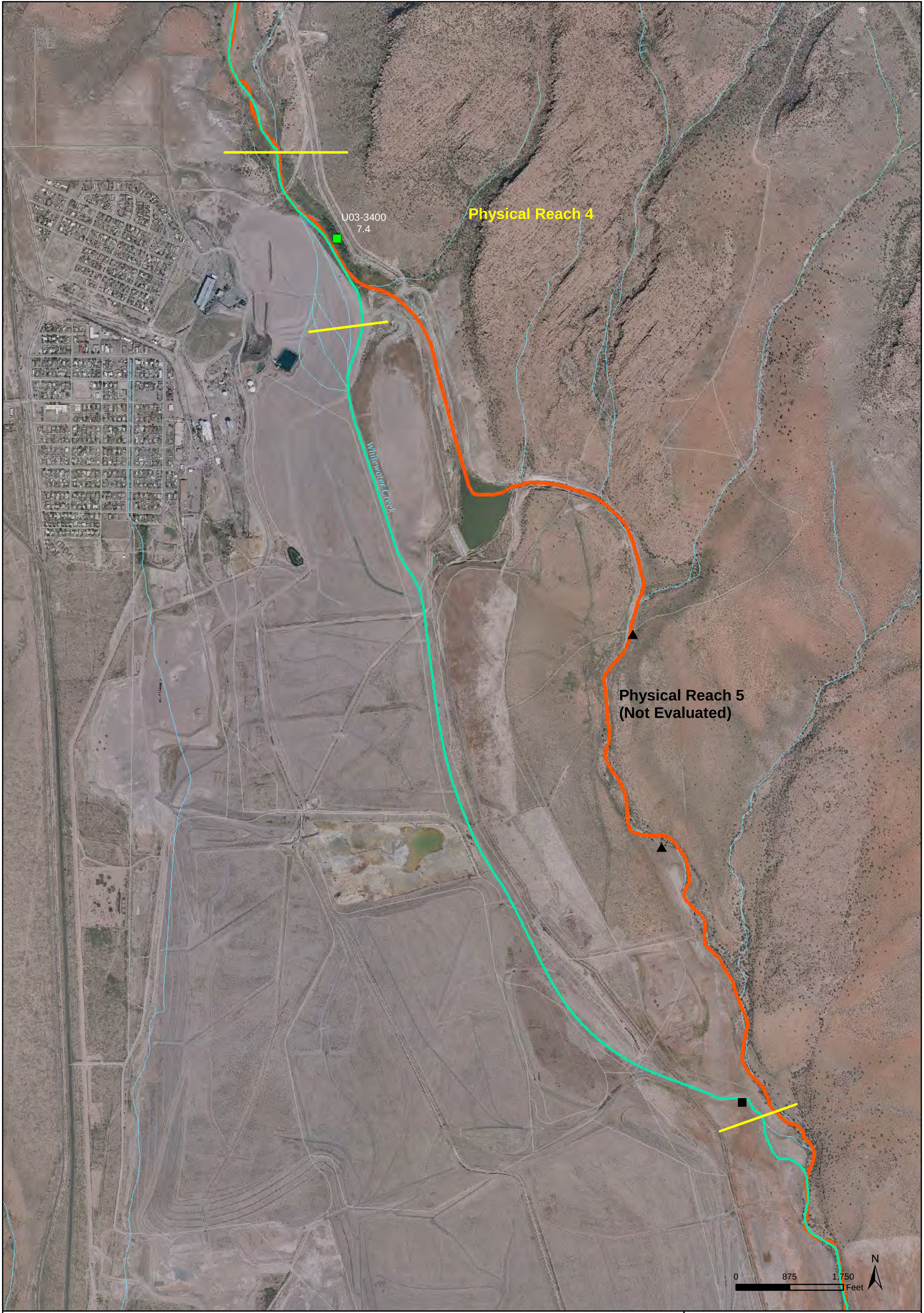
Ecological Risk Assessment

Figure 2.1-3
Soil pCu^{2+}Results
Physical Reach 3

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2.2-4_PCU_PR4_PR5.MXD



Legend

Golder		ECO RI (2001)		Phase I RI (2000)	
🟥	<= 5	▲	<= 5	🔴	< = 5
🟨	5 - 7	▲	5 - 7	🟡	5 - 7
🟩	> 7	▲	> 7	🟢	> 7

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
River/Stream
Physical Reach
Road
Railroad

Samples in Physical Reach 5 part of
STSIU (Smelter Tailings Soil Investigation Unit)

Sampling locations without labels were removed from the
assessment as discussed in Section 1.1

2014 Natural Color Aerial Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 2.1-4
Soil pCu^{2+}Results
Physical Reaches 4 and 5

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2.2-5_PCU_PR6_PR7.MXD

Legend

Golder

🟥 <= 5

🟨 5 - 7

🟩 >7

Hist. Hanover & Whitewater Cr.

Current Whitewater Creek

Road

Railroad

Physical Reach

River/Stream

Note:
Results include those from the Post-Tailings Spill Sampling Event, November, 1999. (Golder, 2000)

2014 Natural Color Aerial Photography

Chino Mines AOC

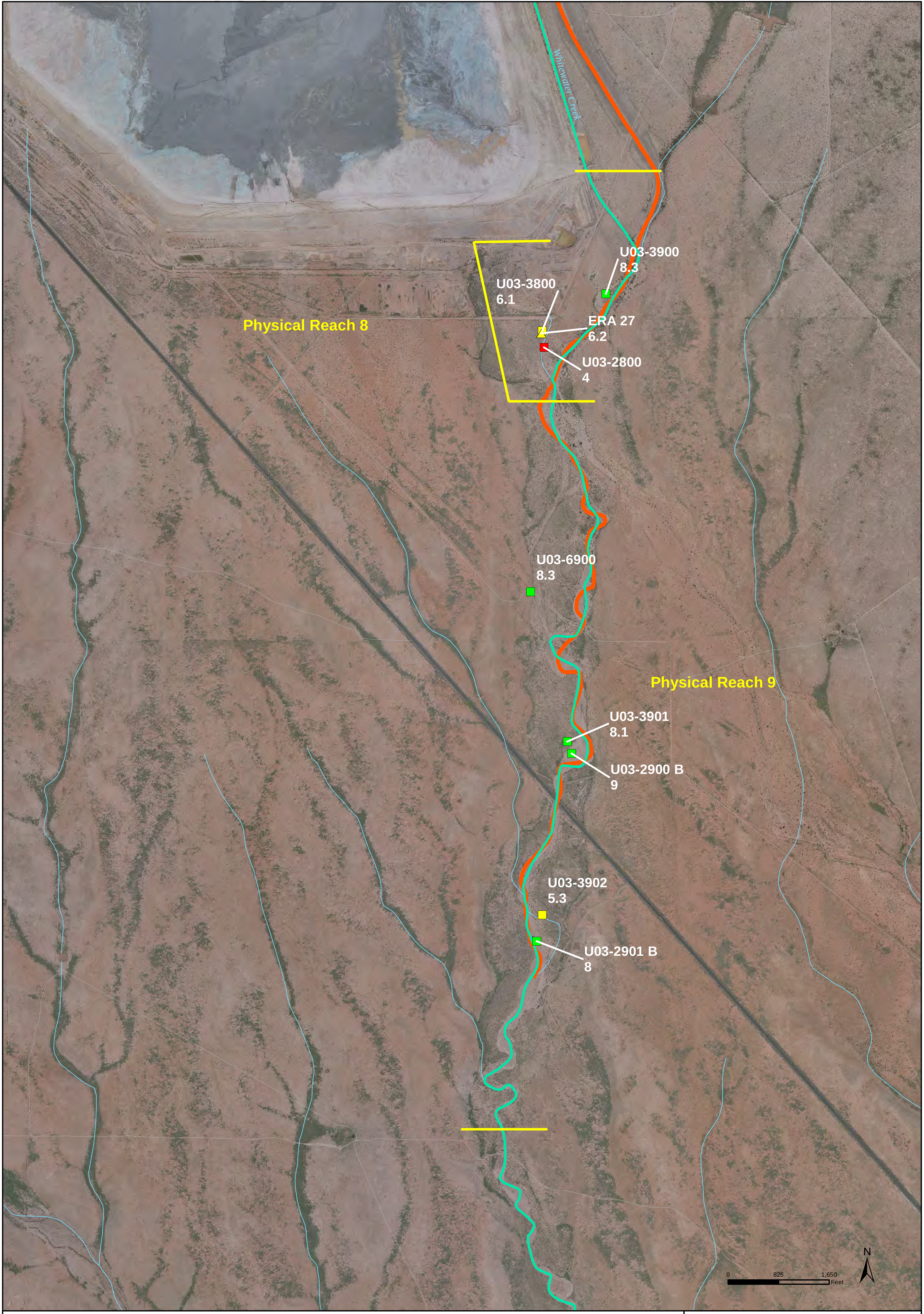
H/WCIU
Ecological Risk Assessment

Figure 2.1-5
Soil pCu^{2+}Results
Physical Reaches 6 and 7

PRJ: 0473-002-900
DATE: 10/29/2015
REV: 0
BY: CRL
CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2.2-6_PCU_PR8_PR9.MXD



Legend

Golder		**ECO RI (2001)**			
🟥	<= 5	▲	<= 5		Hist. Hanover & Whitewater Cr.
🟨	5 - 7	△	5 - 7		Current Whitewater Creek
🟩	> 7	▲	> 7		Road
					Railroad
					Physical Reach
					River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

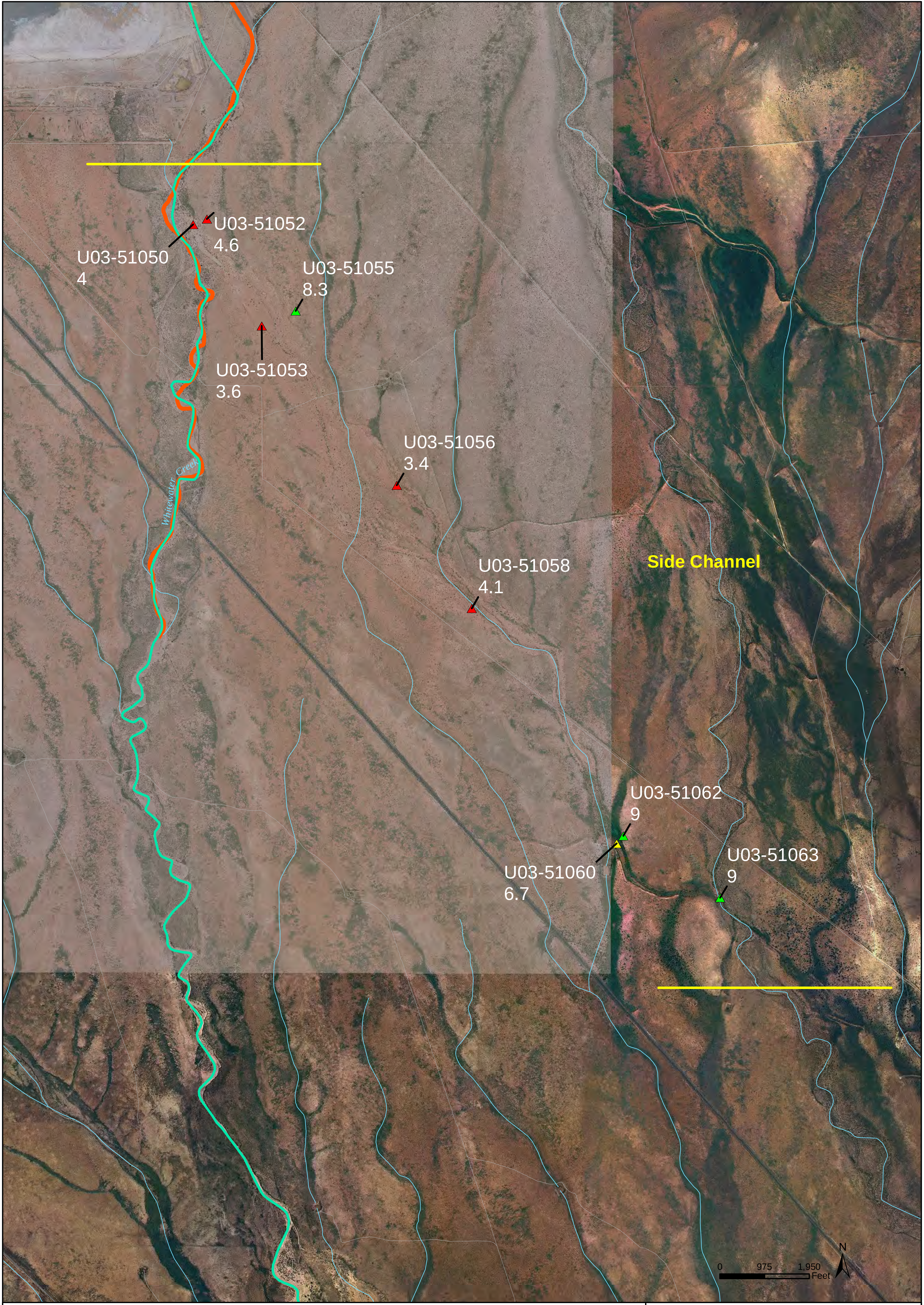
Figure 2.1-6

Soil pCu^{2+}Results
Physical Reaches 8 and 9

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2.1-7_PCU_SC.MXD



Legend

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- River/Stream
- Road
- Railroad
- Physical Reach

ECO RI (2001)

- ▲ <= 5
- ▲ 5 -7
- ▲ > 7

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU

Ecological Risk Assessment

Figure 2.1-7

Soil pCu^{2+} Results

Side Channel

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG2.2-8_PCU_LWW.MXD

Legend

Overbank	**Upland**
🟥 <= 5	● <= 5
🟨 5 - 7	● 5 - 7
🟩 > 7	● > 7

Hist. Hanover & Whitewater Cr.

Current Whitewater Creek

Road

Railroad

River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC

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Ecological Risk Assessment

Figure 2.1-8

Soil pCu^{2+}Results

Lower Whitewater Creek

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION ENVIRONMENTAL

Figure 2.3-1

Phytotoxicity Endpoints vs Cupric Ion Activity (pCu^{2+})

(Originally presented as Figure 2.5-1 in the Sitewide BERA)

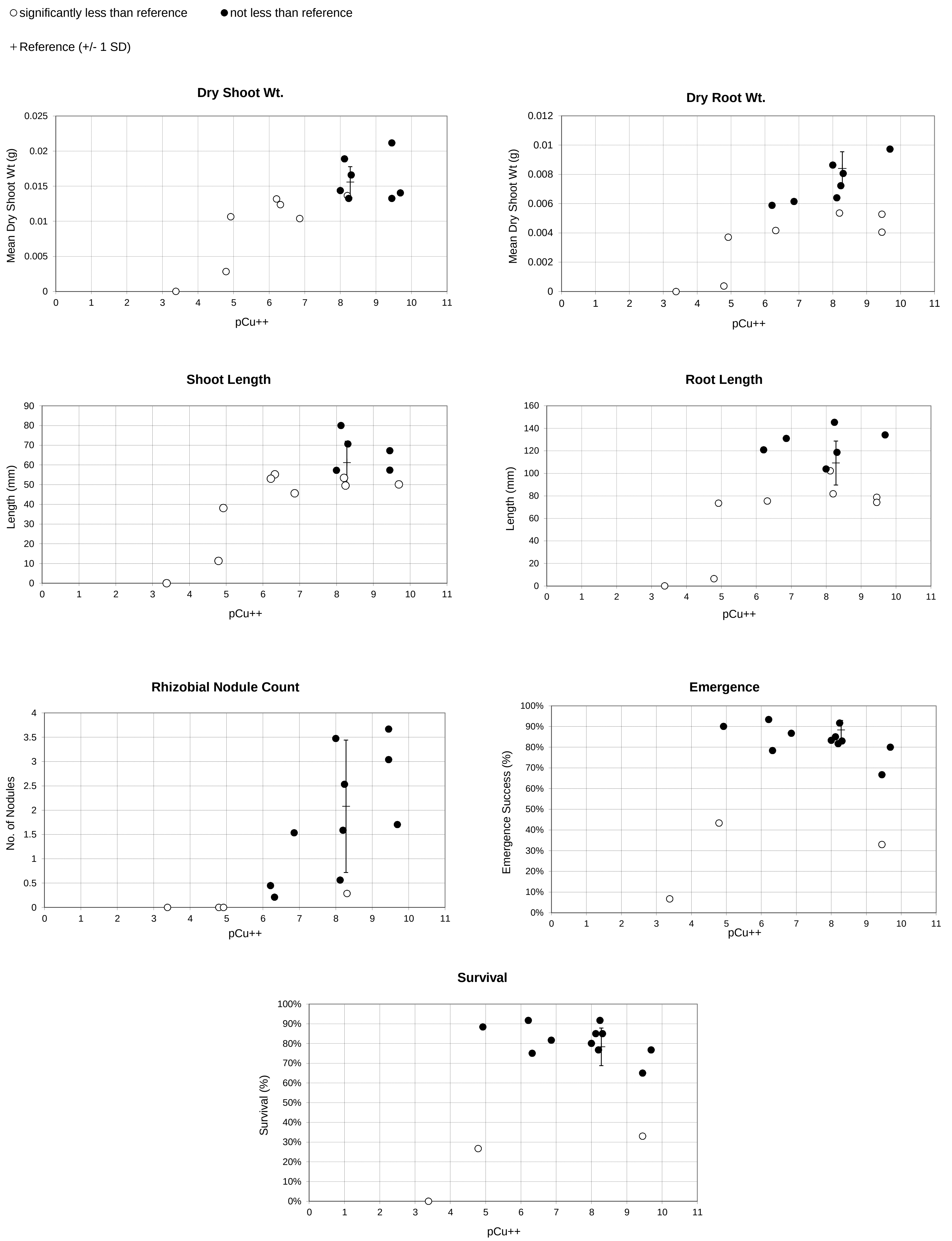


Figure 2.3-2 A
Phytotoxicity Endpoints vs Cupric Ion Activity (pCu^{2+}): pH data from Test Initiation
Chino Mines ERA

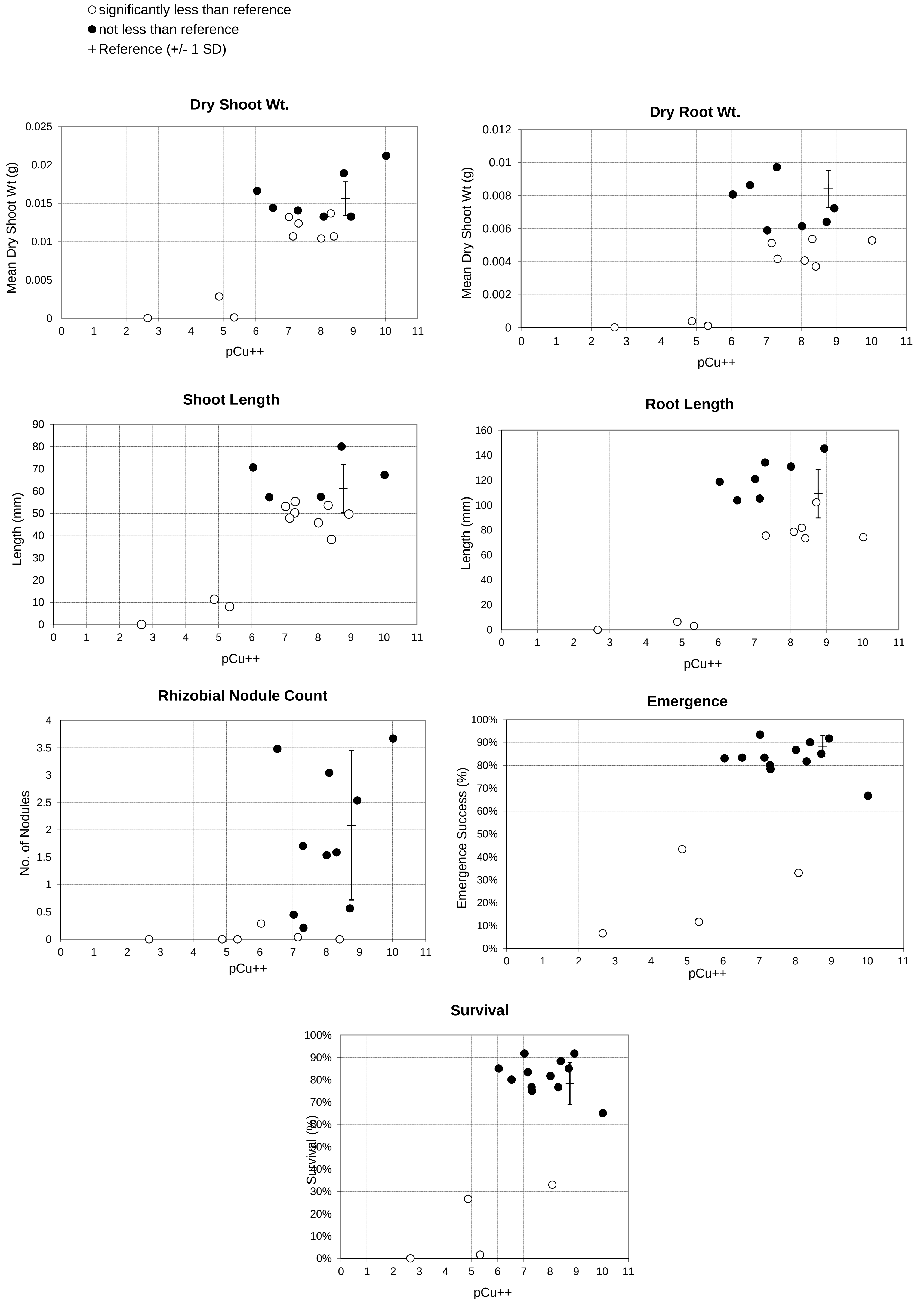
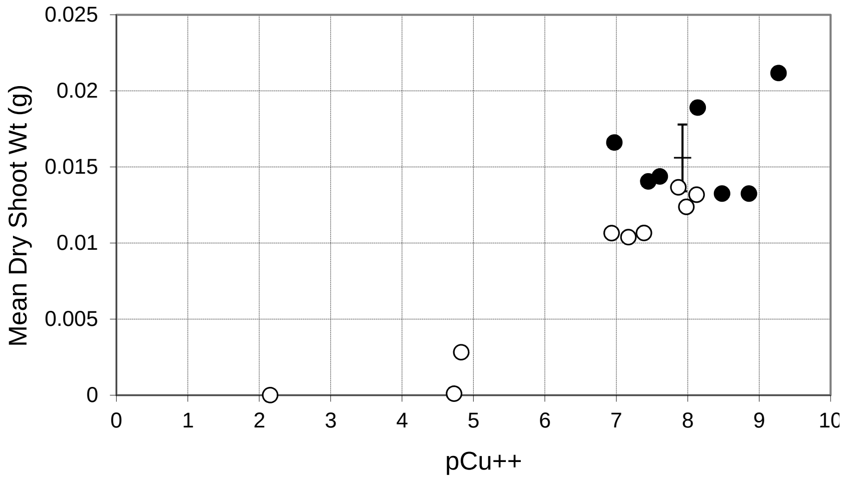


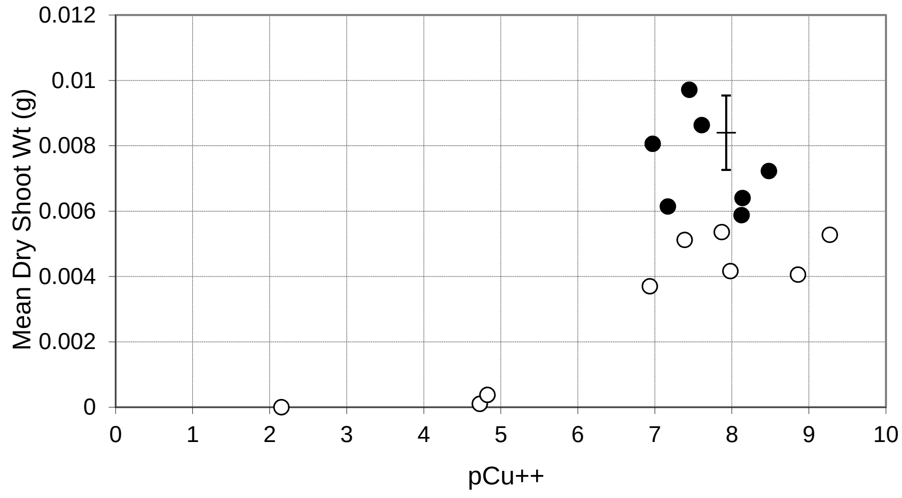
Figure 2.3-2 - B
Phytotoxicity Endpoints vs Cupric Ion Activity (pCu^{2+}): pH data from Test Termination
Chino Mines ERA

○ significantly less than reference
● not less than reference
+ Reference (+/- 1 SD)

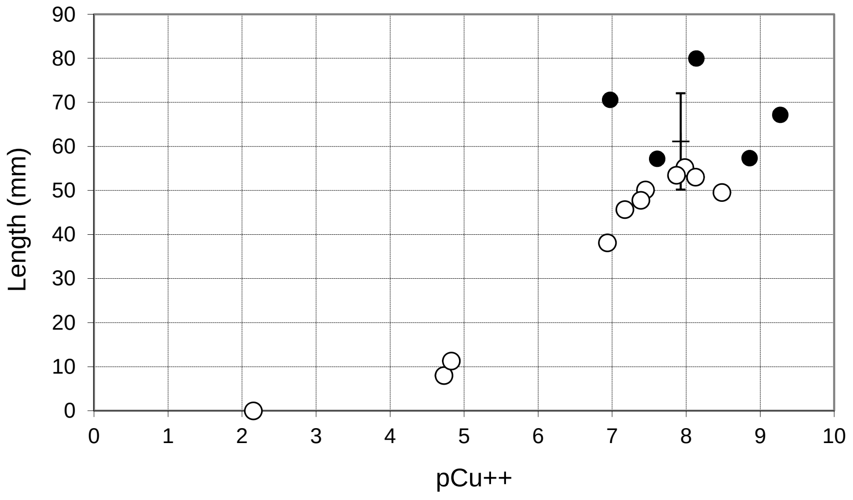
Dry Shoot Wt.



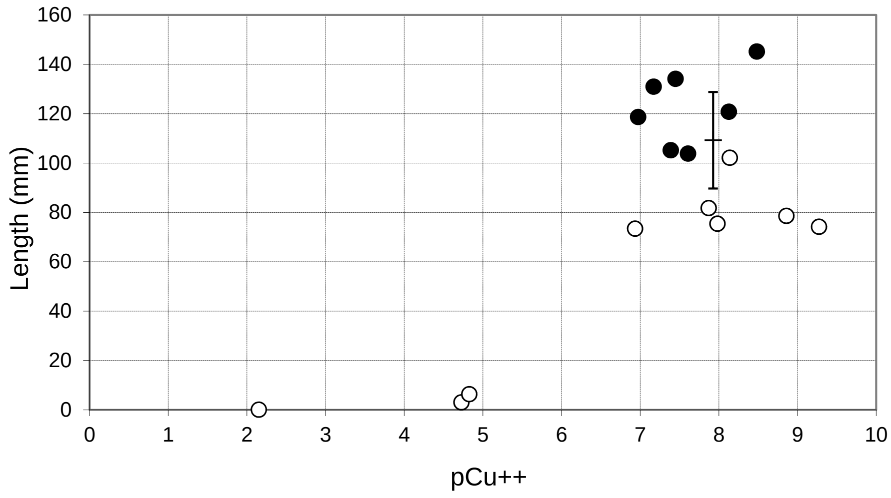
Dry Root Wt.



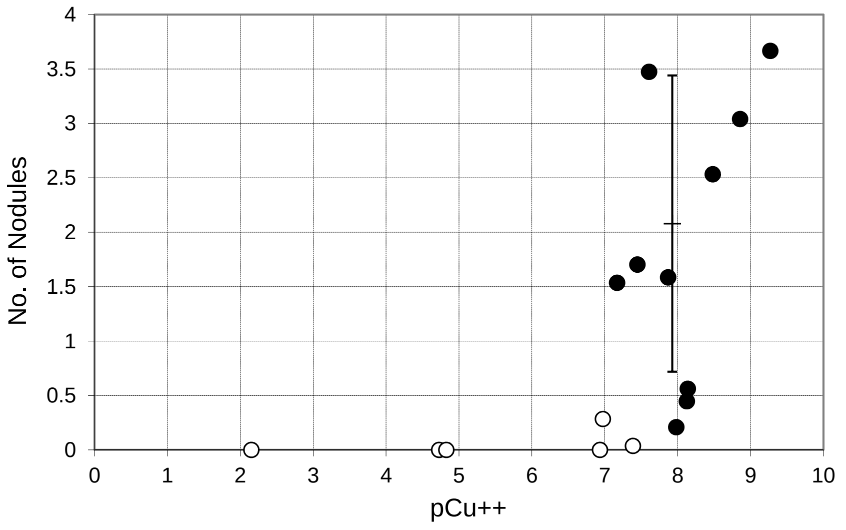
Shoot Length



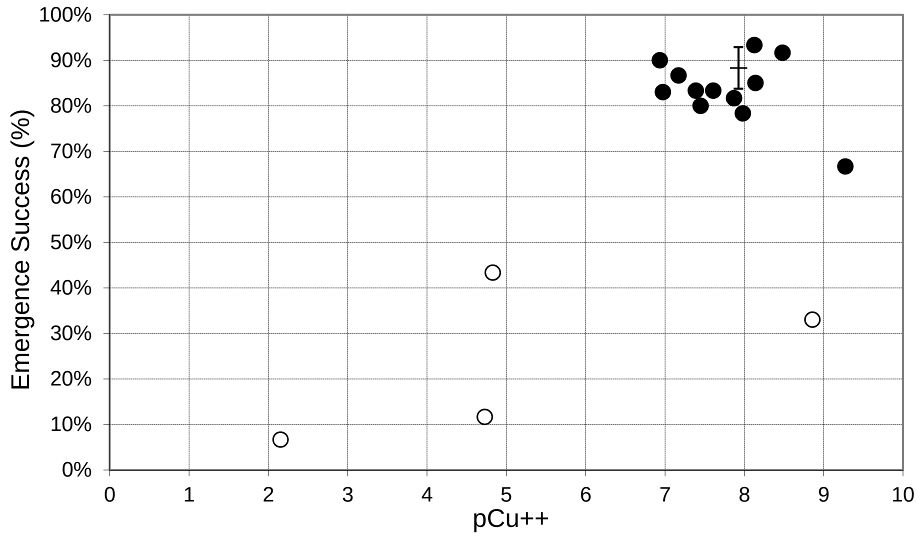
Root Length



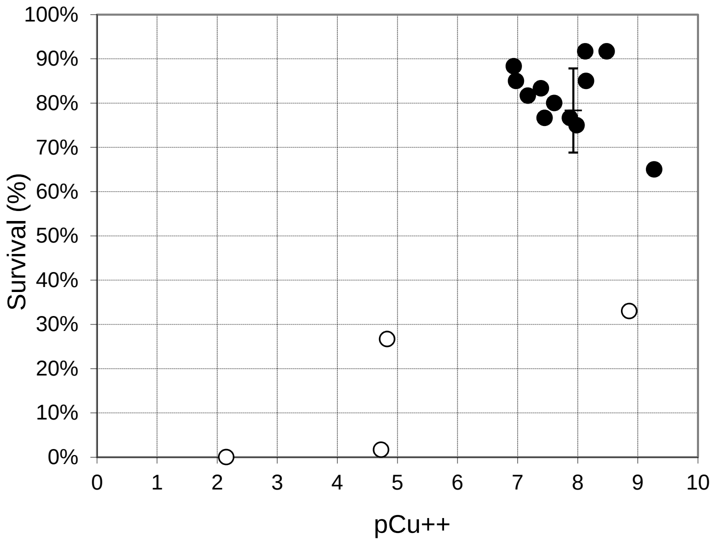
Rhizobial Nodule Count



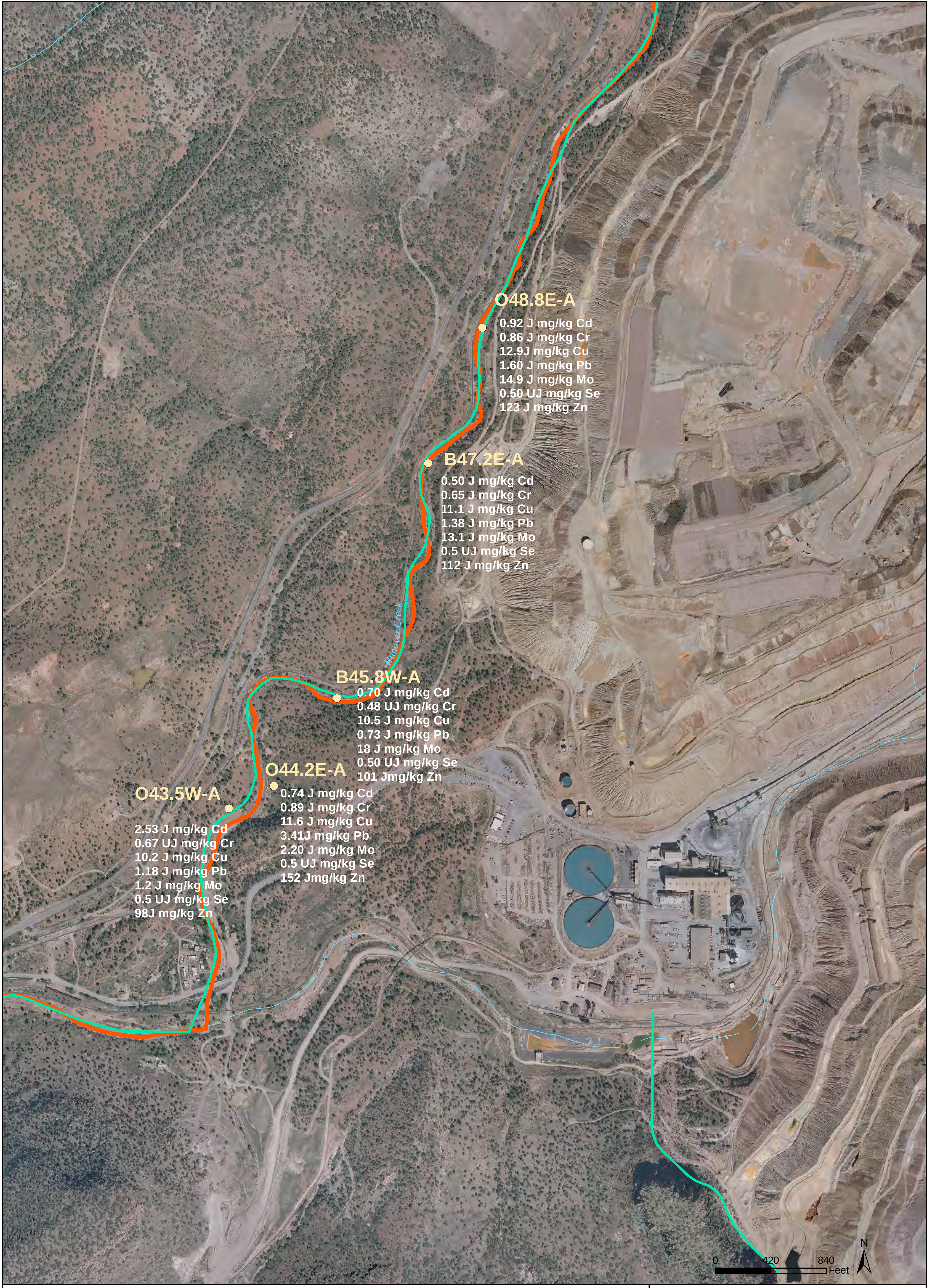
Emergence



Survival



S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.4-1_HANOVER_FOL.MXD



Legend

Golder (2008)

- ● Foliage Sampling Location
- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- Road
- Railroad
- River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

Figure 3.2-1

Foliage Sampling Results
Hanover Creek

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.4-2_HANOVER_SEEDS.MXD

Legend

Golder (2008)

● Seed Head Sampling Location

Hist. Hanover & Whitewater Cr.

Current Whitewater Creek

Road

Railroad

River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

Figure 3.2-2

Seed Head Sampling Results
Hanover Creek

PRJ: 0473-002-900	DATE: 10/29/2015
REV: 0	BY: CRL CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.4-3_HANOVER_INVERTS.MXD

Legend

Golder (2008)

● Invertebrate Sampling Location

— Hist. Hanover & Whitewater Cr.

— Current Whitewater Creek

— Road

—+— Railroad

— River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

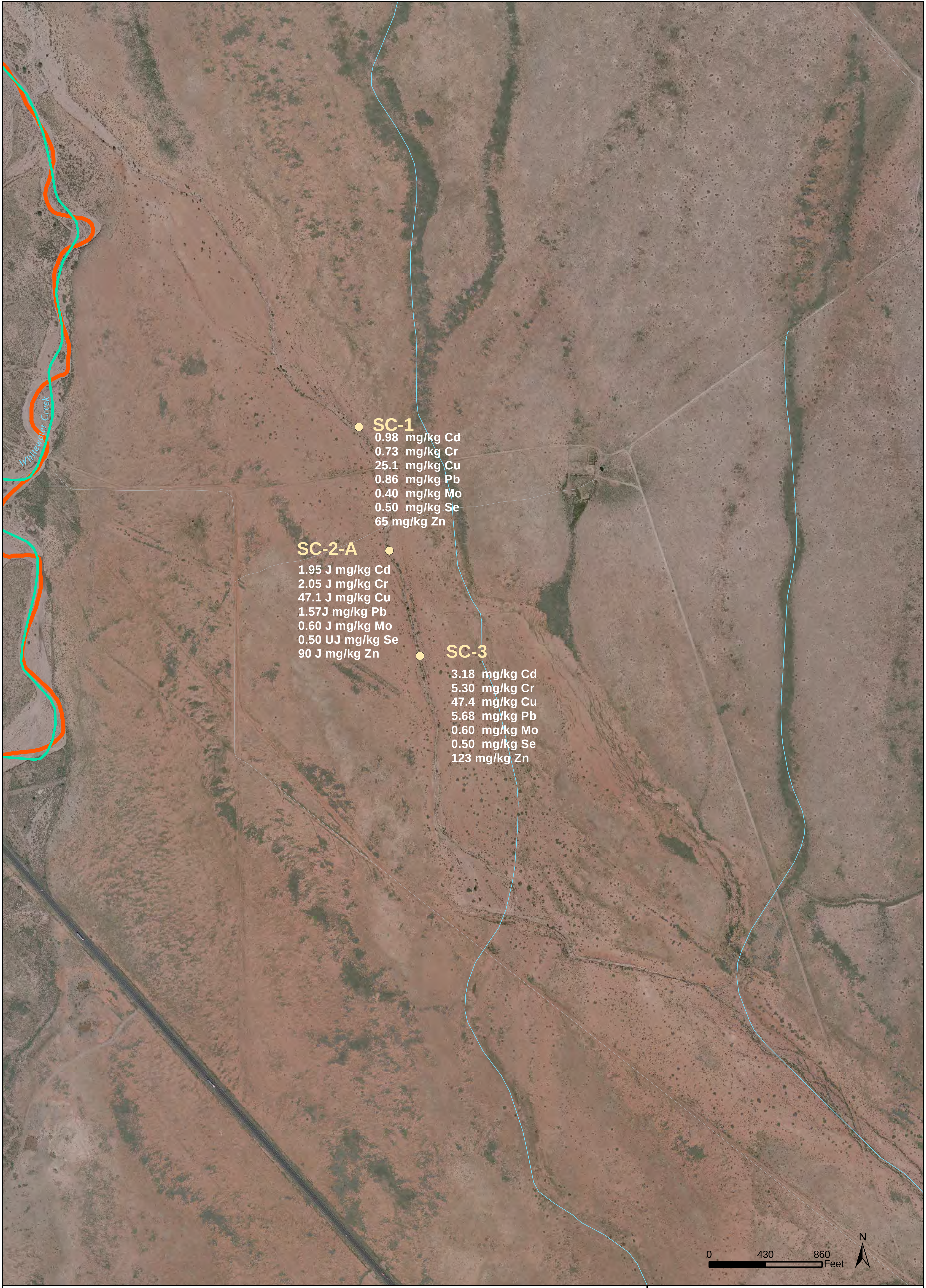
Figure 3.2-3

Invertebrate Sampling Results
Hanover Creek

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.4-4_SIDECHANNELFOLIAGE.MXD



Legend

Golder (2008)

- ● Foliage Sampling Location
- ━ Hist. Hanover & Whitewater Cr.
- ━ Current Whitewater Creek
- ─ Road
- ┼ Railroad
- ─ River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

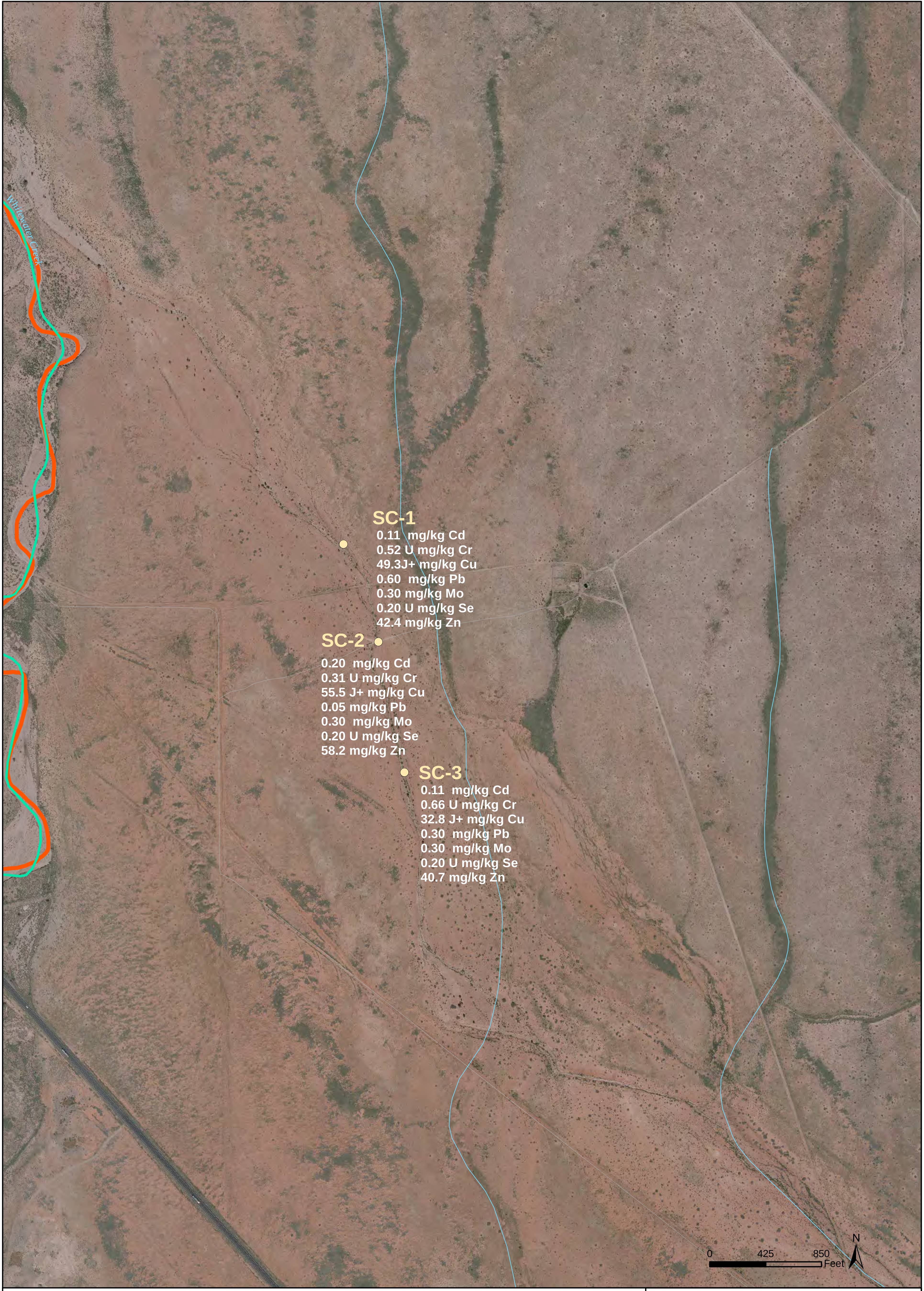
Figure 3.2-4

Foliage Sampling Results
Side Channel

PRJ: 0473-002-900
DATE: 10/29/2015
REV: 0
BY: CRL
CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.4-5_SIDECHANNEL_INVERTS.MXD



Legend

Golder (2008)

● Invertebrate Sampling Location

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Road
Railroad
River/Stream

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

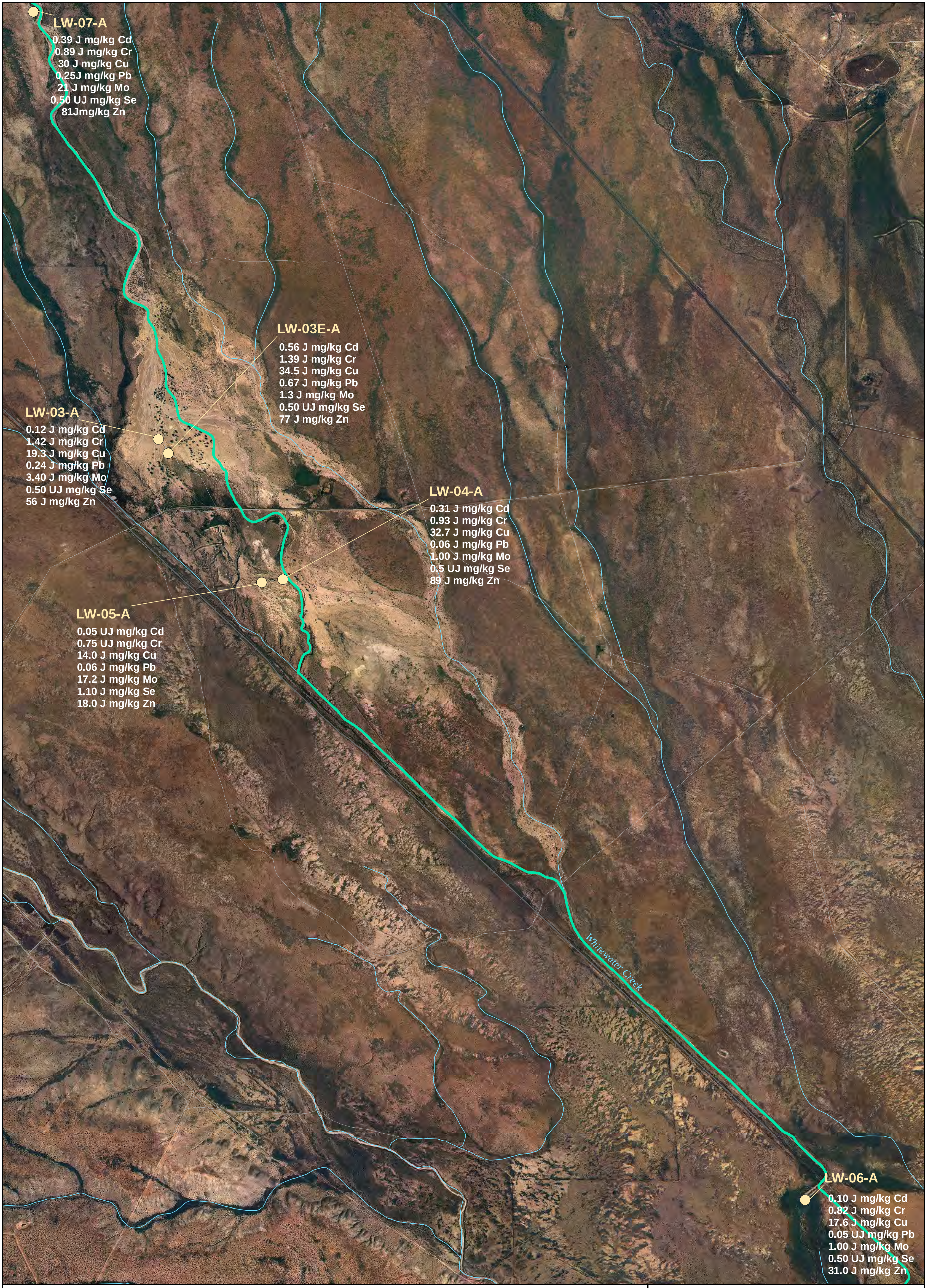
Figure 3.2-5

Invertebrate Sampling Results
Side Channel

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.4-6_LOWERWW_FOL.MXD



Legend

Golder (2008)

● Foliage Sampling Location

Hist. Hanover & Whitewater Cr.

Current Whitewater Creek

Road

Railroad

River/Stream

0 2,000 4,000 Feet

N

2014 Natural Color Aerial Photography

Chino Mines AOC

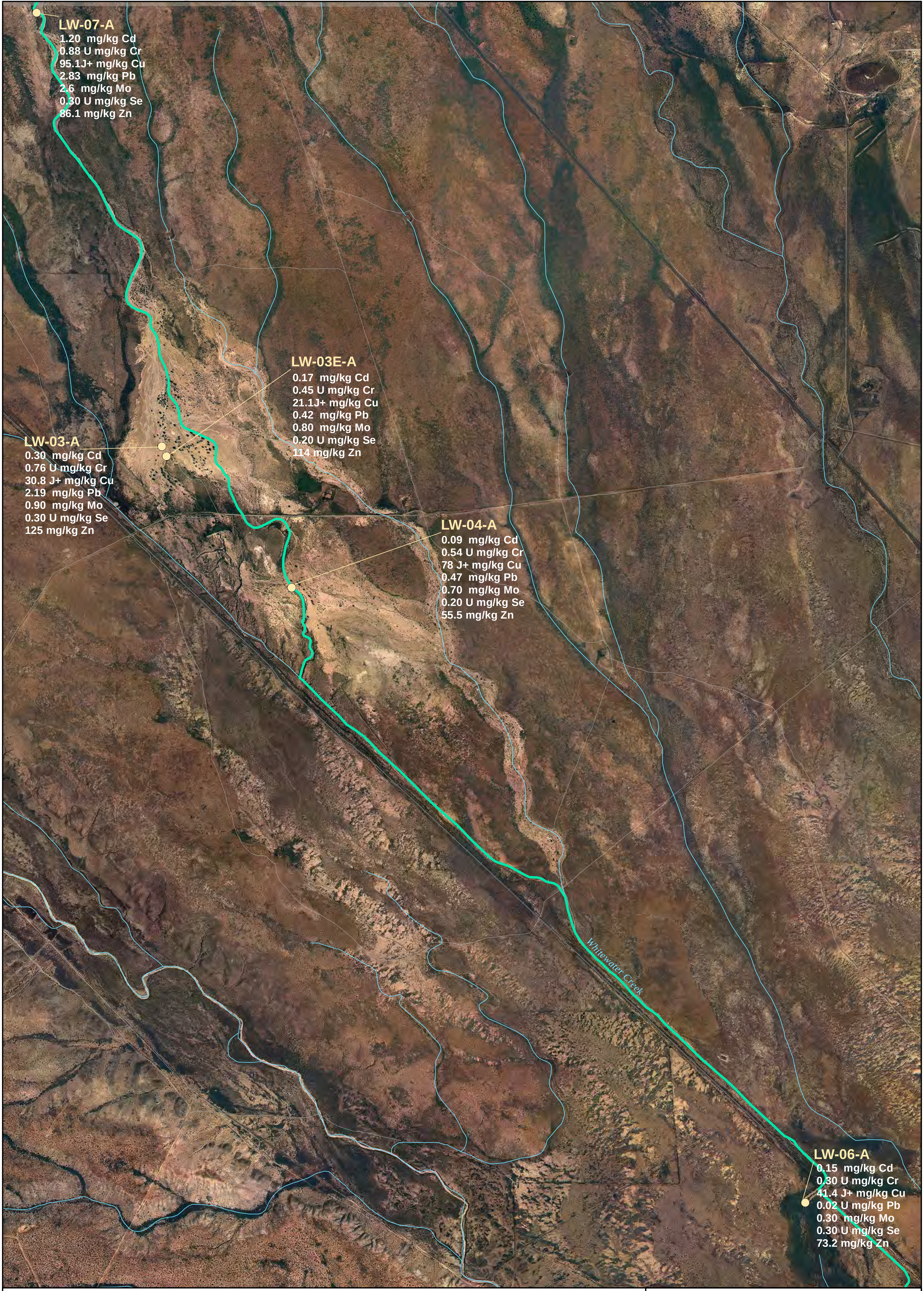
H/WCIU
Ecological Risk Assessment

Figure 3.2-6

Foliage Sampling Results
Lower Whitewater Creek

PRJ: 0473-002-900	DATE: 8/14/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION ENVIRONMENTAL



Legend

NewFields (2008)

● Invertebrate Sampling Location

Hist. Hanover & Whitewater Cr.

Current Whitewater Creek

Road

Railroad

River/Stream

0 2,000 4,000 Feet

N

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

Figure 3.2-7

Invertebrate Sampling Results
Lower Whitewater Creek

PRJ: 0473-002-900	DATE: 8/14/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION ENVIRONMENTAL

Legend

Composite Samples	Overbank Samples	Vegetated Bar Samples
△ < 1114	○ < 1114	□ < 1114
△ 1114 - 1600	● 1114 - 1600	■ 1114 - 1600
▲ > 1600	● >1600	■ > 1600

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- River/Stream
- Road
- Railroad

Note:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC
2014 Natural Color Aerial Photography

0 770 1,540
Feet
N

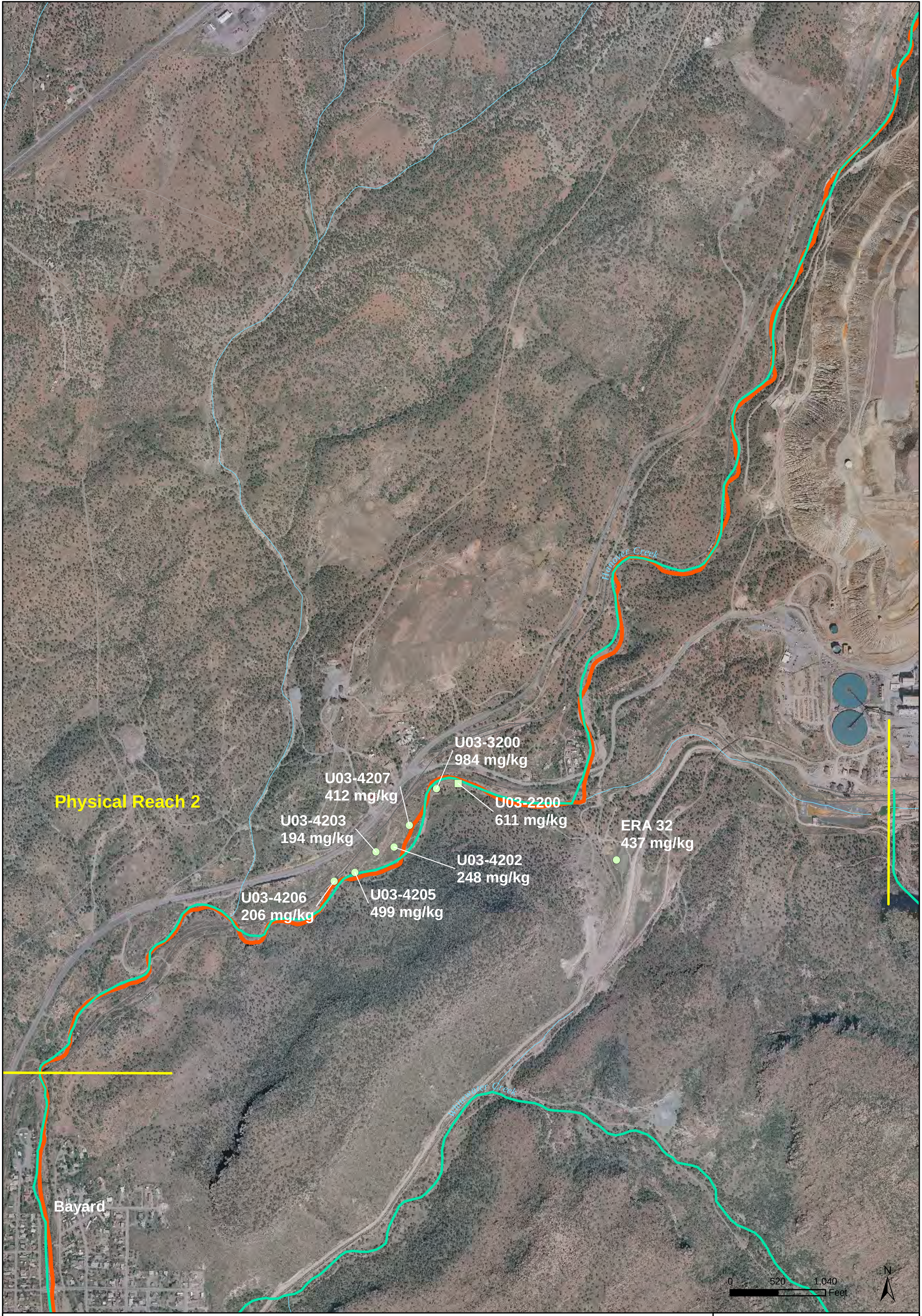
Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-1
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Physical Reach 1

PRJ: 0473-002-900	DATE: 8/14/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.2-2_CUSSLS_PR2.MXD



Legend

Overbank Samples		Vegetated Bar Samples	
●	< 1114	■	< 1114
●	1114 - 1600	■	1114 - 1600
●	>1600	■	> 1600

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- Road
- Railroad
- Physical Reach
- River/Stream

Notes:
1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC

Data from ERA32 replaced with 95% UCL of
post-remediation composite samples from Golder (2009)

2014 Natural Color Aerial Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-2
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Physical Reach 2

PRJ: 0473-002-900
DATE: 10/29/2015
REV: 0
BY: CRL
CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3_3-03_CUSSLS_PR3.MXD

Legend

Overbank Samples
- ○ < 1114
- ● 1114 - 1600
- ● >1600

Vegetated Bar Samples
- ■ < 1114
- ■ 1114 - 1600
- ■ > 1600

Terrace Samples
- ◇ < 1114
- ◆ 1114 - 1600
- ◆ >1600

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
River/Stream
Road
Railroad
Physical Reach

Note: 1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC

0 1,250 2,500
Feet
N

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-3
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Physical Reach 3

PRJ: 0473-002-900	DATE: 8/14/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.2-4 CUSSLS PR4 PR5.MXD

Legend

Overbank Samples

- ● < 1114
- ● 1114 - 1600
- ● >1600

- — Hist. Hanover & Whitewater Cr.
- — Current Whitewater Creek
- — River/Stream
- — Road
- —+—+— Railroad
- — Physical Reach

Notes:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC
Samples in Physical Reach 5 part of
STSIU (Smelter Tailings Soil Investigation Unit)
2014 Natural Color Aerial Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-4
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Physical Reaches 4 and 5

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.2-5_CUSSLS_PR6_PR7.MXD

Legend

Overbank Samples	Vegetated Bar Samples	Terrace Samples
○ < 1114	□ < 1114	△ < 1114

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
River/Stream
Road
Railroad
Physical Reach

Note:
Results include those from the Post-Tailings Spill Sampling Event, November, 1999 (Golder, 2000).

Note:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC

2014 Natural Color Aerial Photography

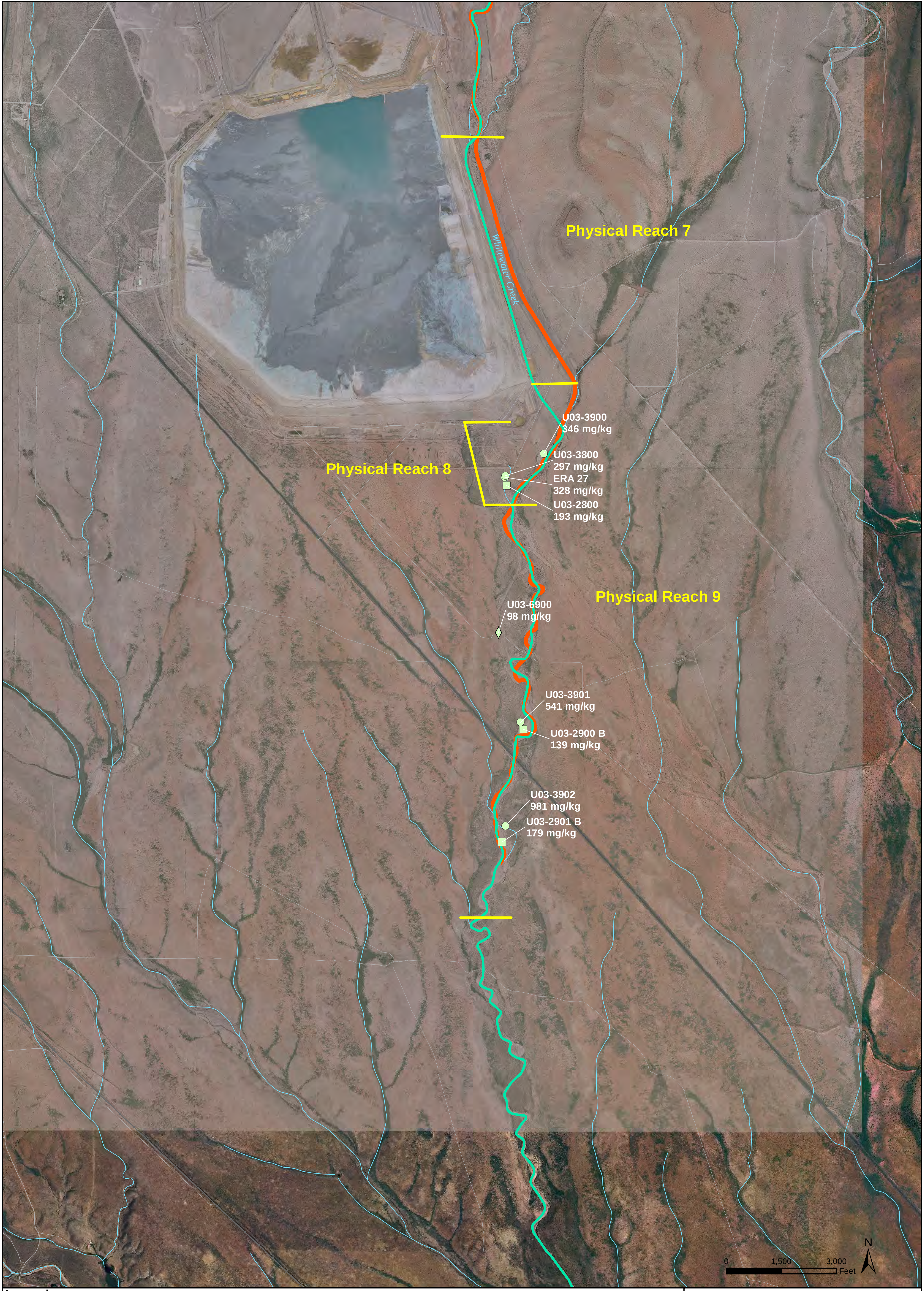
Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-5
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Physical Reaches 6 and 7

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.2-6_CUSSLS_PR8_PR9.MXD



Legend

Terrace Samples	Overbank Samples	Vegetated Bar Samples	
◆ < 1114	● < 1114	■ < 1114	Hist. Hanover & Whitewater Cr.
◆ 1114 - 1600	● 1114 - 1600	■ 1114 - 1600	Current Whitewater Creek
◆ >1600	● >1600	■ > 1600	Road
			Railroad
			Physical Reach
			River/Stream

Note:
Results include those from the
Post-Tailings Spill Sampling Event,
November, 1999 (Golder, 2000).

Note:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC

2014 Natural Color Aerial Photography

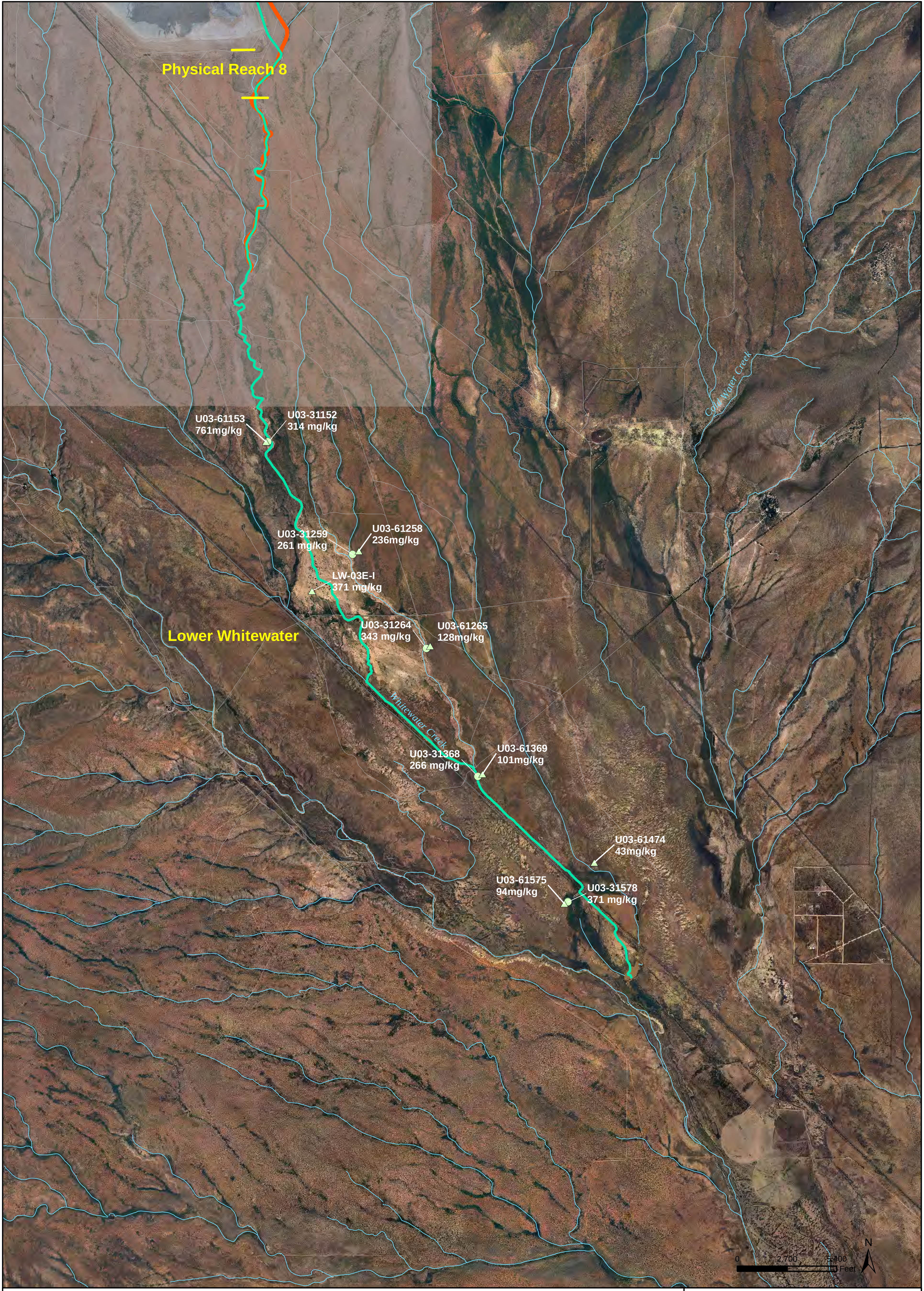
Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-6
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Physical Reaches 8 and 9

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.3-7_CUSSLS_LWW.MXD



Legend

Composite Samples		Overbank Samples	
△	< 1114	○	< 1114
△	1114 - 1600	●	1114 - 1600
▲	> 1600	●	>1600

- Hist. Hanover & Whitewater Cr.
- Road
- Railroad
- River/Stream

Note:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU

Ecological Risk Assessment

Figure 3.3-7

Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Lower Whitewater Creek

PRJ: 0473-002-900
DATE: 10/29/2015
REV: 0
BY: CRL
CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.2-8_CUSSLS_BC.MXD

Legend

Overbank Samples

- ○ **< 1114**
- ● **1114 - 1600**
- ● **>1600**

▬	Hist. Hanover & Whitewater Cr.
▬	Current Whitewater Creek
—	River/Stream
—	Road
┼	Railroad
—	Physical Reach

Note:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC

2014 Natural Color Aerial Photography

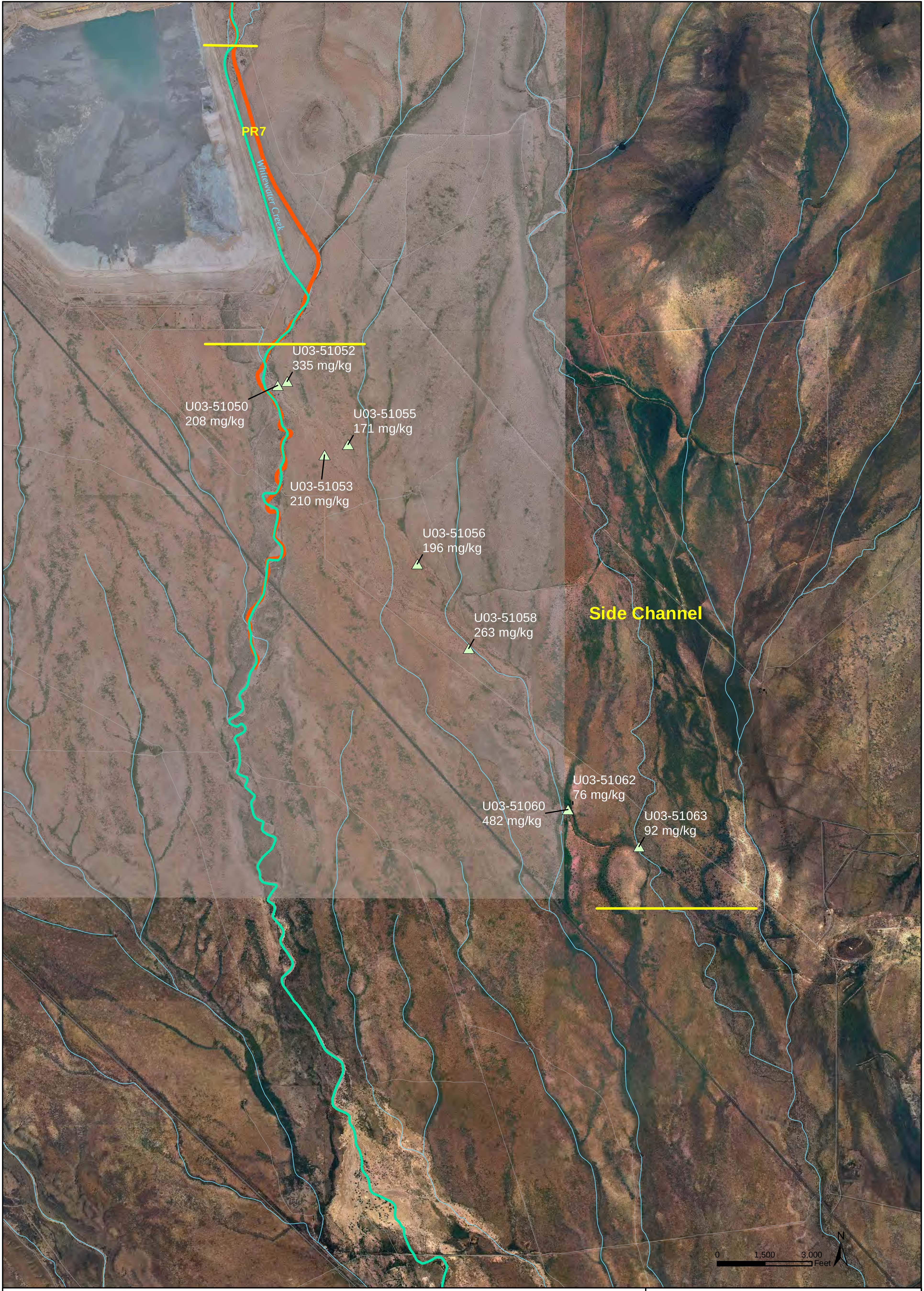
Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 3.3-8
Comparison of Soil Sample
Results to Copper Benchmarks for the
Small Ground-Feeding Bird
Bayard Canyon

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3.2-9_CUSSLS_SC.MXD



Legend

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- River/Stream
- Physical Reach
- Road
- Railroad

Composite Samples

- △ < 1114
- △ 1114 - 1600
- ▲ > 1600

Note:1,114 mg/kg = Small Ground Feeding Bird RBC;
1,600 mg/kg = S/TSIU pre-FS RAC
2014 Natural Color Aerial Photography

Chino Mines AOC

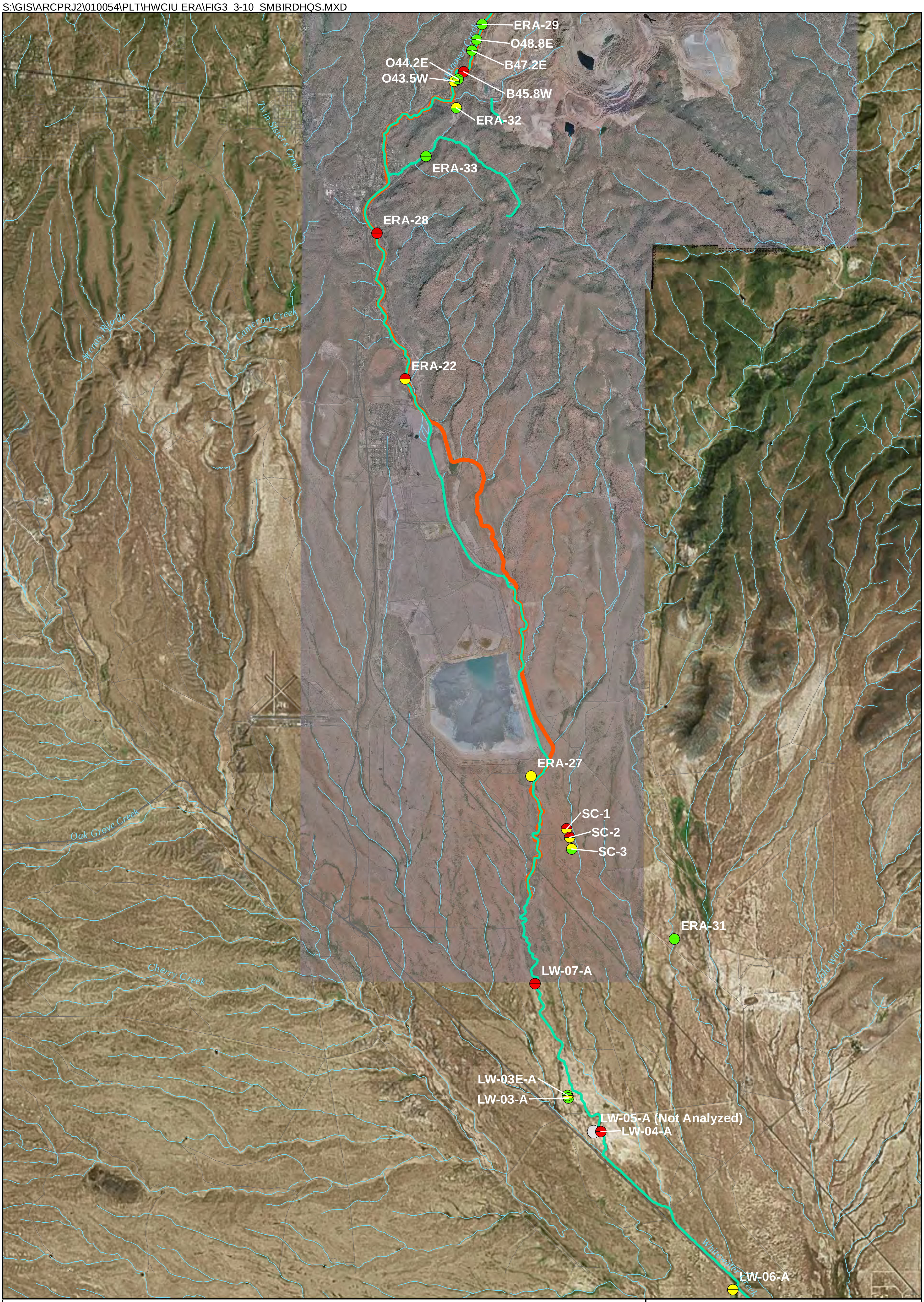
H/WCIU
Ecological Risk Assessment

Figure 3.3-9
Comparison of Soil Sample Results to Copper Benchmarks for the Small Ground-Feeding Bird Side Channel

PRJ: 0473-002-900	DATE: 10/29/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG3_3-10_SMBIRDHQS.MXD



Legend

⊖ 100% Invertebrates
30% Seed 70% Invertebrates

Small Bird HQ 100% Invertebrate Diet

🟢 NOAEL HQ < 1
🟡 NOAEL HQ > = 1
🔴 LOAEL HQ > = 1

2014 Natural Color Aerial Photography

Small Bird HQ 30% Seed 70% Invertebrate Diet

🟢 NOAEL HQ < 1
🟡 NOAEL HQ > = 1
🔴 LOAEL HQ > = 1

River/Stream
Road
Railroad

0 0.75 1.5
Miles

N

Chino Mines AOC

H/WCIU
Ecological Risk Assessment

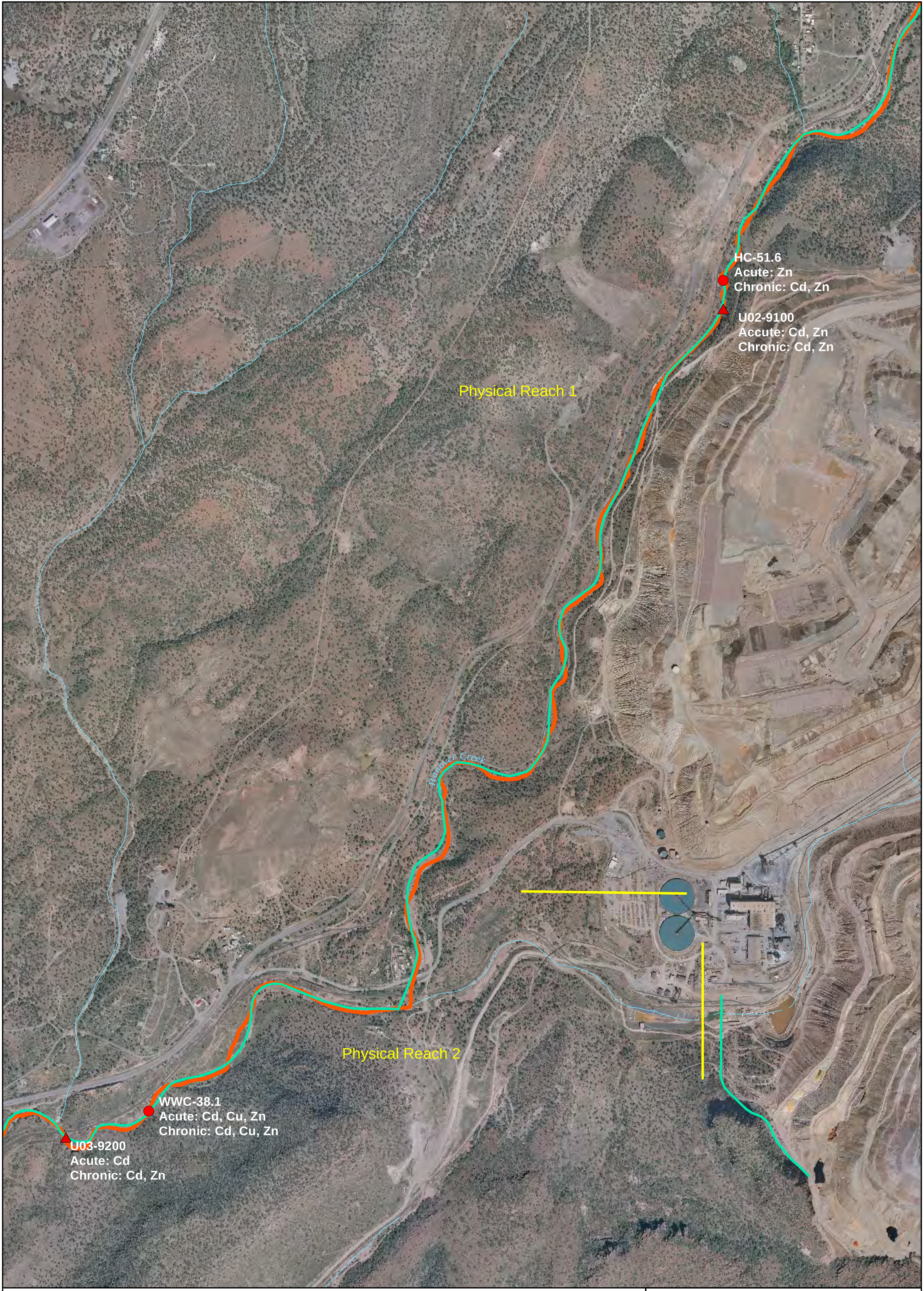
Figure 3.3-10

Small Ground-Feeding Bird Copper HQ Calculations for H/WCIU Locations with Tissue Data Available

PRJ: 0473-002-900	DATE: 8/14/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG 4.1-1_SRFP_RSLTS.MXD



Legend

Phase I RI (2000)
- ▲ Chronic Exceedance
- ▲ Acute Exceedance

Golder (2007)
- ● No Exceedance
- ● Chronic Exceedance
- ● Acute Exceedance
- ━ Hist. Hanover & Whitewater Cr.
- ━ Current Whitewater Creek

- ─ Road
- ┼ Railroad
- ━ Physical Reach
- ─ River/Stream

Note:
1). Results are for dissolved fraction (0.45um)

2014 Natural Color Aerial Photography

0 860 1,720
Feet

N

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 4.1-1

Summer Rainfall Pool Sample Results Compared to New Mexico Surface Water Standards Physical Reaches 1 and 2

PRJ: 0473-002-900	DATE: 8/14/2015	
REV: 0	BY: CRL	CHK: JMA

FORMATION
ENVIRONMENTAL

Legend

Golder (2008)		**Golder (2007)**		**Phase I RI (2000)**	
🟩	No Exceedance	●	No Exceedance	▲	No Exceedance
🟨	Chronic Exceedance	●	Chronic Exceedance	▲	Chronic Exceedance
🟥	Acute Exceedance	●	Acute Exceedance	▲	Acute Exceedance

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Road
Railroad
Physical Reach
River/Stream

2014 Natural Color Aerial Photography

Note:
Results are for dissolved fraction (0.45um)

0 1,000 2,000
Feet

N

CHINO MINES AOC
H/WCIU
ECOLOGICAL RISK ASSESSMENT

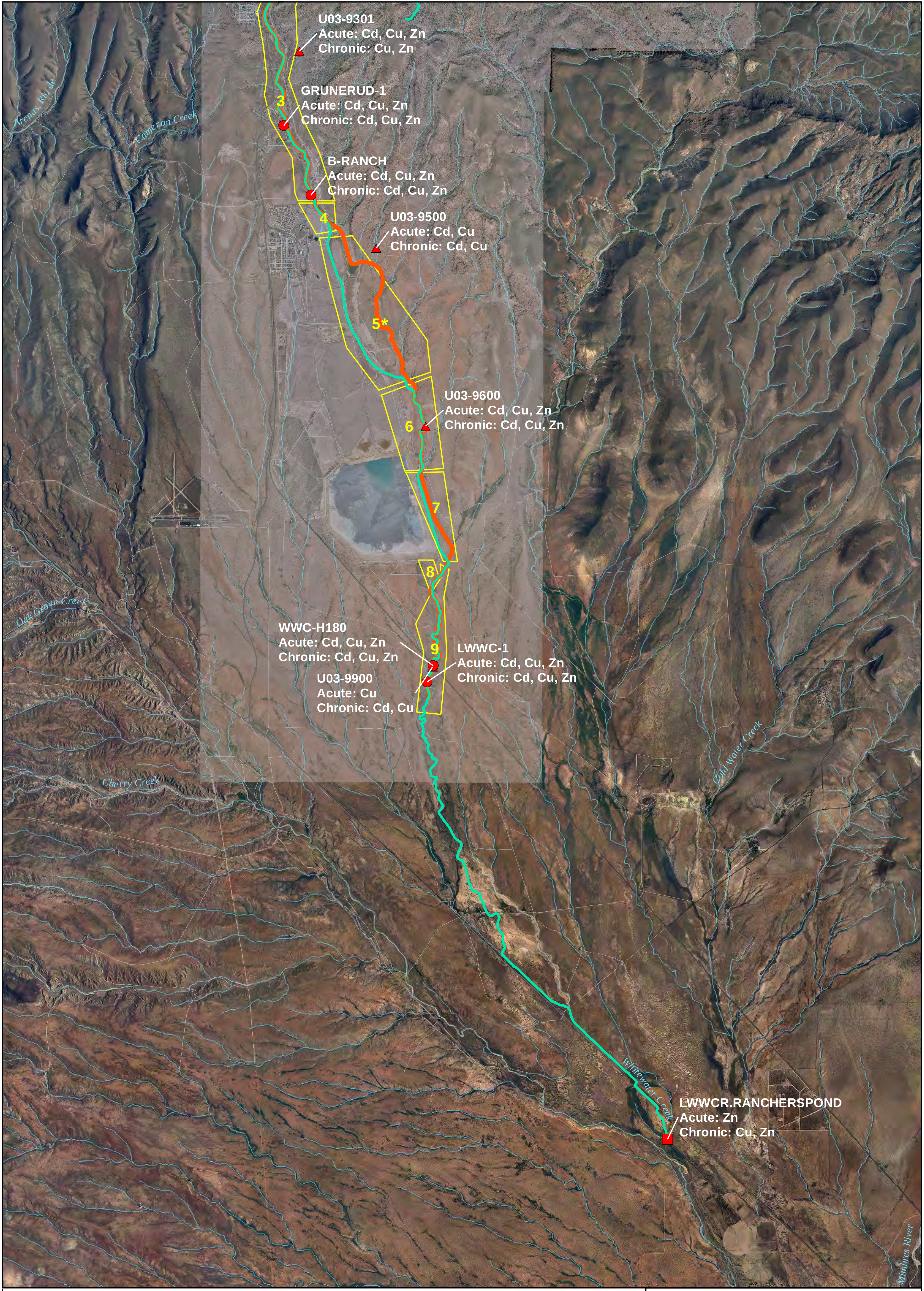
Figure 4.1-2

Summer Rainfall Pool Sample Results Compared To New Mexico Surface Water Standards Physical Reach 3

PRJ: 0473-002-900
DATE: 8/14/2015
REV: 0
BY: CRL
FOR: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.1-3_SRFP_RSLTS.MXD



Legend

Golder (2008)
- 🟩 No Exceedance
- 🟨 Chronic Exceedance
- 🟥 Acute Exceedance

Golder (2007)
- ● No Exceedance
- ● Chronic Exceedance
- ● Acute Exceedance

Phase I RI (2000)
- ▲ No Exceedance
- ▲ Chronic Exceedance
- ▲ Acute Exceedance

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Road
Railroad
Physical Reach
River/Stream

0 4,500 9,000 Feet
N

Notes:
Results are for dissolved fraction (0.45um)
*Samples in Physical Reach 5 part of
STSIU (Smelter Tailings Soil Investigation Unit)
2014 Natural Color Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 4.1-3
Summer Rainfall Pool Sample Results Compared to New Mexico Surface Water Standards Physical Reaches 3 - 9

PRJ: 0473-002-900	DATE: 8/14/2015
REV: 0	BY: CRL CHK: JMA

FORMATION ENVIRONMENTAL

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU

Ecological Risk Assessment

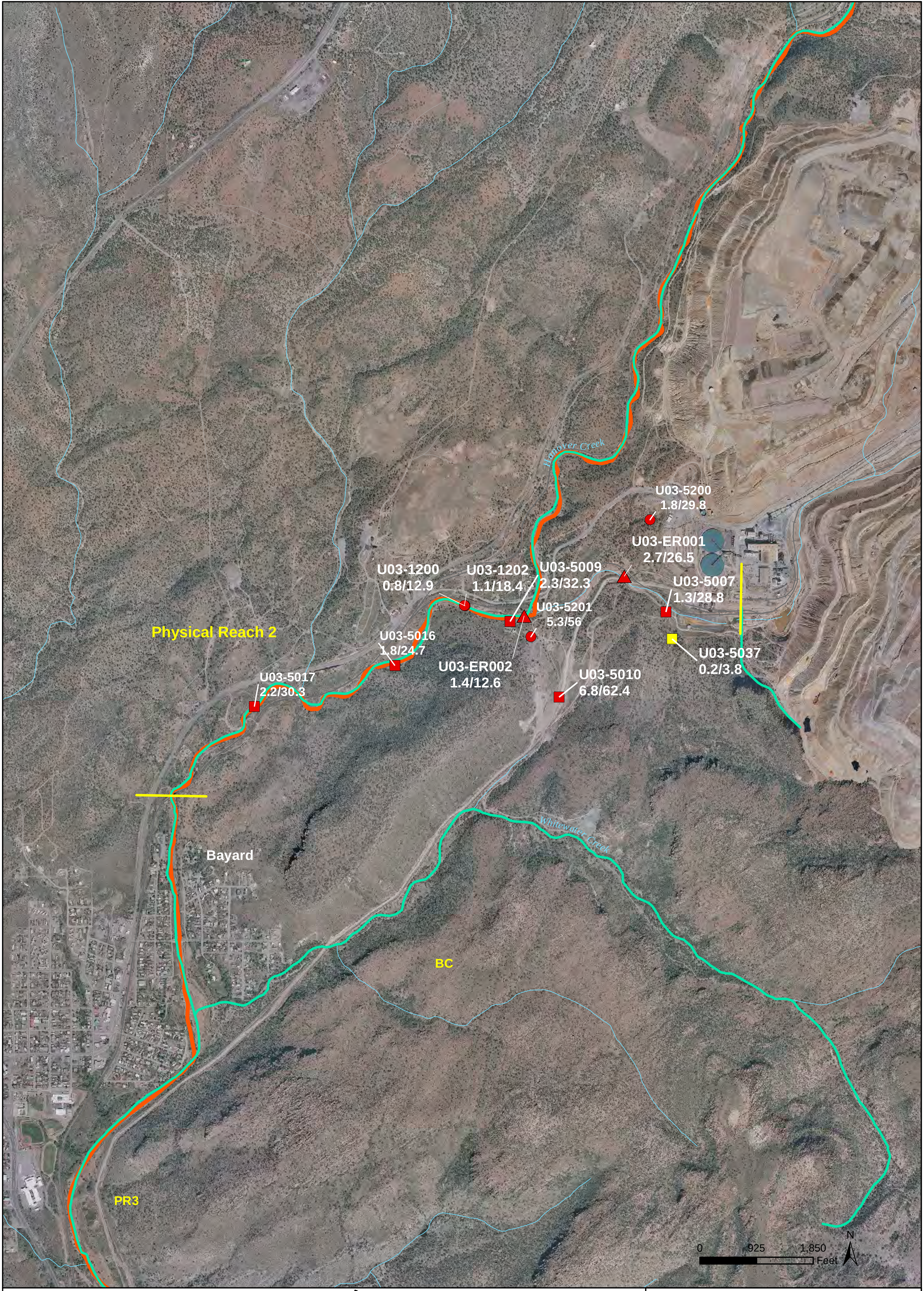
Figure 4.2-1

Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Physical Reach 1

PRJ: 0473-002-900	DATE: AUG 14, 2015	
REV: 0	BY: RLW	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.2-2_TRV_PR2.MXD



○ Sample ID
Mean PEC-Q/Sum SST

	BRI (1995)	Phase I RI (2000)	Golder (2008)
Mean PEC-Q < 0.6 and Sum SST < 3.0	🟩	🟢	▲
Mean PEC-Q < 0.6 and Sum SST > 3.0	🟨	🟡	▲
Mean PEC-Q > 0.6 and Sum SST > 3.0	🟥	🔴	🔺

2014 Natural Color Aerial Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

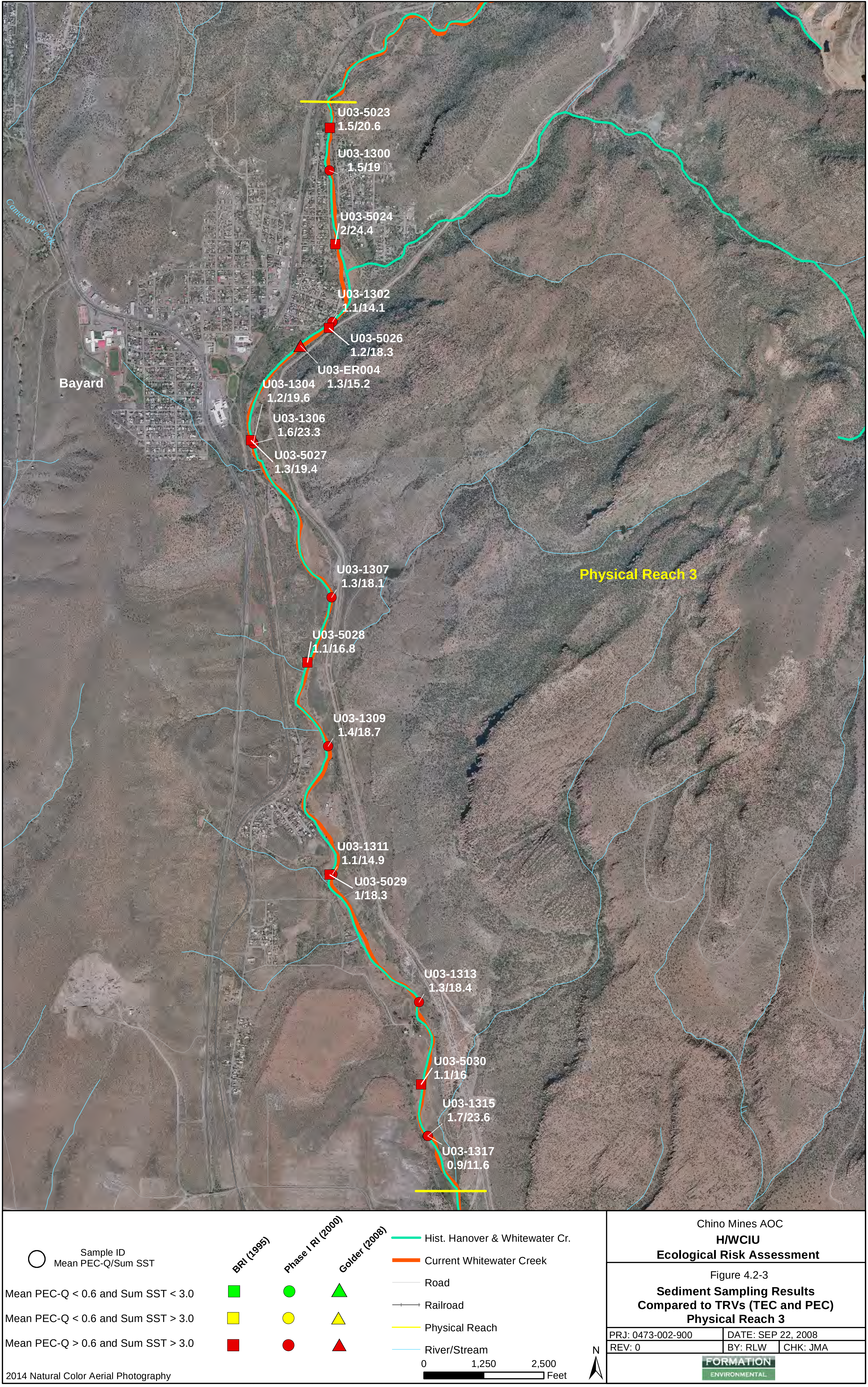
Figure 4.2-2

Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Physical Reach 2

PRJ: 0473-002-900	DATE: OCT 29, 2015	
REV:0	REV: 0	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.2-3_TRV_PR3.MXD



Chino Mines AOC

H/WCIU

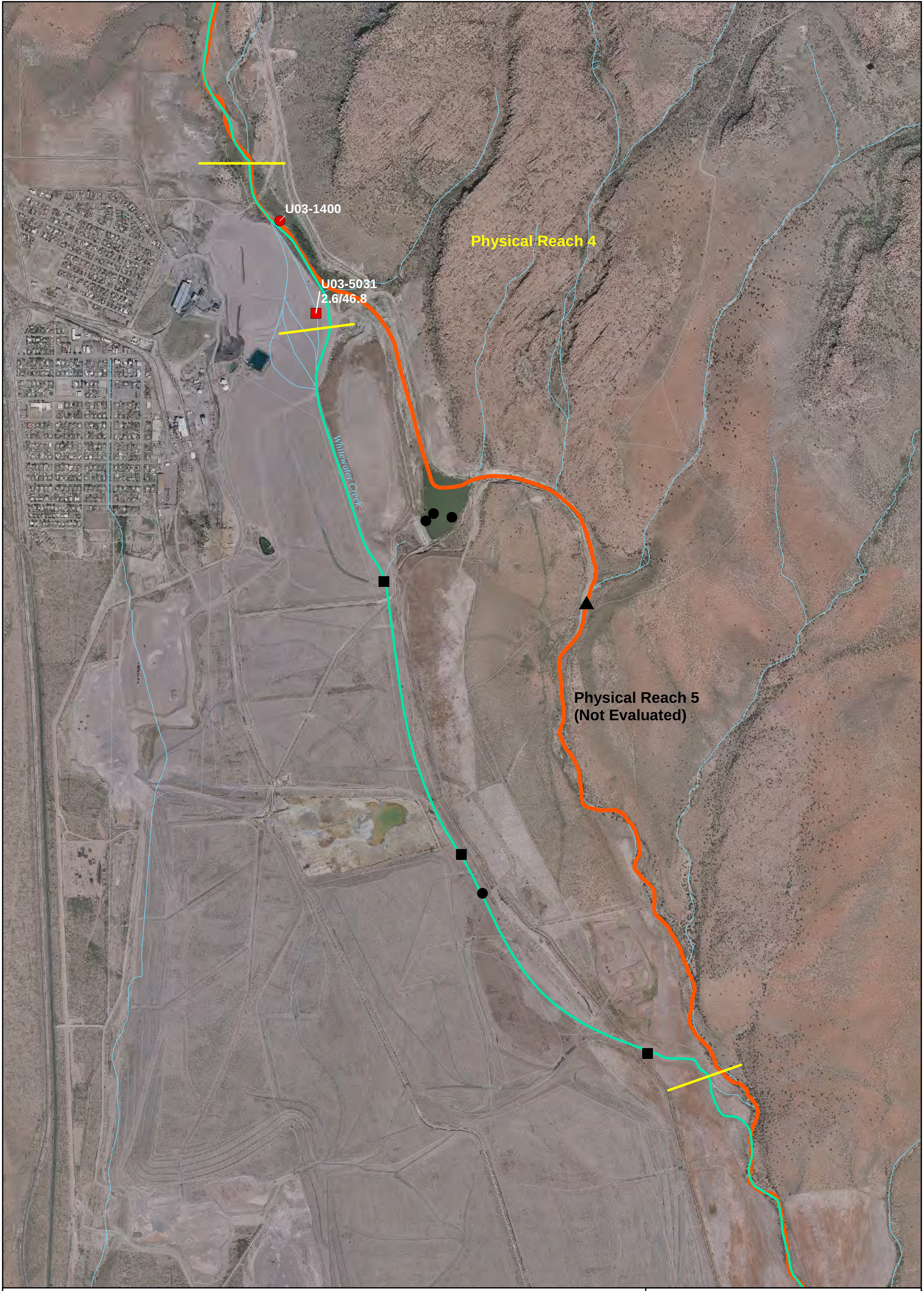
Ecological Risk Assessment

Figure 4.2-3

Sediment Sampling Results Compared to TRVs (TEC and PEC) Physical Reach 3

PRJ: 0473-002-900	DATE: SEP 22, 2008	
REV: 0	BY: RLW	CHK: JMA

FORMATION ENVIRONMENTAL



○ Sample ID
Mean PEC-Q/Sum SST

	BRI (1995)	Phase I RI (2000)	Golder (2008)
Mean PEC-Q < 0.6 and Sum SST < 3.0	🟩	🟢	▲
Mean PEC-Q < 0.6 and Sum SST > 3.0	🟨	🟡	▲
Mean PEC-Q > 0.6 and Sum SST > 3.0	🟥	🔴	▲

Notes: Results include those from the Post-Tailings Spill Sampling Event, November, 1999. (Golder, 2000)
Samples in Physical Reach 5 part of
STSIU (Smelter Tailings Soil Investigation Unit)
Sampling locations without labels were removed from the assessment as discussed in Section 1.1

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Road
Railroad
Physical Reach
River/Stream

2014 Natural Color Aerial Photography

0 1,000 2,000 Feet

N

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 4.2-4

Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Physical Reaches 4 and 5

PRJ: 0473-002-900	DATE: AUG 14, 2015
REV: 0	BY: RLW CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.2-5_TRV_PR6_7.MXD

○ Sample ID
Mean PEC-Q/Sum SST

	BRI (1995)	Phase I RI (2000)	Golder (2008)
Mean PEC-Q < 0.6 and Sum SST < 3.0	🟩	🟢	▲
Mean PEC-Q < 0.6 and Sum SST > 3.0	🟨	🟡	▲
Mean PEC-Q > 0.6 and Sum SST > 3.0	🟥	🔴	▲

Hist. Hanover & Whitewater Cr.
Current Whitewater Creek
Road
Railroad
Physical Reach
River/Stream

2014 Natural Color Aerial Photography

Note: Results include those from the Post-Tailings Spill Sampling Event, November, 1999. (Golder, 2000)

0 1,000 2,000 Feet

N

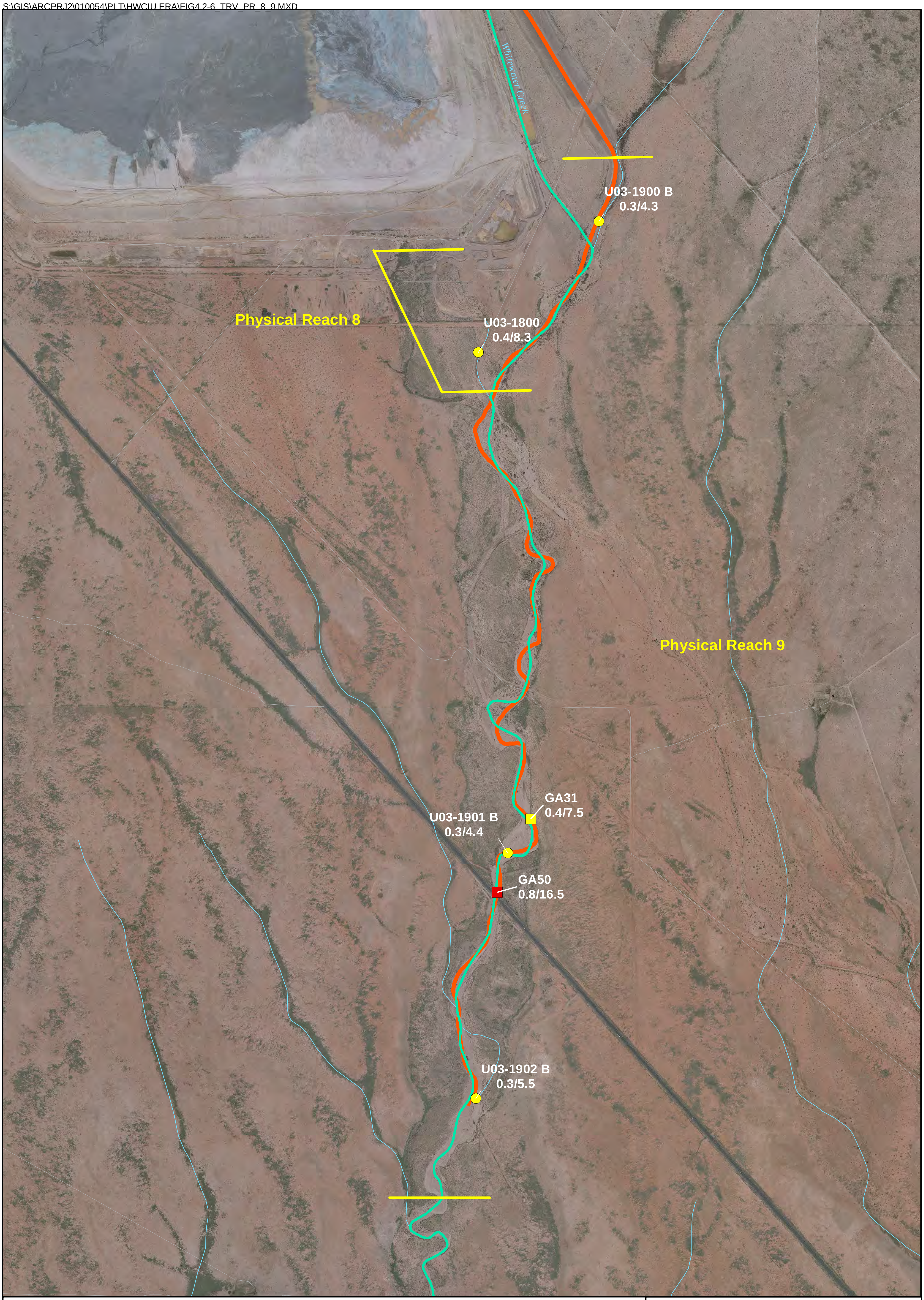
Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 4.2-5
Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Physical Reaches 6 and 7

PRJ: 0473-002-900	DATE: SEP 22, 2008	
REV: 0	BY: RLW	CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.2-6_TRV_PR_8_9.MXD



○ Sample ID Mean PEC-Q/Sum SST	BRI (1995)	Phase I RI (2000)
Mean PEC-Q < 0.6 and Sum SST < 3.0	🟩	🟢
Mean PEC-Q < 0.6 and Sum SST > 3.0	🟨	🟡
Mean PEC-Q > 0.6 and Sum SST > 3.0	🟥	🔴

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- Road
- Railroad
- Physical Reach
- River/Stream

2014 Natural Color Aerial Photography

Note: Results include those from the Post-Tailings Spill Sampling Event, November, 1999. (Golder, 2000)

0 1,000 2,000 Feet

N

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

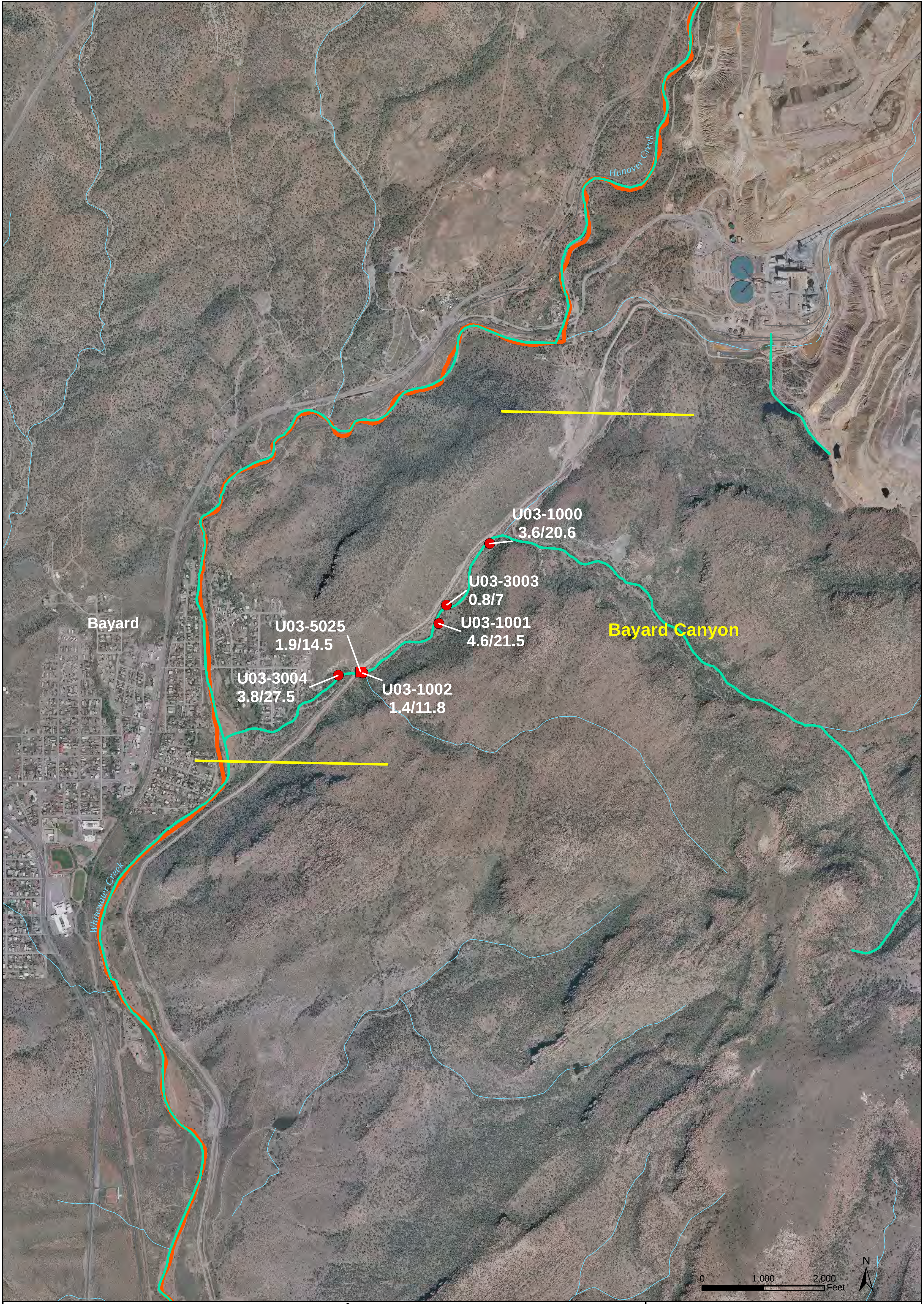
Figure 4.2-6

Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Physical Reaches 8 and 9

PRJ: 0473-002-900	DATE: AUG 14, 2015
REV: 0	BY: RLW · CHK: JMA

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.2-7_TRV_PR_BC.MXD



○ Sample ID
Mean PEC-Q/Sum SST

	BRI (1995)	Phase I RI (2000)
Mean PEC-Q < 0.6 and Sum SST < 3.0	🟩	🟢
Mean PEC-Q < 0.6 and Sum SST > 3.0	🟨	🟡
Mean PEC-Q > 0.6 and Sum SST > 3.0	🟥	🔴

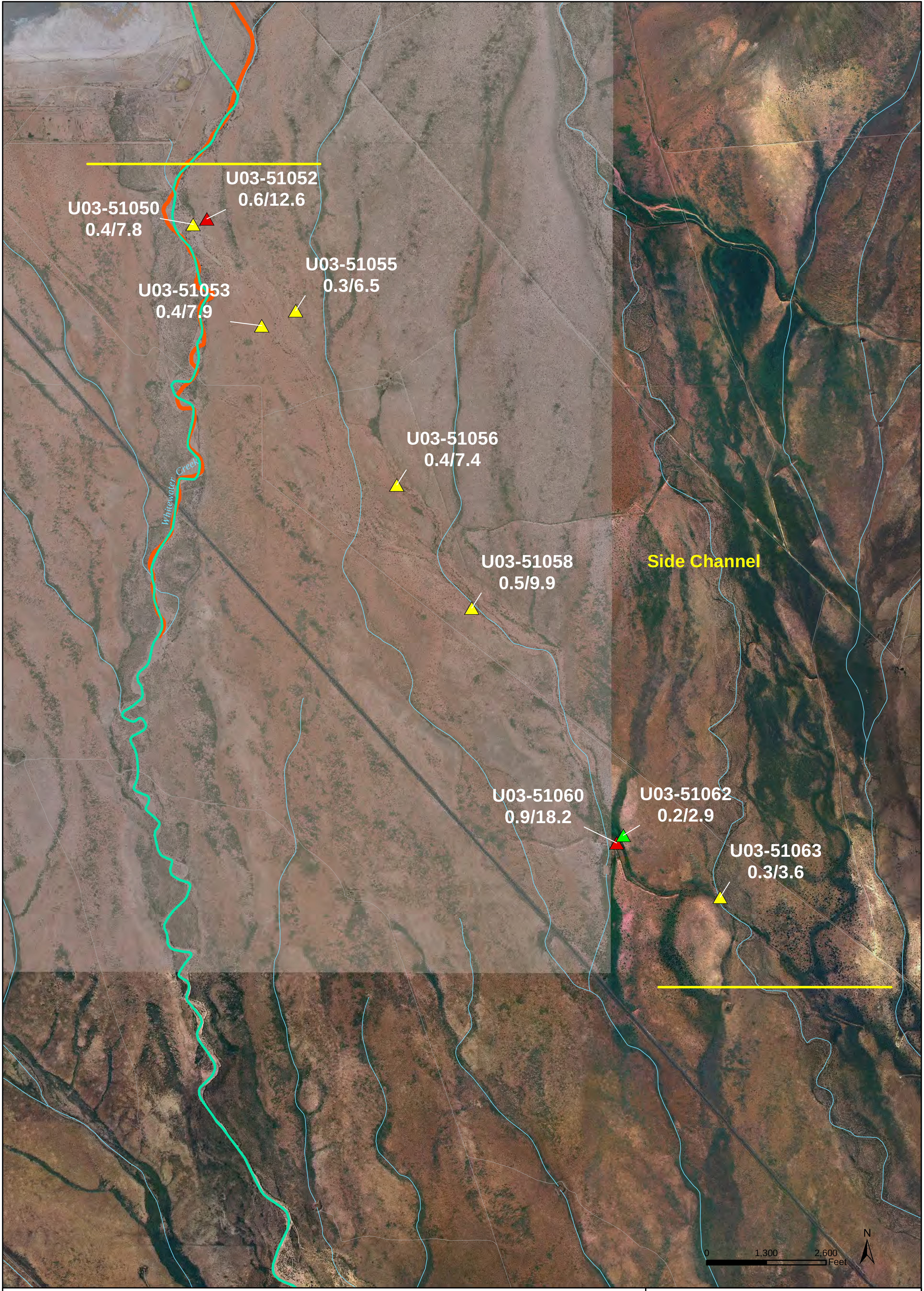
2014 Natural Color Aerial Photography

Chino Mines AOC
H/WCIU
Ecological Risk Assessment

Figure 4.2-7
Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Bayard Canyon

PRJ: 0473-002-900	DATE: OCT 29, 2015	
REV: 0	BY: RLW	CHK: JMA

FORMATION
ENVIRONMENTAL



○ Sample ID
Mean PEC-Q/Sum SST

Golder (2008)

Mean PEC-Q < 0.6 and Sum SST < 3.0 🟩

Mean PEC-Q < 0.6 and Sum SST > 3.0 🟨

Mean PEC-Q > 0.6 and Sum SST > 3.0 🟥

Hist. Hanover & Whitewater Cr.

Current Whitewater Creek

River/Stream

Side Channel

Road

Railroad

2014 Natural Color Aerial Photography

Chino Mines AOC

H/WCIU

Ecological Risk Assessment

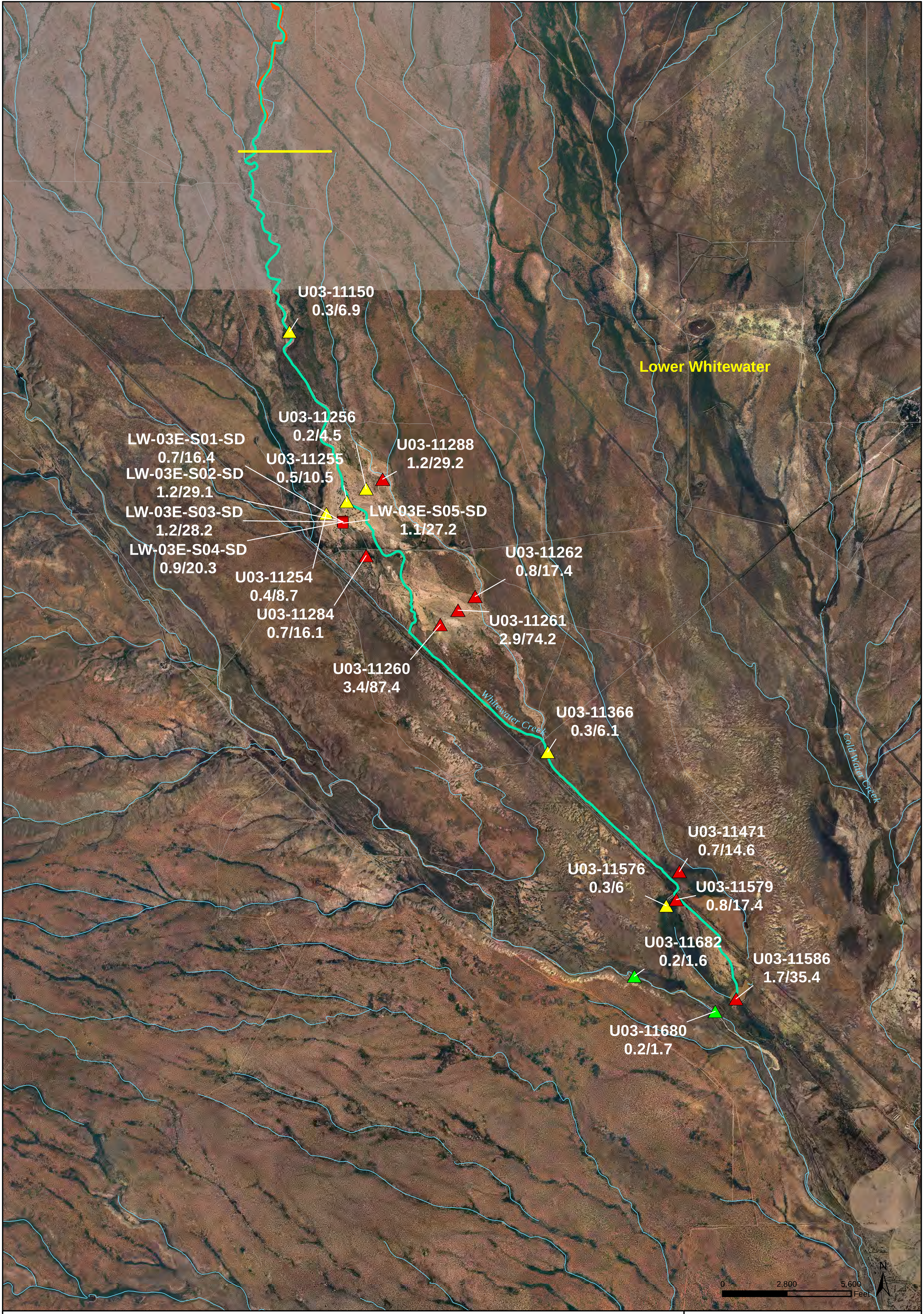
Figure 4.2-8

Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Side Channel

PRJ: 0473-002-900	DATE: OCT 29, 2015
REV: 0	BY: RLW CHK: JMA

FORMATION
ENVIRONMENTAL

S:\GIS\ARCPRJ2\010054\PLT\HWCIU ERA\FIG4.2-9_TRV_PR_LWW.MXD



○ Sample ID
Mean PEC-Q/Sum SST

	Golder (2003)	Golder (2008)
Mean PEC-Q < 0.6 and Sum SST < 3.0	▲	🟩
Mean PEC-Q < 0.6 and Sum SST > 3.0	△	🟨
Mean PEC-Q > 0.6 and Sum SST > 3.0	▲	🟥

- Hist. Hanover & Whitewater Cr.
- Current Whitewater Creek
- River/Stream
- Road
- Railroad

2014 Natural Color Aerial Photography

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Ecological Risk Assessment

Figure 4.2-9

Sediment Sampling Results
Compared to TRVs (TEC and PEC)
Lower Whitewater Creek

PRJ: 0473-002-900	DATE: OCT 29, 2015
REV: 0	BY: RLW · CHK: JMA

FORMATION
ENVIRONMENTAL

APPENDIX A

DATA USED FOR THE HANOVER AND WHITEWATER CREEKS INVESTIGATION UNIT ERA

Appendix Table 1 (A-1)
Summer Rainfall Pool Sample Results-Total Fraction
H/WCIU ERA

Physical Reach	Sample Id	Sample Type	Sample Location	Source	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Hardness	Iron	Lead	Magnesium
1	U02-9100	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.0015	0.0523	0.0002 U	0.063	0.0128	N/A	0.00345 U	0.0036 U	0.0138	1740	0.013 U	0.0014 J	N/A
	HC-51.6	SRFP	SRFP	Golder (2007)	0.299	0.0055	0.0045 U	0.0774	N/A	0.0084 U	0.0048	N/A	0.0013	0.00075	0.0397 J	1450	0.36	0.0026	N/A
2	WWC-38.1	SRFP	SRFP	Golder (2007)	0.537	0.0055 U	0.0045 U	0.0578	N/A	0.0084 U	0.0098	N/A	0.0017	0.0094	0.279 J	1600	0.0184	0.0014	N/A
	U03-9200	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.00075 U	0.0383	0.0002 U	0.0404	0.0067	N/A	0.00345 U	0.0036 U	0.0168	1314	0.0138 U	0.0016 J	N/A
3	U03-9300	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.369	0.0248 U	0.0017	0.0248	0.0002 U	0.0363	0.00031 J	N/A	0.00345 U	0.0036 U	0.0523	76	0.323	0.0129	N/A
	U03-9301	SRFP	SRFP	Phase 1 RI (Golder 2000)	9.46	0.0248 U	0.0042	0.0698	0.00026 U	0.0458	0.0001 J	N/A	0.00345 U	0.0036 U	0.0898	79	6.63	0.0162	N/A
	U03-9302	SRFP	SRFP	Phase 1 RI (Golder 2000)	6.07	0.0248 U	0.00075 U	0.0355	0.0023	0.0381	0.0132	N/A	0.00345 U	0.0903	1.1	741	0.264	0.0156	N/A
	BC-1	SRFP	SRFP	Golder (2007)	0.018	0.0055 U	0.0045 U	0.0589	N/A	0.0204	0.00082	N/A	0.00084	0.0002 U	0.0325 J	169	0.0766	0.0024	N/A
	B-RANCH	SRFP	SRFP	Golder (2007)	28.9	0.0144 UJ	0.0051 U	0.0534	N/A	0.144	0.0343	N/A	0.0004 U	0.366	2.43	1770	0.0245	0.0082	N/A
	GRUNERUD-1	SRFP	SRFP	Golder (2007)	14.2	0.0145 UJ	0.0051 U	0.0727	N/A	0.142	0.0278	N/A	0.0004 U	0.176	1.35	1820	0.0206	0.0056	N/A
	WWC-28.6	SRFP	SRFP	Golder (2007)	39	0.0055 U	0.0045 U	0.31	N/A	0.0084 U	0.011	N/A	0.0174	0.048	0.65 J	1460	30.8	0.0755	N/A
	WWC-29.7	SRFP	SRFP	Golder (2007)	0.079	0.0055 U	0.0045 U	0.0588	N/A	0.0084 U	0.0016	N/A	0.0007 U	0.0013	0.0326 J	515	0.0253	0.00082	N/A
5	U03-9500	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.00075 U	0.0445	0.00028 U	0.046	0.0026	N/A	0.00345 U	0.0036 U	0.0987	109	0.0619	0.0004 U	N/A
6	U03-9600	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.365	0.0248 U	0.00075 U	0.0557	0.00024 U	0.0551	0.0161 J	N/A	0.00345 U	0.0282	0.566	432	0.0103 U	0.0004 U	N/A
9	U03-9900	SRFP	SRFP	Phase 1 RI (Golder 2000)	31	0.0248 U	0.0032 J	0.155	0.0014	0.0298	0.0038	N/A	0.0199	0.0344	1.51	225	28.1	0.141	N/A
	LWWC-1	SRFP	SRFP	Golder (2007)	1.5	0.0129 U	0.0051 U	0.034	N/A	0.039	0.0052	N/A	0.0004 U	0.0577	0.557	347	0.014 U	0.00013 U	N/A
	WWC-H180	SRFP	SRFP	Golder (2007)	1.88	0.0128 U	0.0051 U	0.0787	N/A	0.059	0.0107	N/A	0.00043	0.0871	0.537	725	0.014 U	0.00013 U	N/A
Bayard Canyon	BAYARD CANYON D/S	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0143 J	0.0775	N/A	0.028 J	0.0026 J	44	0.0013 U	0.0013 U	0.0333	155	0.242	0.0037 J	10.9
	BAYARD CANYON MID	SRFP	SRFP	Golder (2008)	0.016 J	0.002 U	0.0098 J	0.0666	N/A	0.0289 J	0.003 J	40.9	0.0013 U	0.0013 U	0.031	143	0.0109 J	0.0047 J	9.83
	BAYARD CANYON U/S	SRFP	SRFP	Golder (2008)	0.014 J	0.002 U	0.0127 J	0.054	N/A	0.0186 J	0.0048 J	51.9	0.0013 U	0.0013 U	0.0384	179	0.0094 J	0.0049 J	12.1
	BAYARD/LB CON	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0126 J	0.0762	N/A	0.0202 J	0.00044 J	48	0.0013 U	0.0013 U	0.0061 J	172	0.0197 J	0.0025 J	12.8
	U03-9001	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.42	0.0248 U	0.0015	0.0715	0.0002 U	0.0313	0.0052	N/A	0.00345 U	0.0036 U	0.0554	168	0.257	0.0299	N/A
	U03-9002	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.034 U	0.0248 U	0.00075 U	0.0315	0.0002 U	0.0298	0.00005 UJ	N/A	0.00345 U	0.0036 U	0.0244	36	0.0525 U	0.0004 U	N/A
	BFT-1	SRFP	SRFP	Golder (2007)	0.148	0.0055 U	0.0045 U	0.0272	N/A	0.0084	0.00007 U	N/A	0.0007 U	0.0002 U	0.02 J	23	0.0976	0.00027	N/A
Lucky Bill Canyon	LUCKY BILL AT NO.5	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0097 J	0.0567	N/A	0.0199 J	0.0002 J	43.5	0.0013 U	0.0013 U	0.0053 J	158	0.0469 J	0.00041 J	11.9
	LUCKY BILL MOUTH	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.012 J	0.0671	N/A	0.0147 J	0.00009 J	49.5	0.0013 U	0.0013 U	0.0041 J	180	0.0744	0.00031 J	13.8
	LUCKY BILL U/S NO.5	SRFP	SRFP	Golder (2008)	0.0197 J	0.002 U	0.0088 U	0.0578	N/A	0.0203 J	0.00005 U	33.4	0.0013 U	0.0013 U	0.0048 J	126	0.174	0.00011 J	10.3
	U03-9000	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0229 U	0.0248 U	0.00075 U	0.0383	0.0002 U	0.0298	0.00005 UJ	N/A	0.00345 U	0.0036 U	0.01	86	0.0363 U	0.0004 U	N/A
Lower Whitewater	LWWCR.RANCHERSPOND	SRFP	SRFP	Golder (2008)	0.159	0.0034 U	0.0046 U	0.0315	N/A	0.0286	0.0001 J	N/A	0.0004 U	0.0012 J	0.0391	228	0.209	0.00043 J	N/A

Notes:

All results reported in mg/L.

N/A: Not Analyzed.

U: Result not detected; 1/2 detection limit was used

J: Result Estimated.

R: Result Rejected

SRFP = Summer Rainfall Pool Sample

Appendix Table 1 (A-1)
Summer Rainfall Pool Sample Results-Total Fraction
H/WCIU ERA

Physical Reach	Sample Id	Sample Type	Sample Location	Source	Manganese	Mercury	Molybdenum	Nickel	pH	Selenium	Silver	TDS	Thallium	TSS	Vanadium	Zinc
1	U02-9100	SRFP	SRFP	Phase 1 RI (Golder 2000)	2.21 J	0.00005 U	0.0246	0.0158 U	6.45	0.0065 UJ	0.00175 U	351	0.00055 U	0.05 U	0.00415 U	1.9 J
	HC-51.6	SRFP	SRFP	Golder (2007)	0.3	0.0001 U	0.0357	0.0024 U	8.1	0.0023	0.00002 U	2172	0.00005 U	8	0.0017	1.55 J
2	WWC-38.1	SRFP	SRFP	Golder (2007)	1.23	0.0001 U	0.0101	0.0153	7.9	0.0022	0.00002 U	2238	0.00005 U	5	0.0007 U	1.81
	U03-9200	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.679 J	0.00005 U	0.00665 U	0.0158 U	6.05	0.0065 UJ	0.00175 U	2070	0.00055 U	0.2	0.00415 U	0.443 J
3	U03-9300	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0417 J	0.00005 U	0.00665 U	0.0158 U	5.57	0.00065 U	0.00175 U	158	0.00055 U	3	0.00415 U	0.0391 J
	U03-9301	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.31 J	0.00005 U	0.00665 U	0.0158 U	6.02	0.00065 UJ	0.00175 U	225	0.00055 U	17	0.0144	0.0264 J
	U03-9302	SRFP	SRFP	Phase 1 RI (Golder 2000)	3.55 J	0.00005 U	0.00665 U	0.0158 U	5.31	0.0065 UJ	0.00175 U	1180	0.00055 U	31	0.0105	3.08 J
	BC-1	SRFP	SRFP	Golder (2007)	0.0574	0.0001 U	0.0073	0.0019 U	7.7	0.0011	0.00003	282	0.00005 U	5	0.0019	0.109 J
	B-RANCH	SRFP	SRFP	Golder (2007)	16.2	0.0001 U	0.0049	0.219	4.2	0.0041	0.00011	3002	0.00005 U	5	0.00048	7.88
	GRUNERUD-1	SRFP	SRFP	Golder (2007)	10.4	0.0001 U	0.0051	0.138	4.6	0.003	0.00008	2858	0.00005 U	14	0.00059	5.54
	WWC-28.6	SRFP	SRFP	Golder (2007)	3.12	0.00018	0.0065	0.0401	7.2	0.0025	0.00031	1952	0.00022	1084	0.0437	2.04 J
	WWC-29.7	SRFP	SRFP	Golder (2007)	0.312	0.0001 U	0.0089	0.0038 U	7.5	0.0017	0.00002 U	763	0.00005 U	5	0.00072	0.218 J
5	U03-9500	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.207 J	0.00005 U	0.00665 U	0.0158 U	6.03	0.00065 U	0.00175 U	245	0.00055 U	0.05 U	0.00415 U	0.0166 J
6	U03-9600	SRFP	SRFP	Phase 1 RI (Golder 2000)	2.08 J	0.00005 U	0.00665 U	0.0158	4.64	0.00065 UJ	0.00175 U	748	0.00055 U	4	0.00415 U	0.968 J
9	U03-9900	SRFP	SRFP	Phase 1 RI (Golder 2000)	1.42 J	0.00005 U	0.0137	0.0158 U	5.85	0.0065 U	0.00175 U	347	0.00055 U	488	0.0384	0.83 J
	LWWC-1	SRFP	SRFP	Golder (2007)	2.34	0.0001 U	0.0032	0.0523	5	0.00091	0.00002 U	589	0.00005 U	6	0.00068	0.872
	WWC-H180	SRFP	SRFP	Golder (2007)	6.1	0.0001 U	0.0052	0.159	5.9	0.0019	0.00002 U	1190	0.00005 U	8	0.00084	1.63
Bayard Canyon	BAYARD CANYON D/S	SRFP	SRFP	Golder (2008)	0.0147	0.0001 U	0.0137	0.0011 U	6.75	0.00066 J	0.00005 U	305	0.00005 U	4.2 U	0.0022 J	0.281
	BAYARD CANYON MID	SRFP	SRFP	Golder (2008)	0.0198	0.0001 U	0.0147	0.0011 U	6.9	0.00045 J	0.00005 U	286	0.00005 U	4.2 U	0.0022 J	0.328
	BAYARD CANYON U/S	SRFP	SRFP	Golder (2008)	0.0036 J	0.0001 U	0.016	0.0011 U	6.94	0.00055 J	0.00007 J J	352	0.00005 U	4.2 U	0.0025 J	0.418
	BAYARD/LB CON	SRFP	SRFP	Golder (2008)	0.0618	0.0001 U	0.0133	0.0011 U	6.76	0.00036 J	0.00005 U	352	0.00005 U	4.2 U	0.0018 J	0.145
	U03-9001	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0294 J	0.00005 U	0.00665 U	0.0158 U	5.8	0.00065 UJ	0.00175 U	313	0.00055 U	0.05 U	0.00415 U	0.333 J
	U03-9002	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0231 J	0.00005 U	0.00665 U	0.0158 U	5.2	0.00065 U	0.00175 U	110	0.00055 U	0.05 U	0.00415 U	0.0018 UJ
	BFT-1	SRFP	SRFP	Golder (2007)	0.0039	0.0001 U	0.0018	0.0019 U	6.3	0.00064	0.00002 U	9	0.00005 U	5	0.0007 U	0.0035 U
Lucky Bill Canyon	LUCKY BILL AT NO.5	SRFP	SRFP	Golder (2008)	0.0983	0.0001 U	0.0124	0.0011 U	6.84	0.00034 J	0.00005 U	330	0.00005 U	4.2 U	0.0013 J	0.0902
	LUCKY BILL MOUTH	SRFP	SRFP	Golder (2008)	0.0596	0.0001 U	0.0137	0.0011 U	6.8	0.00045 J	0.00005 U	365	0.00005 U	4.2 U	0.0014 J	0.0172
	LUCKY BILL U/S NO.5	SRFP	SRFP	Golder (2008)	0.116	0.0001 U	0.0109	0.0011 U	6.42	0.00043 J	0.00005 U	283	0.00005 U	4.2 U	0.0014 J	0.004 J
	U03-9000	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0412 J	0.00005 U	0.00665 U	0.0158 U	5.47	0.00065 UJ	0.00175 U	225	0.00055 U	0.05	0.00415 U	0.0018 UJ
Lower Whitewater	LWWCR.RANCHERSPOND	SRFP	SRFP	Golder (2008)	0.188	0.0001 U	0.0093	0.003 J	7.23	0.0011 J	0.00002 U	404	0.00002 U	9	0.0005 U	0.0023 J

Notes:

All results reported in mg/L.

N/A: Not Analyzed.

U: Result not detected; 1/2 detection limit was used

J: Result Estimated.

R: Result Rejected

SRFP = Summer Rainfall Pool Sample

Appendix Table 2 (A-2)
Summer Rainfall Pool Results-Dissolved (0.45 µm) Fraction
H/WCIU ERA

Physical Reach	Sample Id	Sample Type	Sample Location	Source	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury
1	U02-9100	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0164 U	0.0248 U	0.00075 U	0.0576	0.0002 U	0.057	0.0132	0.00345 U	0.00345 U	0.0142 J	0.0103 U	0.00065 UJ	2.45	0.00005 U
	HC-51.6	SRFP	SRFP	Golder (2007)	0.0069 U	0.0056 U	0.0045 U	0.0787 J	N/A	0.0084 U	0.0043	0.0007 U	0.0007	0.0122	0.0015	0.00015	0.222	0.0001 U
2	U03-9200	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0175 U	0.0248 U	0.00075 U	0.0358	0.0002 U	0.0138 U	0.007	0.00345 U	0.00345 U	0.0104	0.0134 U	0.00055 UJ	0.73	0.00005 U
	WWC-38.1	SRFP	SRFP	Golder (2007)	0.156	0.0055 U	0.0045 U	0.0585 J	N/A	0.0084 U	0.0095	0.0007 U	0.0007	0.209	0.0015	0.00061	1.2	0.0001 U
3	U03-9300	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0266 U	0.0248 U	0.0075 U	0.0201	0.0002 U	0.0138 U	0.00022 J	0.00345 U	0.00345 U	0.047	0.0342 U	0.00135 U	0.0311	0.00005 U
	U03-9301	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.0032	0.0358	0.0002 U	0.0309	0.00005 UJ	0.00345 U	0.00345 U	0.0266	0.0138 U	0.0004 U	0.139	0.00005 U
	U03-9302	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0261	0.0495 U	0.015	0.0331	0.00045 U	0.036	0.0134	0.00345 U	0.00345 U	0.844	0.0103 U	0.0046 U	3.92	0.00005 U
	BC-1	SRFP	SRFP	Golder (2007)	0.01	0.0055 U	0.0045 U	0.058 J	N/A	0.0202 U	0.00053	0.0007 U	0.0007	0.0303	0.0448	0.0014	0.0567	0.0001 U
	B-RANCH	SRFP	SRFP	Golder (2007)	28.8	0.0175 UJ	0.0051 U	0.0496 J	N/A	0.15	0.0342	0.00042	0.00042	2.34	0.0154	0.008	15.9	0.0001 U
	GRUNERUD-1	SRFP	SRFP	Golder (2007)	14	0.016 UJ	0.0051 U	0.0755 J	N/A	0.137	0.0272	0.0004 U	0.0004	1.22	0.0169	0.0057	10.2	0.0001 U
	WWC-28.6	SRFP	SRFP	Golder (2007)	0.153	0.0055 U	0.0045 U	0.0564 J	N/A	0.0084 U	0.009	0.0007 U	0.0007	0.144	0.0052	0.00044	2.13	0.0001 U
	WWC-29.7	SRFP	SRFP	Golder (2007)	0.0321	0.0055 U	0.0045 U	0.0572 J	N/A	0.0084 U	0.0013	0.0007 U	0.0007	0.305	0.007	0.0003	0.309	0.0001 U
5	U03-9500	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.0075 U	0.0428	0.0002 U	0.0138 U	0.0024	0.00345 U	0.00345 U	0.093	0.0144 U	0.0004 U	0.217	0.00005 U
6	U03-9600	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.37	0.0248 U	0.002	0.0611	0.0002 U	0.0331	0.037 J	0.00345 U	0.00345 U	0.599	0.0113 U	0.0004 U	2.16	0.00005 U
9	U03-9900	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0198 U	0.0248 U	0.00075 U	0.0225	0.0002 U	0.0138 U	0.0012	0.0077	0.0077	0.0494	0.0141 U	0.0004 U	0.668	0.00005 U
	LWWC-1	SRFP	SRFP	Golder (2007)	0.726	0.0092 U	0.0051 U	0.0357 J	N/A	0.0388	0.0052	0.0004 U	0.0004	0.554	0.014 U	0.0001	2.31	0.0001 U
	WWC-H180	SRFP	SRFP	Golder (2007)	0.476	0.0117 U	0.0051 U	0.0729 J	N/A	0.0569	0.0106	0.0004 U	0.0004	0.481	0.014 U	0.00013	6.12	0.0001 U
Bayard Canyon	BAYARD CANYON D/S	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0144 J	0.076	N/A	0.0265 J	0.0027 J	0.0013 U	0.0013 U	0.0299	0.0076 U	0.002 J	0.0112	0.0001 U
	BAYARD CANYON MID	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0141 J	0.0675	N/A	0.0313 J	0.0033 J	0.0013 U	0.0013 U	0.028	0.0076 U	0.0032 J	0.0201	0.0001 U
	BAYARD CANYON U/S	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0164 J	0.0572	N/A	0.0167 J	0.0044 J	0.0013 U	0.0013 U	0.0305	0.0076 U	0.0037 J	0.0032 J	0.0001 U
	BAYARD/LB CON	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0134 J	0.0759	N/A	0.0165 J	0.00042 J	0.0013 U	0.0013 U	0.0044 J	0.0076 U	0.0017 J	0.0595	0.0001 U
	BFT-1	SRFP	SRFP	Golder (2007)	0.0627	0.0055 U	0.0045 J	0.0268 J	N/A	0.0084 U	0.0001 UJ	0.0007 U	0.0007	0.021	0.0465	0.00017	0.0041	0.0001 U
	U03-9001	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.00075 U	0.0724	0.0002 U	0.0293	0.0044	0.00345 U	0.00345 U	0.0536	0.013 U	0.0105	0.0277	0.00005 U
	U03-9002	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0186 U	0.0248 U	0.00075 U	0.0297	0.0002 U	0.0138 U	0.00005 UJ	0.00345 U	0.00345 U	0.0228	0.0448 U	0.0004 U	0.02	0.00005 U
Lucky Bill Canyon	LUCKY BILL AT NO.5	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0131 J	0.057	N/A	0.0175 J	0.00019 J	0.0013 U	0.0013 U	0.0034 J	0.0076 U	0.00007 U	0.0917	0.0001 U
	LUCKY BILL MOUTH	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0148 J	0.0667	N/A	0.0148 J	0.00007 J	0.0013 U	0.0013 U	0.002 J	0.0145 J	0.00007 U	0.0547	0.0001 U
	LUCKY BILL U/S NO.5	SRFP	SRFP	Golder (2008)	0.013 U	0.002 U	0.0119 J	0.0561	N/A	0.0166 J	0.00005 U	0.0013 U	0.0013 U	0.0021 J	0.043 J	0.00007 U	0.105	0.0001 U
	U03-9000	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.013 U	0.0248 U	0.00075 U	0.0375	0.0002 U	0.0138 U	0.00005 UJ	0.00345 U	0.00345 U	0.009	0.0356 U	0.0004 U	0.0411	0.00005 U
Lower Whitewater	LWWCR.RANCHERSPOND	SRFP	SRFP	Golder (2008)	0.011 U	0.0034 U	0.0069 J	0.0276	N/A	0.0265 J	0.00007	0.0004 U	0.0004 U	0.0244	0.0162 J	0.00003 U	0.0373	0.0001 U

Notes:

All results reported in mg/L.

N/A: Not analyzed.

U: Result not detected; 1/2 detection limit was used.

J: Result Estimated.

R: Result Rejected.

SRFP = Summer Rainfall Pool Sample

Appendix Table 2 (A-2)
Summer Rainfall Pool Results-Dissolved (0.45 µm) Fraction
H/WCIU ERA

Physical Reach	Sample Id	Sample Type	Sample Location	Source	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
1	U02-9100	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.0332	0.0158 U	R	0.00175 UJ	0.00055 U	0.00415 U	2.16
	HC-51.6	SRFP	SRFP	Golder (2007)	0.0386	0.0019 U	0.0024	0.00004 U	0.00002 UJ	0.00078	1.38
2	U03-9200	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.0066 U	0.484
	WWC-38.1	SRFP	SRFP	Golder (2007)	0.0098	0.0144	0.0021	0.00004 UJ	0.00004 U	0.0007 U	1.72 J
3	U03-9300	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.00475 U	0.029
	U03-9301	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.0059 U	0.0018 U
	U03-9302	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.0073 U	3.42
	BC-1	SRFP	SRFP	Golder (2007)	0.0075	0.0019 U	0.0011	0.00004 UJ	0.00002 U	0.0019	0.103 U
	B-RANCH	SRFP	SRFP	Golder (2007)	0.0052	0.204	0.0062	0.00009 J	0.00004 U	0.00068	7.89 U
	GRUNERUD-1	SRFP	SRFP	Golder (2007)	0.0057	0.143	0.0055	0.00006 J	0.00004 U	0.0004 U	5.84
	WWC-28.6	SRFP	SRFP	Golder (2007)	0.0034	0.0265	0.0014	0.00004 UJ	0.00002 U	0.0007 U	1.67
	WWC-29.7	SRFP	SRFP	Golder (2007)	0.0075	0.0044 U	0.0024	0.00004 UJ	0.00002 U	0.00072	0.21
5	U03-9500	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.00415 U	0.0166
6	U03-9600	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.073	R	0.00175 UJ	0.00055 U	0.00415 U	1.06
9	U03-9900	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.0045 U	0.0371
	LWWC-1	SRFP	SRFP	Golder (2007)	0.0031	0.0547	0.0015	0.00002 UJ	0.00004	0.0004 U	0.901
	WWC-H180	SRFP	SRFP	Golder (2007)	0.0041	0.15	0.0024	0.00002 UJ	0.00005	0.00094	1.6
Bayard Canyon	BAYARD CANYON D/S	SRFP	SRFP	Golder (2008)	0.0139	0.0015 J	0.00072 J	0.00005 U	0.00005 U	0.0022 J	0.278
	BAYARD CANYON MID	SRFP	SRFP	Golder (2008)	0.0138	0.0011 U	0.00067 J	0.00005 U	0.00005 U	0.0019 J	0.354
	BAYARD CANYON U/S	SRFP	SRFP	Golder (2008)	0.0137	0.0011 U	0.00071 J	0.00005 U	0.00005 U	0.0024 J	0.374
	BAYARD/LB CON	SRFP	SRFP	Golder (2008)	0.0127	0.0011 U	0.00058 J	0.00005 U	0.00005 U	0.0016 J	0.144
	BFT-1	SRFP	SRFP	Golder (2007)	0.0014	0.0019 U	0.00057	0.00004 UJ	0.00002 U	0.0007 U	0.0019 U
	U03-9001	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.00415 U	0.358
	U03-9002	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.0057 U	0.0018 U
Lucky Bill Canyon	LUCKY BILL AT NO.5	SRFP	SRFP	Golder (2008)	0.0109	0.0011 U	0.00061 J	0.00005 U	0.00005 U	0.0013 J	0.0892
	LUCKY BILL MOUTH	SRFP	SRFP	Golder (2008)	0.013	0.0011 U	0.00063 J	0.00005 U	0.00005 U	0.0014 J	0.0152
	LUCKY BILL U/S NO.5	SRFP	SRFP	Golder (2008)	0.0109	0.0011 U	0.00063 J	0.00005 U	0.00005 U	0.0014 J	0.003 U
	U03-9000	SRFP	SRFP	Phase 1 RI (Golder 2000)	0.00665 U	0.0158 U	R	0.00175 UJ	0.00055 U	0.0043 U	0.0018 U
Lower Whitewater	LWWCR.RANCHERSPOND	SRFP	SRFP	Golder (2008)	0.0079 J	0.0048 U	0.0013	0.00002 U	0.00003 J	0.0005 U	0.0007 U

Notes:

All results reported in mg/L.

N/A: Not analyzed.

U: Result not detected; 1/2 detection limit was used.

J: Result Estimated.

R: Result Rejected.

SRFP = Summer Rainfall Pool Sample

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)
GA12	GS	AC	Hydrogeologic Investigation (1995)	5,990	N/A	1.4	63.2	N/A	9.8	0.21 U	N/A	8.8	7.0	98.5	28,100	10.6	424	0.049 U	7.49
GA31	GS	AC	Hydrogeologic Investigation (1995)	5,720	N/A	2.10	51.3	N/A	5.00	0.50	N/A	19.6	11.7	199	59,500	23.0	468	0.05 U	10.50
GA50	GS	AC	Hydrogeologic Investigation (1995)	16,800	N/A	2.8	139	N/A	6.2	0.75	N/A	15.6	8.6	435	22,200	50.7	769	0.045 U	5.27
U02-5001	CTC	AC	BRI (1995)	5,920	N/A	2.89	46.3	0.05 U	4.3	7.6	N/A	8.8	N/A	926	71,500	145	2,060	0.1 U	8.1
U02-5002	--	TTC	BRI (1995)	11,900	N/A	7.6	153	0.4	4.4	1.2	7,920	10.7	N/A	257	42,900	61	2,420	0.05 U	3.5
U02-5003	--	OB	BRI (1995)	5,140	N/A	37.4	133	0.05 U	2.3	0.8	15,300	8.9	N/A	421	61,700	1,470	1,690	0.2	2.2
U02-5004	CTC	AC	BRI (1995)	4,620	N/A	4.27	45.1	0.05 U	2.1	4.3	N/A	4.9	N/A	820	98,000	443	1,540	0.1 U	9.5
U02-5005	CTC	AC	BRI (1995)	5,890	N/A	3.5	57.5	0.2	4.9	4.7	N/A	5.7	N/A	670	50,200	190	2,720	0.1 U	10
U02-5008	CTC	AC	BRI (1995)	4,300	N/A	6.09	85	0.05 U	3.5	3.2	N/A	5.2	N/A	725	52,200	207	2,040	0.1 U	7.9
U03-5006	--	TTC	BRI (1995)	11,500	N/A	2.6	131	0.5	3.2	2	6,420	6.1	N/A	581	36,000	218	2,140	0.05 U	15.1
U03-5007	CTC	AC	BRI (1995)	7,930	N/A	3.6	83.7	0.05 U	4.1	0.2	3,320	16.7	N/A	765	60,300	111	347	0.05 U	31.9
U03-5009	CTC	AC	BRI (1995)	6,740	N/A	7.13	44.8	0.3	3.3	3.5	10,800	6.3	N/A	817	44,000	236	1,450	0.1 U	6.4
U03-5010	--	TTC	BRI (1995)	15,800	N/A	6	122	0.8	3.1	15	10,500	6.5	N/A	1,450	27,500	1,030	2,910	0.05 U	4
U03-5011	--	TCO	BRI (1995)	6,500	N/A	3.08	N/A	N/A	N/A	0.1 U	N/A	14.4	N/A	305	45,300	169	895	N/A	6.7
U03-5012	--	TCO	BRI (1995)	21,600	N/A	18.5	N/A	N/A	N/A	1 U	N/A	90.4	N/A	5,590	159,000	2,140	645	N/A	24.7
U03-5013	--	TCO	BRI (1995)	16,100	N/A	22.8	N/A	N/A	N/A	2.7	N/A	59.2	N/A	3,270	122,000	1,180	511	N/A	17.3
U03-5014	--	TCO	BRI (1995)	23,400	N/A	37	N/A	N/A	N/A	53.3	N/A	54.3	N/A	93,300	91,800	1,940	1,010	N/A	28.1
U03-5016	CTC	AC	BRI (1995)	6,050	N/A	5.62	39.1	0.2	0.7 U	2.5	N/A	6	N/A	623	42,500	192	1,090	0.1 U	8.1
U03-5017	CTC	AC	BRI (1995)	6,330	N/A	8.42	59	0.2	3	3	N/A	9.8	N/A	759	59,900	295	1,530	0.1 U	10.7
U03-5023	CTC	AC	BRI (1995)	6,130	N/A	8.38	61	0.1	2.2	1.5	N/A	7.6	N/A	514	50,300	234	1,100	0.1 U	7.7
U03-5024	CTC	AC	BRI (1995)	6,750	N/A	7.89	56.4	0.4	3.2	3.3	N/A	8.4	N/A	602	41,100	263	1,660	0.1 U	6.8
U03-5025	--	TTC	BRI (1995)	4,200	N/A	3.1	57.8	0.3	0.07 U	4.1	1,910	2.7	N/A	305	10,600	498	532	0.05 U	0.6
U03-5026	CTC	AC	BRI (1995)	9,290	N/A	4.88	58.1	0.4	3.8	1.1	N/A	9.2	N/A	465	42,000	161	1,030	0.1 U	7.8
U03-5027	CTC	AC	BRI (1995)	7,380	N/A	3.83	67.6	0.2	3.4	1	N/A	12	N/A	490	57,800	201	971	0.1 U	4.6
U03-5028	CTC	AC	BRI (1995)	7,910	N/A	3.26	63.3	0.4	4.8	0.8	N/A	12.9	N/A	425	46,200	164	929	0.1 U	3.5
U03-5029	CTC	AC	BRI (1995)	9,720	N/A	3.62	105	0.3	3.9	0.2 U	N/A	13.2	N/A	474	63,500	152	567	0.1 U	4.7
U03-5030	CTC	AC	BRI (1995)	9,220	N/A	3.19	71.9	0.3	3.2	0.7	N/A	14.8	N/A	406	57,300	171	815	0.1 U	6.4
U03-5031	CTC	AC	BRI (1995)	16,600	N/A	6.32	117	0.7	6.3	2	N/A	14.7	N/A	1,210	46,900	340	1,030	0.1 U	16.4
U03-5032	CTC	AC	BRI (1995)	9,160	N/A	2.08	93.9	0.5	4.4	3.5	N/A	6.1	N/A	510	17,300	60	530	0.1 U	9.5
U03-5033	CTC	AC	BRI (1995)	6,350	N/A	2.32	98.7	0.3	3.8	0.7	N/A	9.4	N/A	711	57,600	42	348	0.1 U	56.7
U03-5034	CTC	AC	BRI (1995)	10,200	N/A	2.73	62.5	0.4	6.6	1.6	N/A	14.4	N/A	895	80,500	26	591	0.1 U	27.4
U03-5035	CTC	AC	BRI (1995)	6,100	N/A	2.02	70.9	0.1	4.1	0.2	N/A	8.2	N/A	297	32,100	14	348	0.1 U	14.7
U03-5036	CTC	AC	BRI (1995)	4,600	N/A	1.64	53.3	0.3	3.3	0.2 U	N/A	5.2	N/A	211	19,300	25	314	0.1 U	9.8
U03-5037	--	TTC	BRI (1995)	7,830	N/A	2.3	71.3	0.3	4.2	0.1 U	1,240	5	N/A	98.5	16,600	17.7	222	0.5 U	8.7
U03-5039	--	TCO	BRI (1995)	9,510	N/A	6.16	N/A	N/A	N/A	0.1	N/A	21.6	N/A	666	43,900	172	530	N/A	11.3
U03-5040	--	TCO	BRI (1995)	12,500	N/A	4.35	N/A	N/A	N/A	1.5	N/A	47.2	N/A	2,330	86,600	178	436	N/A	0.3
U03-5041	--	TCO	BRI (1995)	11,900	N/A	2.4	N/A	N/A	N/A	0.1	N/A	22.5	N/A	595	64,800	85.2	573	N/A	2.1
U03-5042	--	TCO	BRI (1995)	10,800	N/A	2.97	N/A	N/A	N/A	1	N/A	43.7	N/A	565	102,000	120	350	N/A	3
U03-7300	--	YC	BRI (1995)	N/A	N/A	1.14	N/A	N/A	N/A	1.44	N/A	11.6	N/A	357	N/A	90.6	N/A	N/A	4.47
U03-7301	--	YC	BRI (1995)	N/A	N/A	3.19	N/A	N/A	N/A	3	N/A	15.3	N/A	925	N/A	114	N/A	N/A	5.06
U03-7302	--	YC	BRI (1995)	N/A	N/A	3.59	N/A	N/A	N/A	2.11	N/A	15.9	N/A	508	N/A	145	N/A	N/A	4.73
U03-7303	--	YC	BRI (1995)	N/A	N/A	13.83	N/A	N/A	N/A	1.8	N/A	11.1	N/A	466	N/A	137	N/A	N/A	3.35
U03-7304	--	YC	BRI (1995)	N/A	N/A	1.42	N/A	N/A	N/A	1.13	N/A	7.21	N/A	290	N/A	86.9	N/A	N/A	3.78
U03-7305	--	YC	BRI (1995)	N/A	N/A	3.20	N/A	N/A	N/A	2.88	N/A	11.9	N/A	395	N/A	149	N/A	N/A	5.48
U02-5100	TTC	TRIB	Phase I RI (Golder 2000)	8,204	4.95 UJ	11.1 J	104	0.44 U	8.22	10.9 J	N/A	22.2	13.4	279	40,782	545 J	4,880 J	0.025 U	5.3
U02-5101	TTC	TRIB	Phase I RI (Golder 2000)	5,028	4.95 UJ	5.08 J	122	0.11 U	16.4	3.86 J	N/A	20	3.22	270	73,022	128 J	387 J	0.025 U	16.7
U02-5102	TTC	TRIB	Phase I RI (Golder 2000)	15,587	4.95 UJ	9.19 J	166	1.02	5.08 U	5.15 J	N/A	22.7	12.4	251	35,315	186 J	2,627 J	0.034 U	5.63

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Nickel (mg/kg)	Paste pH (SU)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	TOC (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
GA12	GS	AC	Hydrogeologic Investigation (1995)	6.5	N/A	0.52	0.31 U	N/A	N/A	N/A	46
GA31	GS	AC	Hydrogeologic Investigation (1995)	8.00	N/A	0.75	0.6 U	N/A	N/A	N/A	97.0
GA50	GS	AC	Hydrogeologic Investigation (1995)	14.6	N/A	0.36	0.28 U	N/A	N/A	N/A	224
U02-5001	CTC	AC	BRI (1995)	9.46	N/A	0.6	0.8	N/A	N/A	52.5	3,600
U02-5002	--	TTC	BRI (1995)	8.60	N/A	0.6	0.1 U	N/A	N/A	32.7	760
U02-5003	--	OB	BRI (1995)	6.00	N/A	1.6	2.9	N/A	N/A	25.0	548
U02-5004	CTC	AC	BRI (1995)	8.49	N/A	4.2	1	N/A	N/A	18.6	1,870
U02-5005	CTC	AC	BRI (1995)	7.75	N/A	0.5	0.1 U	N/A	N/A	28.6	1,730
U02-5008	CTC	AC	BRI (1995)	7.97	N/A	1.5	0.1 U	N/A	N/A	22.6	1,340
U03-5006	--	TTC	BRI (1995)	6.8	N/A	0.6	0.6	N/A	N/A	25.7	601
U03-5007	CTC	AC	BRI (1995)	5.6	N/A	1.3	0.1 U	N/A	N/A	25.6	198
U03-5009	CTC	AC	BRI (1995)	7.2	N/A	0.8	0.1 U	N/A	N/A	23.3	1530
U03-5010	--	TTC	BRI (1995)	8.7	N/A	0.5 U	1.5	N/A	N/A	26.3	6,000
U03-5011	--	TCO	BRI (1995)	3.65	N/A	0.2	N/A	N/A	N/A	N/A	283
U03-5012	--	TCO	BRI (1995)	25	N/A	1.5	N/A	N/A	N/A	N/A	409
U03-5013	--	TCO	BRI (1995)	10.5	N/A	2	N/A	N/A	N/A	N/A	535
U03-5014	--	TCO	BRI (1995)	128	N/A	4.8	N/A	N/A	N/A	N/A	1,680
U03-5016	CTC	AC	BRI (1995)	5.59	N/A	0.8	0.1 U	N/A	N/A	20	1,230
U03-5017	CTC	AC	BRI (1995)	8.57	N/A	1.2	0.1 U	N/A	N/A	24.4	1,380
U03-5023	CTC	AC	BRI (1995)	4.62	N/A	1.1	0.1 U	N/A	N/A	22.2	917
U03-5024	CTC	AC	BRI (1995)	7.97	N/A	0.5	0.1 U	N/A	N/A	25.4	1,340
U03-5025	--	TTC	BRI (1995)	4	N/A	0.1	0.5	N/A	N/A	24.6	1,280
U03-5026	CTC	AC	BRI (1995)	7.75	N/A	0.5 U	0.1 U	N/A	N/A	28.7	719
U03-5027	CTC	AC	BRI (1995)	7.08	N/A	0.2	0.6	N/A	N/A	28.2	706
U03-5028	CTC	AC	BRI (1995)	10.5	N/A	0.2	0.4	N/A	N/A	29.7	568
U03-5029	CTC	AC	BRI (1995)	7.23	N/A	0.5 U	0.8	N/A	N/A	33.6	259
U03-5030	CTC	AC	BRI (1995)	5.96	N/A	0.2	0.1 U	N/A	N/A	37	430
U03-5031	CTC	AC	BRI (1995)	11.6	N/A	0.9	0.7	N/A	N/A	30.7	874
U03-5032	CTC	AC	BRI (1995)	26.7	N/A	0.3	0.2	N/A	N/A	23	321
U03-5033	CTC	AC	BRI (1995)	11.2	N/A	2.4	0.7	N/A	N/A	20.5	153
U03-5034	CTC	AC	BRI (1995)	16.2	N/A	2.9	0.9	N/A	N/A	21.8	149
U03-5035	CTC	AC	BRI (1995)	5.66	N/A	0.4	0.1 U	N/A	N/A	25	88
U03-5036	CTC	AC	BRI (1995)	6.18	N/A	0.4	0.1 U	N/A	N/A	21.3	58
U03-5037	--	TTC	BRI (1995)	1.05 U	N/A	0.4	0.1 U	N/A	N/A	23.4	54.1
U03-5039	--	TCO	BRI (1995)	5.36	N/A	0.5	N/A	N/A	N/A	N/A	332
U03-5040	--	TCO	BRI (1995)	13.8	N/A	0.2	N/A	N/A	N/A	N/A	324
U03-5041	--	TCO	BRI (1995)	5.29	N/A	0.05	N/A	N/A	N/A	N/A	264
U03-5042	--	TCO	BRI (1995)	5.29	N/A	0.5	N/A	N/A	N/A	N/A	271
U03-7300	--	YC	BRI (1995)	9.80	N/A	0.13	N/A	N/A	N/A	N/A	426
U03-7301	--	YC	BRI (1995)	15.7	N/A	0.13	N/A	N/A	N/A	N/A	657
U03-7302	--	YC	BRI (1995)	9.25	N/A	0.13	N/A	N/A	N/A	N/A	483
U03-7303	--	YC	BRI (1995)	9.25	N/A	0.20	N/A	N/A	N/A	N/A	440
U03-7304	--	YC	BRI (1995)	6.51	N/A	0.51	N/A	N/A	N/A	N/A	278
U03-7305	--	YC	BRI (1995)	14.7	N/A	0.28	N/A	N/A	N/A	N/A	969
U02-5100	TTC	TRIB	Phase I RI (Golder 2000)	18	7.34	0.54 U	0.35 U	1.1 U	0.19	24.6	4,144
U02-5101	TTC	TRIB	Phase I RI (Golder 2000)	3.15 U	2.55	1.28 UJ	0.35 U	0.29 UJ	0.35	25.6	1,273
U02-5102	TTC	TRIB	Phase I RI (Golder 2000)	10.3	7.84	0.58 U	0.35 U	0.11 UJ	1.61	32.8	1,901

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)
U02-5103	TTC	TRIB	Phase I RI (Golder 2000)	18,758	4.95 UJ	10.6 J	122	1.91	12.4	5.63 J	N/A	22.8	18	1,833	50,854	468 J	4,581 J	0.046 U	9.97
U02-5104	TTC	TRIB	Phase I RI (Golder 2000)	16,046	10.6 J	3.37	203	0.338 U	9.57	2.57	N/A	14.1	14.6	208	33,527	387 J	3,205	0.025 U	3.15
U02-5105	TTC	TRIB	Phase I RI (Golder 2000)	9,955	4.95 UJ	7.68	136	0.266 U	12.5	1.26	N/A	11.6	13.1	385	42,518	144 J	1,884	0.025 U	8.33
U02-5108	TTC	TRIB	Phase I RI (Golder 2000)	12,765	4.95 UJ	2.67	130	0.306 U	10.2	2.13	N/A	14	13.2	294	31,199	172 J	2,133	0.025 U	9.37
U02-5109	TTC	TRIB	Phase I RI (Golder 2000)	16,370	4.95 UJ	1.43 J	136	0.235 U	6.92	2.75 J	N/A	13.9	9.22	108	29,868	201 J	2,623 J	0.025 U	4.79
U02-5110	TTC	TRIB	Phase I RI (Golder 2000)	9,962	4.95 UJ	0.803 J	97.6	0.116 U	4.12 U	0.41 UJ	N/A	10.1	9.27	153	20,467	147 J	1,316 J	0.025 U	10.5
U02-5111	TTC	TRIB	Phase I RI (Golder 2000)	5,267	5.71 UJ	3.1 J	188	0.172 U	4.59 U	2.98 J	N/A	10.6	13	2,286	28,194	157	1,884	0.025 U	6.59
U02-1100	SP	AC	Phase I RI (Golder 2000)	4,940	6.61 UJ	3.89 J	82.2	0.202 U	3.68 U	7.55 J	N/A	11	10.2	297	19,374	249 J	2,256 J	0.025 U	5.48
U02-1102	CTC	AC	Phase I RI (Golder 2000)	6,115	6.24 UJ	4.02 J	55.6	0.269 U	6.61 U	6.05 J	N/A	14.3	10.9	371	32,460	215 J	1,909 J	0.025 U	12.2
U02-1103	SP	AC	Phase I RI (Golder 2000)	3,743	4.95 UJ	5.9 J	102	0.145 U	6.29 U	1.59 J	N/A	6.36 U	14.3	378	24,702	189 J	1,884 J	0.025 U	5.86
U02-1105	CTC	AC	Phase I RI (Golder 2000)	4,287	4.95 UJ	6.74 J	49.3	0.161 U	5.19 U	1.79 J	N/A	10.3	13	366	29,900	200 J	1,210 J	0.025 U	13.4
U02-2100	SP	BAR	Phase I RI (Golder 2000)	5,435	4.95 UJ	3.57 J	51.2	0.137 U	10.1	4.98 J	N/A	14	14.9	484	39,227	178 J	1,575 J	0.025 U	7.17
U02-2102	SP	BAR	Phase I RI (Golder 2000)	5,785	4.95 UJ	6.03	53.3	0.198 U	9.18	3.79	N/A	16.2	13.8	499	43,870	176 J	1,429	0.025 U	9.76
U02-3100	SP	OB	Phase I RI (Golder 2000)	5,530	4.95 UJ	4.8 J	73.1	0.254 U	5.37 U	11.5 J	N/A	12.9	12.8	476	29,250	334 J	2,358 J	0.025 U	9.41
U02-3102	SP	OB	Phase I RI (Golder 2000)	11,586	R	2.63	152	0.409 U	3.46 U	2.84	N/A	12.5	14.4	163 J	28,016	271 J	2,441	0.0379 UJ	1.9 U
U03-1000	TTC	TRIB	Phase I RI (Golder 2000)	4,561	4.95 UJ	3.74	113	0.305	2.75 U	1.99	N/A	4.32	3.44	318	8,627	1,850 J	445	0.025 U	4.47
U03-1001	TTC	TRIB	Phase I RI (Golder 2000)	4,479	4.95 UJ	4.34	88.3	0.326	2.75 U	2.37	N/A	4.81	4.45	257	9,769	2,528 J	529	0.0276 U	2.26 U
U03-1002	TTC	TRIB	Phase I RI (Golder 2000)	22,700	4.95 UJ	2.32	175	1	7.65	1.45	N/A	12	6.25	249	17,708	522 J	536	0.025 U	1.66 U
U03-5200	TTC	TRIB	Phase I RI (Golder 2000)	8,183	4.95 UJ	1.75 J	92.3	0.312 U	3.54 U	1.22 J	N/A	9.39	13	759	22,684	312 J	1,731 J	0.025 U	9.96
U03-5201	TTC	TRIB	Phase I RI (Golder 2000)	11,375	5.68 UJ	5.91	144	0.405 U	3.53 U	8.89	N/A	10.4	20.1	1,338	23,838	828 J	2,874	0.033 U	5.7
U03-5500	SP	TRIB	Phase I RI (Golder 2000)	9,658	4.95 U	1.06 J	124	0.279 U	3.86 U	1.17	N/A	11.8	10.3	260	11,950	15	275	0.025 U	3.28 U
U03-5501	SP	TRIB	Phase I RI (Golder 2000)	8,247	4.95 U	3.71	132	0.819	2.36 U	6.43	N/A	11	8.39	1,641	17,175	70.9	163	0.025 U	24.7
U03-5502	SP	TRIB	Phase I RI (Golder 2000)	27,519	4.95 UJ	5.64 J	221	1.42	4.67 J	10.1	N/A	24.5	11.9	3,366	41,194	80.9	214 J	0.095	45.6
U03-5503	SP	TRIB	Phase I RI (Golder 2000)	27,175	4.95 UJ	6.72 J	212	1.36	2.13 UJ	8.1	N/A	41.4	14.1	2,859	73,604	98.4	242 J	0.067	81.1
U03-1200	SP	AC	Phase I RI (Golder 2000)	3,192	4.95 UJ	5.48	50.1	0.219 U	N/A	3.04	N/A	6.33	11.2	329	17,459	56.007 J	411	0.006 U	2.891
U03-1202	CTC	AC	Phase I RI (Golder 2000)	5,457	6.85 UJ	6.71	68	0.241 U	8.04	3.55	N/A	15.2	13.9	479	38,198	58.6 J	438	0.006 U	4.07
U03-1300	SP	AC	Phase I RI (Golder 2000)	7,798	4.95 UJ	6.04	65.9	0.638	7.05	2.07 J	N/A	22.6	8.35	469	43,554	223 J	1,111	0.025 U	8.20
U03-1302	SP	AC	Phase I RI (Golder 2000)	7,554	4.95 UJ	3.95	91.8	0.34 U	3.87 U	1.29	N/A	17.7	10.8	354	31,998	131 J	868	0.025 U	6.92
U03-1304	SP	AC	Phase I RI (Golder 2000)	5,010	4.95 UJ	7.32	55	0.258 U	10.4	0.533 U	N/A	20.9	7.58	499	47,218	203 J	459	0.025 U	9.11
U03-1306	CTC	AC	Phase I RI (Golder 2000)	7,175	6.39 UJ	8.42	69.7	0.312 U	13.3	1.46	N/A	21.7	10.7	586.64	54,879	260 J	964	0.025 U	10.7
U03-1307	SP	AC	Phase I RI (Golder 2000)	6,544	4.95 UJ	5.9	83.9	0.307 U	6.32	1.44	N/A	18.9	9.51	453	41,312	214 J	818	0.025 U	11.8
U03-1309	SP	AC	Phase I RI (Golder 2000)	5,287	4.95 UJ	4.25	61	0.281 U	5.27	1.8	N/A	19	8.34	469	40,654	204 J	748	0.025 U	6.9
U03-1311	SP	AC	Phase I RI (Golder 2000)	5,174	4.95 UJ	3.47	49.2	0.253 U	2.75 U	1.68	N/A	15.1	7.85	374	29,487	147 J	620	0.025 U	5.41
U03-1313	SP	AC	Phase I RI (Golder 2000)	5,204	4.95 UJ	5.24	70.4	0.508	6.05	1.87	N/A	15.7	13	462	35,096	173 J	1,115	0.025 U	12.4
U03-1315	SP	AC	Phase I RI (Golder 2000)	7,525	4.95 UJ	5.79 J	90.9	0.62	2.75 UJ	2.64	N/A	20.5	16.7	594	39,610	217	1,213 J	0.025 U	6.59
U03-1317	CTC	AC	Phase I RI (Golder 2000)	6,547	4.95 UJ	4.43 J	79.2	0.47	2.75 UJ	0.515 U	N/A	17.8	6.19	287	37,248	183	412 J	0.025 U	3.66
U03-1400	CTC	AC	Phase I RI (Golder 2000)	12,881	4.95 UJ	2.52 J	162	0.62	2.79 UJ	0.844	N/A	14.9	8.23	272	23,177	73.2	456 J	0.025 U	1.35 U
U03-1500 B	CTC	AC	Post Tailings Spill Memo (2000)	16,355	4.53 U	3.52	170	1.47	10.87	3.80	N/A	17.2	108	2,619	30,812	25.6	1345	0.025 U	50.7
U03-1600 B	CTC	AC	Post Tailings Spill Memo (2000)	4,617	3.2 UJ	1.36	52.7	0.24	7.40	0.73	N/A	7.9	6.3	140	16,751	17.4	261	0.025 U	7.45
U03-1700 B	CTC	AC	Post Tailings Spill Memo (2000)	2,040	3.2 UJ	1.29	38.3	0.17	2.70 U	0.32 U	N/A	4.5	5.2	99.0	8376	7.15	223	0.025 U	4.43
U03-1702 B	CTC	AC	Post Tailings Spill Memo (2000)	3,118	3.2 UJ	1.25	55.1	0.19	3.29 U	0.32 U	N/A	5.6	5.3	104	10,009	10.7	259	0.025 U	5.88
U03-1800	CTC	AC	Phase I RI (Golder 2000)	7,186	4.95 UJ	1.85 J	88.4	0.16 U	2.91 UJ	0.41 U	N/A	11	6.82	220	19,484	29.6	271 J	0.025 U	9.69
U03-1900 B	CTC	AC	Post Tailings Spill Memo (2000)	4,084	3.2 UJ	1.12	96.7	0.23	2.75 U	1.34	N/A	6.1	5.3	109	12,433	12.6	1099	0.025 U	4.99
U03-1901 B	CTC	AC	Post Tailings Spill Memo (2000)	4,498	3.2 UJ	1.51	65.1	0.19	8.07	0.28 U	N/A	13.1	5.7	115	20,935	24.2	398	0.025 U	5.25
U03-1902 B	CTC	AC	Post Tailings Spill Memo (2000)	3,226	3.2 UJ	1.82	53.5	0.21	2.67 U	0.43 U	N/A	6.2	5.3	144	12,703	38.0	318	0.025 U	6.56
U03-2200	SP	BAR	Phase I RI (Golder 2000)	8,201	4.95 UJ	8.83	70.5	0.35 U	13.9	5.67	N/A	21.3	17.5	611	54,800	118 J	625	0.007 U	12.3
U03-2300	SP	BAR	Phase I RI (Golder 2000)	5,485	9.15 UJ	7.57	63.8	0.26 U	6.04	2.19	N/A	17.9	11.4	505	38,393	226 J	879	0.025 U	11.6

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Nickel (mg/kg)	Paste pH (SU)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	TOC (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
U02-5103	TTC	TRIB	Phase I RI (Golder 2000)	9.81	5.46	0.79 U	0.35 U	0.38 UJ	2.61	38.4	2,124
U02-5104	TTC	TRIB	Phase I RI (Golder 2000)	4.05 U	4.87	0.182 U	0.424 U	0.11 UJ	0.38	27.3	857
U02-5105	TTC	TRIB	Phase I RI (Golder 2000)	3.8 UJ	4.57	1.26	0.515 U	0.11 UJ	0.23	24.6	580
U02-5108	TTC	TRIB	Phase I RI (Golder 2000)	4.29 U	6.8	0.369	0.542 U	0.11 UJ	0.4	32.8	926
U02-5109	TTC	TRIB	Phase I RI (Golder 2000)	9.8	7.79	0.13 U	0.35 U	0.11 U	0.23	33.1	850
U02-5110	TTC	TRIB	Phase I RI (Golder 2000)	7	7.55	0.249 UJ	0.35 U	0.11 U	0.1	26.6	419
U02-5111	TTC	TRIB	Phase I RI (Golder 2000)	4.02 U	8.16	0.73 U	0.35 U	0.11 U	0.34	22.5	536
U02-1100	SP	AC	Phase I RI (Golder 2000)	6.39	7.68	0.185 U	0.545 U	0.327 UJ	0.1	16.4	2,934
U02-1102	CTC	AC	Phase I RI (Golder 2000)	9.18	7.68	0.337 U	0.35 U	0.322 UJ	0.19	27.8	2,376
U02-1103	SP	AC	Phase I RI (Golder 2000)	7.22	7.68	0.39 U	0.416 U	0.11 U	0.08	13.6	995
U02-1105	CTC	AC	Phase I RI (Golder 2000)	4.23 U	7.68	0.403 UJ	0.35 U	0.11 UJ	0.09	17.1	1,001
U02-2100	SP	BAR	Phase I RI (Golder 2000)	3.15 U	7.68	0.287 U	0.35 U	0.362 UJ	0.12	32	2,076
U02-2102	SP	BAR	Phase I RI (Golder 2000)	4.13 U	7.68	0.535	0.35 U	0.412 UJ	0.17	33.1	1,396
U02-3100	SP	OB	Phase I RI (Golder 2000)	8.45	7.68	0.64 U	0.405 U	0.531 UJ	0.48	20	4,637
U02-3102	SP	OB	Phase I RI (Golder 2000)	4.47 U	5.36	0.208 U	0.982	0.11 UJ	0.48	36.7	1,171
U03-1000	TTC	TRIB	Phase I RI (Golder 2000)	3.15 U	4.93	0.13 U	2.08	0.11 UJ	0.28	24.7	540
U03-1001	TTC	TRIB	Phase I RI (Golder 2000)	3.15 U	2.54	0.13 U	1.62	0.11 UJ	0.09	48.1	528
U03-1002	TTC	TRIB	Phase I RI (Golder 2000)	4.64 U	4.45	0.13 U	1.74	0.11 UJ	0.61	34.4	313
U03-5200	TTC	TRIB	Phase I RI (Golder 2000)	3.15 U	8.16	0.447 U	0.442 U	0.11 U	0.34	16.5	482
U03-5201	TTC	TRIB	Phase I RI (Golder 2000)	4.17 U	8.16	0.331	0.906 U	0.234 UJ	0.34	27.1	4,299
U03-5500	SP	TRIB	Phase I RI (Golder 2000)	6.31 U	2.5	0.18 U	0.358 U	0.11 UJ	0.24	18.5	69.6 J
U03-5501	SP	TRIB	Phase I RI (Golder 2000)	4.83 U	2.5	1.61	0.35 U	0.129 UJ	0.24	18.3	100 J
U03-5502	SP	TRIB	Phase I RI (Golder 2000)	14.5	2.5	2.15	0.636 U	0.11 UJ	0.24	29.9	192 J
U03-5503	SP	TRIB	Phase I RI (Golder 2000)	17.1	2.5	4.75	0.506 U	0.819 U	0.24	33.8	198 J
U03-1200	SP	AC	Phase I RI (Golder 2000)	1.084 U	7.37	0.138 U	0.079 U	0.025 UJ	0.12	3.25	418
U03-1202	CTC	AC	Phase I RI (Golder 2000)	1.40	7.3	0.15	0.08 U	0.25 UJ	0.21	6.95	382
U03-1300	SP	AC	Phase I RI (Golder 2000)	6.97	7.1	0.232 U	2.29 J	0.25 UJ	0.11	28.5	1010
U03-1302	SP	AC	Phase I RI (Golder 2000)	3.81 U	7.03	0.206 U	0.41 U	0.11 UJ	0.2	25.6	658
U03-1304	SP	AC	Phase I RI (Golder 2000)	3.23 UJ	4.6	0.534	0.505 U	0.11 UJ	0.11	21.8	404
U03-1306	CTC	AC	Phase I RI (Golder 2000)	8.5 J	5.83	0.559	0.742 U	0.11 UJ	0.25	34.7	798
U03-1307	SP	AC	Phase I RI (Golder 2000)	4.26 U	5.85	0.563 J	0.35 U	0.305 UJ	0.19	28.7	650 J
U03-1309	SP	AC	Phase I RI (Golder 2000)	4.15 U	6.79	0.411 J	0.35 U	0.255 UJ	0.09	24	720 J
U03-1311	SP	AC	Phase I RI (Golder 2000)	3.15 U	7.37	0.262 J	0.35 U	0.177 UJ	0.08	21.4	637 J
U03-1313	SP	AC	Phase I RI (Golder 2000)	7.84	7.87	0.178 U	1.47	0.195 UJ	0.07	24.9	800
U03-1315	SP	AC	Phase I RI (Golder 2000)	10.8	6.69	0.13 UJ	0.431 U	0.513 UJ	0.26	24.5	1,016 J
U03-1317	CTC	AC	Phase I RI (Golder 2000)	3.79 U	5.99	0.13 U	0.35 U	0.241 UJ	0.15	30.8	345 J
U03-1400	CTC	AC	Phase I RI (Golder 2000)	9.27	7.21	0.13 UJ	0.359 U	0.138 U	0.27	28	198 J
U03-1500 B	CTC	AC	Post Tailings Spill Memo (2000)	38.8	N/A	1.98 J	0.44 U	0.09 U	N/A	21.3	451
U03-1600 B	CTC	AC	Post Tailings Spill Memo (2000)	7.30	N/A	0.13 UJ	0.44 U	0.09 U	N/A	28.1	62.8
U03-1700 B	CTC	AC	Post Tailings Spill Memo (2000)	2.85 U	N/A	0.15 UJ	0.44 U	0.09 U	N/A	16.3	28.1
U03-1702 B	CTC	AC	Post Tailings Spill Memo (2000)	4.15 U	N/A	0.13	0.44 U	0.09 U	N/A	17.8	44.6
U03-1800	CTC	AC	Phase I RI (Golder 2000)	4.36 U	4.38	0.33	0.35 U	0.11 U	N/A	24.1	65.7 J
U03-1900 B	CTC	AC	Post Tailings Spill Memo (2000)	3.89 U	N/A	0.13 UJ	0.44 U	0.09 U	N/A	23.9	191
U03-1901 B	CTC	AC	Post Tailings Spill Memo (2000)	4.43 U	N/A	0.10 UJ	0.44 U	0.20	N/A	37.1	81.4
U03-1902 B	CTC	AC	Post Tailings Spill Memo (2000)	4.28 U	N/A	0.13 UJ	0.44 U	0.09 U	N/A	19.7	104
U03-2200	SP	BAR	Phase I RI (Golder 2000)	3.56 UJ	5.66	0.42	0.11 U	0.33 UJ	0.3	14.7	664
U03-2300	SP	BAR	Phase I RI (Golder 2000)	4.77 U	6.21	0.64	0.56 U	0.11 UJ	0.37	23.8	894

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)
U03-2302	SP	BAR	Phase I RI (Golder 2000)	4,929	4.95 UJ	8.78	60.4	0.16 U	6.55	1.09	N/A	18.2	5.38	382	38,422	274 J	653	0.025 U	12.5
U03-2303	SP	BAR	Phase I RI (Golder 2000)	12,810	4.95 UJ	5.97	109	0.83	4.57 U	2.62	N/A	16	45.4	1,307	34,934	292 J	2,239	0.025 U	7.57
U03-2305	SP	BAR	Phase I RI (Golder 2000)	6,058	4.95 UJ	5.59	58.7	0.46	3.05 U	2.01	N/A	17.8	11.4	681	31,075	227 J	1,009	0.025 U	7.61
U03-2306	SP	BAR	Phase I RI (Golder 2000)	7,067	4.95 UJ	6.45	68.6	0.223 U	7.19	1.76 J	N/A	24	8.39	485	45,893	248 J	754	0.025 U	9.41
U03-2307	SP	BAR	Phase I RI (Golder 2000)	5,489	4.95 UJ	6.69	73.5	0.30	4.29 U	0.41 U	N/A	17.6	8.71	532	32,872	294 J	783	0.025 U	8.7
U03-2309	SP	BAR	Phase I RI (Golder 2000)	7,163	4.95 UJ	7.97	73.5	0.70	7.39	2.06	N/A	16.1	15.4	1,085	35,069	340 J	1,461	0.025 U	10.2
U03-2311	SP	BAR	Phase I RI (Golder 2000)	4,614	4.95 UJ	6.84	64.7	0.189 U	3.62 U	3.19	N/A	11.3	8.85	978	22,356	239 J	854	0.025 U	8.74
U03-2312	SP	BAR	Phase I RI (Golder 2000)	8,110	4.95 UJ	7.47	88.2	0.332 U	7.73	0.541 U	N/A	21.3	10.5	393	44,765	217 J	917	0.0427	7.63
U03-2313	SP	BAR	Phase I RI (Golder 2000)	7,900	4.95 UJ	5.19	78.3	0.342 UJ	6.47	0.41 U	N/A	24.5	7.96	439	46,225	413 J	1,008	0.025 U	11.6
U03-2315	SP	BAR	Phase I RI (Golder 2000)	12,308	4.95 UJ	4.9 J	96	0.70	2.78 UJ	0.95	N/A	24.1	12.1	573	49,326	180	721 J	0.025 U	6.47
U03-2316	SP	BAR	Phase I RI (Golder 2000)	13,694	4.95 UJ	6.5 J	71.3	0.91	3.2 UJ	0.99	N/A	28.5	13.0	1,112	49,987	404	617 J	0.025 U	10.6
U03-2318	SP	BAR	Phase I RI (Golder 2000)	5,650	4.95 UJ	5.88	67.5	0.211 UJ	8.32	0.636 U	N/A	23.3	6.17	452	46,480	198 J	587	0.025 U	10
U03-2320	SP	BAR	Phase I RI (Golder 2000)	6,733	4.95 U	5.8	75.8	0.171 UJ	7.86	0.613 U	N/A	26.8	4.16	422	48,879	204 J	458	0.025 U	9.28
U03-2321	SP	BAR	Phase I RI (Golder 2000)	6,678	4.95 U	7.24	69.7	0.161 UJ	6.39	0.41 U	N/A	24	4.68	438	45,107	213 J	437	0.025 U	9.27
U03-2322	SP	BAR	Phase I RI (Golder 2000)	5,480	4.95 U	5.46	73.8	0.125 UJ	6.02	0.76	N/A	24.7	3.82	396	43,030	239 J	378	0.025 U	7.8
U03-2600 B	SP	BAR	Post Tailings Spill Memo (2000)	2,774	3.2 UJ	1.70	67.3	0.17	4.73 U	0.28 U	N/A	7.97	2.51	104	22,744	9.99	129	0.025 U	12.8
U03-2602 B	SP	BAR	Post Tailings Spill Memo (2000)	2,805	3.2 UJ	2.51	57.8	0.17	3.64 U	2.47	N/A	5.79	6.41	325	12,316	48.3	270	0.025 U	14.6
U03-2800	SP	BAR	Phase I RI (Golder 2000)	6,083	4.95 UJ	1.56 J	105	0.106 U	2.75 UJ	0.41 U	N/A	12.2	5.06	193	22,612	16.9	179 J	0.025 U	21.2
U03-2900 B	SP	BAR	Post Tailings Spill Memo (2000)	4,801	3.2 UJ	1.42	71.5	0.20	3.50 U	0.59	N/A	6.87	5.86	139	13,168	19.4	274	0.025 U	9.89
U03-2901 B	SP	BAR	Post Tailings Spill Memo (2000)	4,056	3.2 UJ	1.67	80.5	0.20	3.78 U	0.28 U	N/A	8.26	4.75	179	18,710	24.2	290	0.025 U	16.4
U03-3003	SP	TRIB	Phase I RI (Golder 2000)	3,821	4.95	1.44	78.0	0.40	2.75	0.59	N/A	3.62	3.43	149	5,016	316	403	0.03	3.14
U03-3004	SP	TRIB	Phase I RI (Golder 2000)	7,365	4.95	2.95	87.2	0.25	2.75	1.35	N/A	6.19	7.17	510	1,836	1,836	575	0.03	7.1
U03-3200	SP	OB	Phase I RI (Golder 2000)	8,338	4.95 UJ	6.35 J	68.7	0.398 U	2.75 U	1.71	N/A	18.3	28.4	984	43,846	147.1	513	0.011 UJ	10.6
U03-3300	SP	OB	Phase I RI (Golder 2000)	6,977	4.95 UJ	3.31	125	0.246 U	3.51 U	2.92 J	N/A	9.25 J	8.15 J	3,250	13,285	537	1,578	0.201	11.6
U03-3302	SP	OB	Phase I RI (Golder 2000)	11,307	4.95 UJ	8.05	98.3	0.512 U	9.27	6.56 J	N/A	22.7 J	24.3 J	1,439	40,653	363	1,838	0.025 U	11.3
U03-3303	SP	OB	Phase I RI (Golder 2000)	5,844	4.95 UJ	10.2	80.1	0.214 U	2.75 U	3.24 J	N/A	13.1 J	12.5 J	780	27,890	323	1,191	0.025 U	7.73
U03-3305	SP	OB	Phase I RI (Golder 2000)	14,087	4.95 UJ	1.43 U	128	0.356 U	5.19 U	1.93 J	N/A	16.5 J	11.9 J	518	25,058	138	1,089	0.025 U	10.5
U03-3306	SP	OB	Phase I RI (Golder 2000)	10,972	4.95 UJ	4.3	99.4	0.257 U	5.9	3.31 J	N/A	16.5 J	12 J	771	29,738	233	1,169	0.025 U	5.54
U03-3308	SP	OB	Phase I RI (Golder 2000)	6,361	4.95 UJ	2.11	116	0.404 U	2.75 U	1.71 J	N/A	7.12 J	7.2 J	601	9,445	89	929	0.025 U	3.65
U03-3309	SP	OB	Phase I RI (Golder 2000)	10,077	4.95 UJ	1.21	149	0.361 U	2.75 U	0.41 U	N/A	8.53 J	6.44 J	242	11,532	38.1	619	0.025 U	1.78 U
U03-3311	SP	OB	Phase I RI (Golder 2000)	7,807	4.95 UJ	0.67	119	0.297 U	3.7 U	0.41 U	N/A	5.34 J	5.1 J	133	8,675	16.3	498	0.025 U	2.04 U
U03-3312	SP	OB	Phase I RI (Golder 2000)	10,095	4.95 UJ	2.93 J	102	0.326 U	7.35	1.67	N/A	14.6	7.89	782	24,087	120	964	0.025 U	6.09
U03-3314	SP	OB	Phase I RI (Golder 2000)	7,825	4.95 UJ	2.9 J	94.9	0.479	2.75 U	1.6	N/A	13.9	7.4 J	714	17,807	116	939	0.025 U	4.96
U03-3316	SP	OB	Phase I RI (Golder 2000)	11,231	4.95 UJ	2.49 J	106	0.307 U	3.76 U	1.5	N/A	15.9	8.57 J	833	23,369	110	941	0.025 U	3.35 U
U03-3317	SP	OB	Phase I RI (Golder 2000)	16,767	4.95 UJ	2.27 J	164	0.655	2.75 U	1.18	N/A	15.3	8.12 J	585	20,307	63.3	797	0.025 U	3.55
U03-3318	SP	OB	Phase I RI (Golder 2000)	6,530	4.95 UJ	5.55	86.4	0.315 U	2.75 U	2.75 J	N/A	11.3 J	10.8 J	952	18,697	133	897	0.025 U	5.08
U03-3320	SP	OB	Phase I RI (Golder 2000)	6,547	4.95 UJ	6.05 J	85.2	0.281 U	2.75 U	4.05	N/A	12.6	11.8	1,454	23,663	193	1,056	0.025 U	6.88
U03-3321	SP	OB	Phase I RI (Golder 2000)	7,222	4.95 UJ	1.31 J	103	0.279 U	2.75 U	0.955 U	N/A	4.7	4.89 J	957	8,413	33.1	494	0.0351 U	5.13
U03-3322	SP	OB	Phase I RI (Golder 2000)	5,416	4.95 UJ	3.66 J	78.6	0.234 U	2.75 U	3.04	N/A	11.4	9.3 J	1,175	18,148	131	969	0.025 U	3.96
U03-3400	SP	OB	Phase I RI (Golder 2000)	13,103	4.95 UJ	2.22 J	182	0.585 U	8.49	2.42	N/A	9.58	10.1	2,384	15,538	53.2	381	0.0561	16.4
U03-3500	SP	OB	Phase I RI (Golder 2000)	7,134	R	0.974	106	0.254 U	4.28 U	0.705 U	N/A	11.3	22.3	980 J	25,234	8.05	315	0.025 U	37
U03-3600	SP	OB	Phase I RI (Golder 2000)	7,110	R	1.19	113	0.415 U	3.46 U	0.41 U	N/A	8.65 J	9.76	342 J	12,828	10.6	307	0.027 U	5.64 U
U03-3602	SP	Terrace	Phase I RI (Golder 2000)	10,002	4.95	0.862	125	0.427	2.75	0.41	N/A	12.921	6.718	190	13,903	9.28	333	0.025	2.01
U03-3604	SP	OB	Phase I RI (Golder 2000)	3,125	4.95 UJ	1.67 J	99.5	0.113 U	2.75 UJ	0.41 U	N/A	6.26	5.43	285	13,114	16.1	94.1 J	0.025 U	13.7
U03-3800	SP	OB	Phase I RI (Golder 2000)	4,608	R	1.32	84.6	0.184 U	2.75 U	0.41 U	N/A	6.19	6.48	297 J	11,126	39.4	481	0.025 U	4.01
U03-3900	SP	OB	Phase I RI (Golder 2000)	10,095	4.95 UJ	2 J	118	0.199 U	3.38 UJ	0.41 U	N/A	20	8.51	346	45,510	15.5	224 J	0.025 U	16.2
U03-3901	SP	OB	Phase I RI (Golder 2000)	8,188	4.95 UJ	1.16 J	83.7	0.231 U	3.51 U	0.41 U	N/A	10.8	4.61 J	541	16,318	35.2	577	0.025 U	4.75

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Nickel (mg/kg)	Paste pH (SU)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	TOC (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
U03-2302	SP	BAR	Phase I RI (Golder 2000)	3.91 U	3.92	0.72	0.35 U	0.11 UJ	0.11	23.5	413
U03-2303	SP	BAR	Phase I RI (Golder 2000)	10.4	6.17	0.499	2.1	0.11 UJ	0.14	29.6	1,023
U03-2305	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.45	0.70	2.14	0.172 UJ	0.19	18.5	1,055
U03-2306	SP	BAR	Phase I RI (Golder 2000)	4.67 U	6.3	0.816 J	1.86 J	0.333 UJ	0.16	26.6	717
U03-2307	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.73	0.56	1.86	0.172 UJ	0.15	19.3	469
U03-2309	SP	BAR	Phase I RI (Golder 2000)	8	6.02	0.50	5.1	0.11 UJ	0.25	26.9	852
U03-2311	SP	BAR	Phase I RI (Golder 2000)	4.93 U	6	0.644 J	1.15	0.11 UJ	0.34	17.9	1,289
U03-2312	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.15	0.64	0.35 U	0.398 UJ	0.15	35	353 J
U03-2313	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.26	0.49	0.35 U	0.335 UJ	0.17	32.2	339 J
U03-2315	SP	BAR	Phase I RI (Golder 2000)	8.41	4.52	0.13 UJ	0.35 U	0.11 UJ	0.26	47.1	342 J
U03-2316	SP	BAR	Phase I RI (Golder 2000)	8.56	3.73	0.446 UJ	0.404 U	1.1 U	0.27	36.6	362 J
U03-2318	SP	BAR	Phase I RI (Golder 2000)	4.03 U	3.86	0.61	0.35 U	0.362 UJ	0.12	28	410 J
U03-2320	SP	BAR	Phase I RI (Golder 2000)	4.43 U	4.31	0.87	0.35 U	0.402 UJ	0.13	27.8	288 J
U03-2321	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.04	0.85	0.35 U	0.463 UJ	0.15	26.4	308 J
U03-2322	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.02	0.62	0.35 U	0.11 UJ	0.11	23.3	284 J
U03-2600 B	SP	BAR	Post Tailings Spill Memo (2000)	2.85 U	N/A	1.08 J	0.44 U	0.09 U	N/A	18.9	10.9
U03-2602 B	SP	BAR	Post Tailings Spill Memo (2000)	4.20 U	N/A	0.31 UJ	0.44 U	0.09 U	N/A	13.5	141
U03-2800	SP	BAR	Phase I RI (Golder 2000)	3.15 U	4.17	0.8	0.504 U	0.11 U	N/A	22	36.1 J
U03-2900 B	SP	BAR	Post Tailings Spill Memo (2000)	7.60	N/A	0.18 UJ	0.44 U	0.09 U	N/A	17.5	60.1
U03-2901 B	SP	BAR	Post Tailings Spill Memo (2000)	4.51 U	N/A	0.39 J	0.44 U	0.09 U	N/A	21.6	97.3
U03-3003	SP	TRIB	Phase I RI (Golder 2000)	3.15	3.24	0.13	0.77	0.11	0.56	12.9	137
U03-3004	SP	TRIB	Phase I RI (Golder 2000)	3.15	2.5	0.27	3.71	0.11	0.24	24.7	393
U03-3200	SP	OB	Phase I RI (Golder 2000)	1.49 U	5.38	0.51	0.39	UJ	0.4	9.57 U	317
U03-3300	SP	OB	Phase I RI (Golder 2000)	3.15 U	7	0.63	0.875 U	0.11 U	3	15.7 J	733 J
U03-3302	SP	OB	Phase I RI (Golder 2000)	11.1 J	6.43	0.53	0.35 U	0.11 UJ	0.6	29.9 J	2,528 J
U03-3303	SP	OB	Phase I RI (Golder 2000)	5.43 J	5.07	0.51	0.35 U	0.11 U	1.03	17.5 J	1,228 J
U03-3305	SP	OB	Phase I RI (Golder 2000)	11.3 J	7.75	0.13 U	0.35 U	0.11 U	1.17	33.7 J	755 J
U03-3306	SP	OB	Phase I RI (Golder 2000)	9.88 J	7.55	0.13 U	0.35 U	0.11 U	0.76	34.2 J	1,215 J
U03-3308	SP	OB	Phase I RI (Golder 2000)	7.75 J	7.40	0.13 U	0.35 U	0.11 U	1.77	16.6 J	384 J
U03-3309	SP	OB	Phase I RI (Golder 2000)	5.92 J	7.30	0.13 U	0.35 U	0.11 U	1.09	18.6 J	144 J
U03-3311	SP	OB	Phase I RI (Golder 2000)	4.18 U	7.08	0.13 U	0.35 U	0.11 U	0.66	14.7 J	94.1 J
U03-3312	SP	OB	Phase I RI (Golder 2000)	4.13 U	7.08	0.361	0.93	R	0.72	21.2 U	467
U03-3314	SP	OB	Phase I RI (Golder 2000)	6.95	7.08	0.13 U	0.35 UJ	0.11 U	0.6	22.2	494
U03-3316	SP	OB	Phase I RI (Golder 2000)	8.93	7.08	0.354	0.35 UJ	0.11 U	0.72	30	462
U03-3317	SP	OB	Phase I RI (Golder 2000)	10.9	7.08	0.328	0.688 J	0.11 U	2.87	31.7	265
U03-3318	SP	OB	Phase I RI (Golder 2000)	6.68 J	7.08	0.36	0.35 U	0.11 U	0.68	21.2 J	879 J
U03-3320	SP	OB	Phase I RI (Golder 2000)	4.94 U	7.08	1.29	0.35 UJ	0.11 U	0.53	22.4	1,457
U03-3321	SP	OB	Phase I RI (Golder 2000)	5.21 U	7.08	0.485	0.35 UJ	0.11 U	1.22	13.2	254
U03-3322	SP	OB	Phase I RI (Golder 2000)	4.75 U	7.08	0.587 J	0.881 J	0.11 U	0.28	18.5	1,126
U03-3400	SP	OB	Phase I RI (Golder 2000)	8.18	7.12	1.56	0.64	U	2.18	12.6 U	175
U03-3500	SP	OB	Phase I RI (Golder 2000)	6.15	4.35	1.96	0.35 U	0.11 UJ	0.15	18.1	88.7
U03-3600	SP	OB	Phase I RI (Golder 2000)	8.49	4.04	0.56	0.35 U	0.11 U	0.84	19.8	32.1
U03-3602	SP	Terrace	Phase I RI (Golder 2000)	13.5	4.45	0.59	0.35	0.11	0.3	22.1	29.0
U03-3604	SP	OB	Phase I RI (Golder 2000)	3.15 U	3.98	1.01	1.58	0.11 U	0.49	11.4	13.9 J
U03-3800	SP	OB	Phase I RI (Golder 2000)	3.45 U	5.78	0.197 U	0.35 U	0.11 U	0.08	18.6	83.6
U03-3900	SP	OB	Phase I RI (Golder 2000)	4.94	7.53	0.776 U	0.35 U	0.177 UJ	0.48	22.4	43.7 J
U03-3901	SP	OB	Phase I RI (Golder 2000)	5.05 U	7.4	0.185 U	0.35 UJ	0.11 U	0.13	22.4	174

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)
U03-3902	SP	OB	Phase I RI (Golder 2000)	5,070	4.95 UJ	1.42 J	74.1	0.243	2.75 U	0.41 U	N/A	7.12	4.81 J	981	11,431	30.1	397	0.025 U	9.79
U03-4202	--	TCO	Golder (2005)	9,410	2.45 UJ	2.026 UJ	59.32	0.41	6.40	0.65	N/A	13.53	5.44	248.45	24,809.61	110.36	558.23	0.025	2.90
U03-4203	--	TCO	Golder (2005)	10,806.44	2.45 UJ	1.83	60.48	0.25 U	4.93 U	0.72	N/A	14.01	5.73 U	193.56	24,638.31	67.72 J	403.02	0.03 U	3.42
U03-4205	--	TCO	Golder (2005)	8,268.15	3.36 UJ	1.53	42.71	0.22	3.54	0.91	N/A	11.57	14.93	499.10	18,572.97	96.62 J	469.62	0.03 U	1.74 U
U03-4206	--	TCO	Golder (2005)	8,548.01	2.45 UJ	2.20	41.09	0.39 U	5.10 U	0.63	N/A	11.75	21.82	205.51	20,655.70	83.10 J	557.40	0.03 U	2.51
U03-4207	--	TCO	Golder (2005)	5,351.00	7.03 J	3.29	65.51	0.19 U	11.62	0.60 J	N/A	28.74	3.60	412.44	52,607.86	147.16	285.67 J	0.03 U	3.74 U
U03-4306	--	TCO	ECO RI (2001)	8,156.97	4.13 UJ	5.02	76.60	0.68	5.53 U	8.23	N/A	16.13	22.14	1,399.99	31,892.10	321.15 J	1,589.24	0.03 U	9.99
U03-4308	--	TCO	ECO RI (2001)	9,400.37	4.08 UJ	3.76 J	93.53	0.38 U	11.82 U	1.17 J	N/A	19.37	10.30	336.15	44,999.78	133.45	603.75 J	0.03 U	6.57 U
U03-4309	--	TCO	ECO RI (2001)	6,855.18	6.63 UJ	2.39 U	87.00	0.31 U	6.06	1.14 J	N/A	13.06	14.98	288.54	25,291.34	96.20	923.88 J	0.03 U	5.77
U03-4311	--	TCO	ECO RI (2001)	10,696.61	6.56 UJ	3.31	101.46	0.82	4.32 U	1.11	N/A	14.77	24.75	482.92	27,792.21	128.07 J	972.99	0.03 U	3.97
U03-4313	--	TCO	ECO RI (2001)	8,076.65	2.45 UJ	3.09	89.64	0.42 U	3.95 U	1.31	N/A	11.79	53.38	349.08	25,063.37	147.51 J	1,791.53	0.03 U	4.83
U03-4314	--	TCO	ECO RI (2001)	12,745.06	7.71 UJ	5.96	95.57	0.32 U	13.92 U	0.97 J	N/A	32.39	6.26	335.76	66,087.86	313.40	788.27 J	0.03 U	8.70
U03-4315	--	TCO	ECO RI (2001)	9,152.06	2.45 UJ	1.98	115.84	0.67	3.25 U	1.42	N/A	13.05	6.28 U	277.68	25,157.61	72.74 J	356.64	0.03 U	1.15 U
U03-4317	--	TCO	ECO RI (2001)	11,408.85	6.66 UJ	5.59 J	88.94	0.46 U	10.65 U	1.61 J	N/A	26.07	10.22	520.61	50,652.59	357.67	775.97 J	0.03 U	9.68
U03-4319	--	TCO	ECO RI (2001)	6,182.87	3.51 UJ	2.29 J	81.66	0.32 U	5.8 U	1.57 J	N/A	14.00	7.19	497.39	30,564.56	94.61	751.26 J	0.03 U	7.27
U03-4320	--	TCO	ECO RI (2001)	9,210.32	2.98 Uj	1.59 J	81.82	0.34 U	4.25 U	1.43	N/A	8.97	57.19	605.63	16,430.36	64.70	1,180.10 J	0.03 U	3.76
U03-4321	--	TCO	ECO RI (2001)	5,947.05	6.98 UJ	3.74 J	62.80	0.22 U	20.44	0.24 U	N/A	29.02	5.09	418.54	83,402.01	231.58	429.58 J	0.03 U	9.51
U03-4322	--	TCO	ECO RI (2001)	6,598.99	6.69 UJ	4.10 J	68.45	0.21 U	11.01 U	0.65 J	N/A	22.11	6.54	303.24	51,075.84	218.51	487.73 J	0.03 U	7.08
U03-4324	--	TCO	ECO RI (2001)	8,068.03	7.79 UJ	3.50 J	75.92	0.32 U	11.05 U	1.53 J	N/A	20.40	11.16	409.48	36,729.96	156.59	867.02 J	0.03 U	16.73
U03-6300	TC	Terrace	Phase I RI (Golder 2000)	13,813	4.95 UJ	2.51 J	150	0.65	2.75 U	0.71 U	N/A	14.5	9.72	662	18,618	46.1	931	0.03 U	4.52
U03-6600	TC	Terrace	Phase I RI (Golder 2000)	9,112	4.95 UJ	0.86 J	126	0.28 U	2.75 U	0.41 U	N/A	11.4	11.3	360	20,597	8.19	365	0.03 U	5.27 U
U03-6900	TC	Terrace	Phase I RI (Golder 2000)	8,929	4.95 UJ	2.10 J	98.5	0.64	2.75 U	0.41 U	N/A	13.5	6.04 J	98.1	15,270	24.2	503	0.03 U	1.35 U
ERA 22	--	OB	ECO RI (2001)	10,780	R	3.6 J	97.6	N/A	2.83 J	4.93	11,090	9.8	26.1	1,120	27,900	161	1,140 J	0.033 J	9.2
ERA 23	--	OB	ECO RI (2001)	13,933	R	1.73 UJ	146	N/A	4.23 J	1.6	3,540	8.5 J	9.05 J	973	19,800	21.4	289	0.037 J	14.1
ERA 26	--	OB	ECO RI (2001)	7,487	R	1.11 UJ	129	N/A	2.8 J	0.553	1,203	6.00	3.45	535	16,333	13.7	126 J	0.027 J	16.8
ERA 27	--	OB	ECO RI (2001)	7,420	0.03	0.68	97.3	N/A	2.6 U	0.703	3,420	6.73	5.65	328	16,800	34.6	520	0.01	5.25
ERA 28	--	OB	ECO RI (2001)	10,320	0.30	2.8	99.8	N/A	5.1 UJ	3.47	9,213	10.8 J	11.4 J	1,060	29,367	223 J	991	0.023 J	9.4 J
ERA 29	--	OB	ECO RI (2001)	5,270	0.1 R	2.83 U	74.3	N/A	1.4 UJ	6.00	14,633	8.17 J	12.4	459.7	23,133	365.7 J	2,050 J	0.01 UJ	5.5
ERA 31	--	OB	ECO RI (2001)	8,263	R	0.68 UJ	138	N/A	1.83	0.86	12,350	8.03 J	5.95 J	77.7 J	10,666	11.68 U	383	0.01 U	1.1 U
ERA 32	--	OB	ECO RI (2001)	10,900	R	3.87 J	190	N/A	2.87 UJ	19.1	26,353	6.27 U	10.2 J	419.5 J	28,100	2,128	2,807	0.05 U	6.8 J
ERA 33	--	OB	ECO RI (2001)	5,273	0.06 R	2.27	91.5	N/A	1.27	1.3	2,573	3.8 J	4.5	176.2	6,733	551.3 J	435 J	0.043 U	3.5
U03-51050	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.09 J	N/A	9.0	N/A	208	N/A	23.3	N/A	N/A	21.1
U03-51052	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.6	N/A	14.8	N/A	335	N/A	34.3	N/A	N/A	11.3
U03-51053	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.26	N/A	15.2	N/A	210	N/A	24.4	N/A	N/A	4.4
U03-51055	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.22 J	N/A	16.2	N/A	171	N/A	21.6	N/A	N/A	4.4
U03-51056	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.14 J	N/A	19	N/A	196	N/A	24.7	N/A	N/A	2.2 J
U03-51058	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.41 J	N/A	20.5	N/A	263	N/A	24.4	N/A	N/A	3.8 J
U03-51060	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.98	N/A	16	N/A	482	N/A	47.4	N/A	N/A	11.2
U03-51062	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.24	N/A	15.3	N/A	76.4	N/A	11.1	N/A	N/A	2.8 J
U03-51063	CTC	SED	Golder (2002)	N/A	N/A	N/A	N/A	N/A	N/A	0.75	N/A	15.4	N/A	92.2	N/A	17.5	N/A	N/A	1.5 J
U03-11150	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.24 J	N/A	5.9 J	N/A	183 J	N/A	21	N/A	N/A	13.5
U03-11254	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.02 UJ	N/A	6.5 J	N/A	233 J	N/A	21.2	N/A	N/A	32.4
U03-11255	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.19 J	N/A	7.6 J	N/A	281 J	N/A	25.1	N/A	N/A	20.8
U03-11256	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.34	N/A	4.9	N/A	118	N/A	18.9	N/A	N/A	11.9
U03-11260	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.66	N/A	23.4	N/A	2,360	N/A	42.9	N/A	N/A	24 J
U03-11261	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.66	N/A	22.4	N/A	2,000	N/A	41.4	N/A	N/A	20.8 J
U03-11262	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.49	N/A	15.9	N/A	465	N/A	36	N/A	N/A	8 J

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Nickel (mg/kg)	Paste pH (SU)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	TOC (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
U03-3902	SP	OB	Phase I RI (Golder 2000)	3.34 U	5.36	0.221 U	0.35 U	R	0.48	17.1	109
U03-4202	--	TCO	Golder (2005)	3.5	6.98	0.06	0.29	0.1	0.31	30.83	370.38
U03-4203	--	TCO	Golder (2005)	6.03 U	7.51	0.06 UJ	0.29 UJ	0.1 UJ	0.43	35.96	315.88 J
U03-4205	--	TCO	Golder (2005)	5.41 U	4.45	0.06 UJ	0.29 UJ	0.1 UJ	0.31	24.26	475.36 J
U03-4206	--	TCO	Golder (2005)	4.83 U	5.75	0.06 UJ	0.29 UJ	0.1 UJ	0.25	27.85	316.79 J
U03-4207	--	TCO	Golder (2005)	4.20 UJ	3.85	--	0.29 UJ	0.21 UJ	0.05	31.73	205.37 J
U03-4306	--	TCO	ECO RI (2001)	13.15	5.82	0.31 UJ	0.29 UJ	0.1 UJ	0.24	28.15	3,209.2 J
U03-4308	--	TCO	ECO RI (2001)	7.64 UJ	4.07	0.24 UJ	0.29 UJ	0.1 UJ	0.22	36.62	356.08 J
U03-4309	--	TCO	ECO RI (2001)	4.96 U	5.14	0.06 UJ	0.29 UJ	0.1 UJ	0.23	26.96	420.69 J
U03-4311	--	TCO	ECO RI (2001)	10.85	4.43	0.20 UJ	0.29 UJ	0.1 UJ	0.40	29.32	576.35 J
U03-4313	--	TCO	ECO RI (2001)	15.06	4.51	0.12 J	0.29 UJ	0.1 UJ	0.31	25.93	569.04 J
U03-4314	--	TCO	ECO RI (2001)	4.97 U	3.92	0.10 UJ	0.29 UJ	0.1 UJ	0.27	60.40	386.52 J
U03-4315	--	TCO	ECO RI (2001)	3.5 U	3.89	0.06 UJ	0.29 UJ	0.1 UJ	0.40	38.98	213.75 J
U03-4317	--	TCO	ECO RI (2001)	8.47 J	4.47	0.13J	0.29 UJ	0.1 UJ	0.37	39.11	734.23 J
U03-4319	--	TCO	ECO RI (2001)	4.25 U	4.11	0.16 UJ	0.29 UJ	0.1 UJ	0.13	29.79	343.01 J
U03-4320	--	TCO	ECO RI (2001)	11.97	4.31	0.6 UJ	0.29 UJ	0.1 UJ	0.27	23.25	232.62 J
U03-4321	--	TCO	ECO RI (2001)	4.17 UJ	3.66	0.08 UJ	0.29 UJ	0.22 UJ	0.07	33.71	274.55 J
U03-4322	--	TCO	ECO RI (2001)	3.5 UJ	3.74	0.06 UJ	0.29 UJ	0.1 UJ	0.13	30.63	271.88 J
U03-4324	--	TCO	ECO RI (2001)	5.55 UJ	6.62	0.06 UJ	0.29 UJ	0.1 UJ	0.29	30.84	643.38 J
U03-6300	TC	Terrace	Phase I RI (Golder 2000)	11.7	7.08	0.25	0.35 UJ	0.11 U	0.66	30.4	204
U03-6600	TC	Terrace	Phase I RI (Golder 2000)	5.68 U	3.71	0.52 U	0.35 UJ	0.11 U	0.56	19.0	36.1
U03-6900	TC	Terrace	Phase I RI (Golder 2000)	4.42 U	7.34	0.13 U	0.35 UJ	0.11 U	0.19	26.5	88.1
ERA 22	--	OB	ECO RI (2001)	12.3	N/A	0.47 J	N/A	0.14	N/A	15.6	1520
ERA 23	--	OB	ECO RI (2001)	11.7	N/A	0.73	N/A	0.11	N/A	12.8	35.6
ERA 26	--	OB	ECO RI (2001)	5.37	N/A	1.03 J	N/A	0.09	N/A	9.2	18.1
ERA 27	--	OB	ECO RI (2001)	7.77	N/A	0.39	N/A	0.12	N/A	16.6 J	108 J
ERA 28	--	OB	ECO RI (2001)	9.57 J	N/A	0.56	N/A	0.14	N/A	15.1 J	1182
ERA 29	--	OB	ECO RI (2001)	8.43	N/A	0.427	N/A	0.12	N/A	10.2 J	2,240
ERA 31	--	OB	ECO RI (2001)	12.7	N/A	0.13 U	N/A	0.09	N/A	14 J	37.93
ERA 32	--	OB	ECO RI (2001)	7.67 J	N/A	0.35 U	N/A	0.32	N/A	21.7 J	8,350
ERA 33	--	OB	ECO RI (2001)	4.17	N/A	0 .11 U	N/A	0.10	N/A	17.7 J	243
U03-51050	CTC	SED	Golder (2002)	N/A	4.18	0.38 J	N/A	N/A	0.03	N/A	50.8
U03-51052	CTC	SED	Golder (2002)	N/A	4.73	0.1 UJ	N/A	N/A	0.52	N/A	130
U03-51053	CTC	SED	Golder (2002)	N/A	3.87	0.1 UJ	N/A	N/A	0.41	N/A	109
U03-51055	CTC	SED	Golder (2002)	N/A	7.38	0.1 UJ	N/A	N/A	0.75	N/A	71.5
U03-51056	CTC	SED	Golder (2002)	N/A	3.72	0.1 UJ	N/A	N/A	0.47	N/A	102
U03-51058	CTC	SED	Golder (2002)	N/A	4.3	0.1 UJ	N/A	N/A	0.48	N/A	140
U03-51060	CTC	SED	Golder (2002)	N/A	6.33	0.1	N/A	N/A	0.65	N/A	225
U03-51062	CTC	SED	Golder (2002)	N/A	7.83	0.1 UJ	N/A	N/A	1.08	N/A	54.4
U03-51063	CTC	SED	Golder (2002)	N/A	7.87	0.1 UJ	N/A	N/A	0.31	N/A	110
U03-11150	CTC	AC	Golder (2003)	N/A	4.62 J	0.3 J	N/A	N/A	0.19	N/A	70.1
U03-11254	CTC	AC	Golder (2003)	N/A	4.09 J	0.46 J	N/A	N/A	0.44	N/A	69.3
U03-11255	CTC	AC	Golder (2003)	N/A	4.42 J	0.81 J	N/A	N/A	0.28	N/A	66.2
U03-11256	CTC	AC	Golder (2003)	N/A	4.37 J	0.23 J	N/A	N/A	0.69 J	N/A	55.9
U03-11260	CTC	AC	Golder (2003)	N/A	6.57 J	0.44 J	N/A	N/A	1.06	N/A	204
U03-11261	CTC	AC	Golder (2003)	N/A	6.31 J	0.34 J	N/A	N/A	1.84	N/A	227
U03-11262	CTC	AC	Golder (2003)	N/A	4.65 J	R	N/A	N/A	1.07	N/A	158

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)
U03-11284	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.49	N/A	11.0	N/A	429	N/A	33.9	N/A	N/A	16.9 J
U03-11288	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.31	N/A	11.9	N/A	784	N/A	38.8	N/A	N/A	18.9
U03-11366	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.27	N/A	8.9	N/A	159	N/A	34.3	N/A	N/A	10.3 J
U03-11471	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.62	N/A	12.5	N/A	388	N/A	36.1	N/A	N/A	9.1
U03-11576	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.35	N/A	6.4	N/A	157	N/A	22.4	N/A	N/A	6.9 J
U03-11579	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.77 J	N/A	14.2 J	N/A	463 J	N/A	41.6 J	N/A	N/A	10.6 J
U03-11586	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	1.4	N/A	23.4	N/A	941	N/A	90.3	N/A	N/A	11.1 J
U03-11680	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.02 U	N/A	18.4	N/A	43	N/A	18.9	N/A	N/A	2
U03-11682	CTC	AC	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.19	N/A	19.4	N/A	40.5	N/A	20.2	N/A	N/A	2
U03-31152	CTC	OB	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.35 J	N/A	7.3 J	N/A	314 J	N/A	32.3	N/A	N/A	6.9
U03-31259	CTC	OB	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.24	N/A	9.8	N/A	261	N/A	25	N/A	N/A	15.3
U03-31264	CTC	OB	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.39	N/A	11.7	N/A	343	N/A	41.2	N/A	N/A	14.8 J
U03-31368	CTC	OB	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.45	N/A	14.1	N/A	266	N/A	42.6	N/A	N/A	4.2 J
U03-31578	CTC	OB	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.49	N/A	10.4	N/A	371	N/A	29.9	N/A	N/A	11.2 J
U03-61153	CTC	UL	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.57 J	N/A	10 J	N/A	761 J	N/A	73.5	N/A	N/A	6.3
U03-61258	CTC	UL	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.3	N/A	17.6	N/A	236	N/A	28.7	N/A	N/A	5.4
U03-61265	CTC	UL	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.28	N/A	16.7	N/A	128	N/A	29.3	N/A	N/A	4.1 J
U03-61369	CTC	UL	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.22	N/A	17.2	N/A	101	N/A	25.9	N/A	N/A	2.3
U03-61474	CTC	UL	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.17	N/A	14	N/A	43.4	N/A	13.9	N/A	N/A	2
U03-61575	CTC	UL	Golder (2003)	N/A	N/A	N/A	N/A	N/A	N/A	0.29	N/A	9.7	N/A	93.9	N/A	30.4	N/A	N/A	2.4
LW-03E-S01-SD	GS	SED	Golder (2008)	11,600	0.1 UJ	2.2	140 J+	N/A	2	0.5	N/A	10.1	12	439	20,200	24.5	357	N/A	18.5
LW-03E-S02-SD	GS	SED	Golder (2008)	13,100	0.1 UJ	3	153 J+	N/A	3	1.06	N/A	12.7	23	779	20,500	30.9	847	N/A	16.7
LW-03E-S03-SD	GS	SED	Golder (2008)	17,000	0.1 UJ	4.9	171 J+	N/A	3	0.95	N/A	20.6	10	756	24,900	40.7	405	N/A	25
LW-03E-S04-SD	GS	SED	Golder (2008)	12,100	0.1 UJ	3.1	149 J+	N/A	2	1	N/A	12.7	10	542	19,000	32.6	651	N/A	12.2
LW-03E-S05-SD	GS	SED	Golder (2008)	13,800	0.1 UJ	2.7	162 J+	N/A	4	0.69	N/A	12.1	8	731	27,400	27.5	271	N/A	22.3
U02-ER001	SP	OB	Golder (2008)	6,500	0.15 J	7.9	N/A	N/A	6.7	4.6	7,940	N/A	N/A	549	48,900	312	N/A	0.02 J	8.1
U02-ER002	SP	OB	Golder (2008)	5,120	0.3 J	8.7	N/A	N/A	8.9	5.5	9,040	N/A	N/A	618	60,900	297	N/A	0.3 U	9.2
U02-ER003	SP	OB	Golder (2008)	7,220	0.18 J	10.2	N/A	N/A	7.6	6	8,950	N/A	N/A	449	45,000	458	N/A	0.03 J	5.7
U02-ER004	SP	OB	Golder (2008)	5,400	0.17 J	8.8	N/A	N/A	7.9	4.7	12,200	N/A	N/A	438	48,400	571	N/A	0.02 J	8.1
U02-ER005	SP	BAR	Golder (2008)	5,530	0.23 J	3.4 J	N/A	N/A	3 J	4	9,830	N/A	N/A	544	41,600	169	N/A	0.06	6
U02-ER006	SP	BAR	Golder (2008)	4,630	0.2 J	3.8	N/A	N/A	6.7	3	12,600	N/A	N/A	441	42,100	89.3	N/A	0.3 U	7.9
U02-ER007	SP	BAR	Golder (2008)	4,730	0.16 J	4.1	N/A	N/A	6.7	2.9	12,700	N/A	N/A	463	40,700	126	N/A	0.01 U	9.1
U02-ER009	SP	BAR	Golder (2008)	5,000	0.12 J	4.5	N/A	N/A	7.3	3	15,200	N/A	N/A	585	38,000	165	N/A	0.008 U	9.2
U02-ER010	SP	BAR	Golder (2008)	4,850	0.15 J	10	N/A	N/A	6.1	1.4	7,220	N/A	N/A	423	53,800	317	N/A	0.3 U	9.3
U02-ER011	CTC	AC	Golder (2008)	3,500	0.12 J	1.6 J	N/A	N/A	2 J	2.5	10,500	N/A	N/A	249	29,900	71.2	N/A	0.02 J	3.5 J
U03-ER001	CTC	AC	Golder (2008)	5,920	0.25 J	2 J	N/A	N/A	3 J	2.9	5,050	N/A	N/A	622	36,100	682	N/A	0.02 U	7.1
U03-ER002	CTC	AC	Golder (2008)	4,600	0.1 J	1.7 J	N/A	N/A	1 J	2.4	8,960	N/A	N/A	307	25,200	134	N/A	0.02 J	2.5 J
U03-ER004	CTC	AC	Golder (2008)	6,410	0.3 J	2.4 J	N/A	N/A	2.9 J	1.5	4,870	N/A	N/A	387	35,500	99	N/A	0.02 J	5.3
U03-ER005	CTC	AC	Golder (2008)	2,940	0.08 J	1.7 J	N/A	N/A	0.96 J	0.49 J	1,680	N/A	N/A	111	8,440	5.9	N/A	0.02 U	1 J
U03-ER006	CTC	AC	Golder (2008)	3,310	0.26 J	1.2 J	N/A	N/A	0.87 J	0.26 J	1,880	N/A	N/A	358	11,400	39.8	N/A	0.02 J	1.6 J

Notes:

N/A: Not Available

U: Result not detected

J: Result estimated

AC = Active Channel, BAR = Channel Bar, CTC = Channel Transect Composite

GS = Grab Sample, OB = Overbank, SED = Sediment Sample

SP = Sample Point, TC = Tin Can Operation Sample

Terrace = Upland Terrace Sample, TRIB = Tributary Sample, YC = Yard Composite

Appendix Table 3 (A-3)
Sediment Sample Results
H/WCIU ERA

Sample Id	Sample Type	Sample Location	Source	Nickel (mg/kg)	Paste pH (SU)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	TOC (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
U03-11284	CTC	AC	Golder (2003)	N/A	6.31 J	0.36 J	N/A	N/A	0.46	N/A	125
U03-11288	CTC	AC	Golder (2003)	N/A	6.49 J	0.39 J	N/A	N/A	0.8 J	N/A	148
U03-11366	CTC	AC	Golder (2003)	N/A	7.85 J	R	N/A	N/A	0.07	N/A	103
U03-11471	CTC	AC	Golder (2003)	N/A	7.34 J	0.16 UJ	N/A	N/A	0.94 J	N/A	168
U03-11576	CTC	AC	Golder (2003)	N/A	6.41 J	R	N/A	N/A	0.07	N/A	89.1
U03-11579	CTC	AC	Golder (2003)	N/A	7.01 J	R	N/A	N/A	0.8	N/A	195 J
U03-11586	CTC	AC	Golder (2003)	N/A	5.72 J	0.45 J	N/A	N/A	1.03	N/A	378
U03-11680	CTC	AC	Golder (2003)	N/A	7.55 J	0.16 UJ	N/A	N/A	0.22 J	N/A	71
U03-11682	CTC	AC	Golder (2003)	N/A	8.08 J	0.16 UJ	N/A	N/A	0.16 J	N/A	74.5
U03-31152	CTC	OB	Golder (2003)	N/A	6.48 J	0.18 J	N/A	N/A	0.53	N/A	113
U03-31259	CTC	OB	Golder (2003)	N/A	6.83 J	0.19 J	N/A	N/A	0.51 J	N/A	77
U03-31264	CTC	OB	Golder (2003)	N/A	7.49 J	0.29 J	N/A	N/A	0.71	N/A	134
U03-31368	CTC	OB	Golder (2003)	N/A	7.86 J	R	N/A	N/A	0.82	N/A	173
U03-31578	CTC	OB	Golder (2003)	N/A	6.84 J	R	N/A	N/A	0.43	N/A	118
U03-61153	CTC	UL	Golder (2003)	N/A	6.83 J	0.16 UJ	N/A	N/A	0.96	N/A	201
U03-61258	CTC	UL	Golder (2003)	N/A	6.2 J	0.16 UJ	N/A	N/A	0.88 J	N/A	110
U03-61265	CTC	UL	Golder (2003)	N/A	7.7 J	R	N/A	N/A	0.97	N/A	105
U03-61369	CTC	UL	Golder (2003)	N/A	7.39 J	0.16 UJ	N/A	N/A	0.7 J	N/A	99.9
U03-61474	CTC	UL	Golder (2003)	N/A	7.83 J	0.16 UJ	N/A	N/A	0.8 J	N/A	53.6
U03-61575	CTC	UL	Golder (2003)	N/A	7.84 J	0.16 UJ	N/A	N/A	0.49 J	N/A	115
LW-03E-S01-SD	GS	SED	Golder (2008)	7.8	4	0.7	N/A	0.27 U	0.4	23.9	90
LW-03E-S02-SD	GS	SED	Golder (2008)	15.1	4.9	0.25	N/A	0.16 U	0.4	28.9	177
LW-03E-S03-SD	GS	SED	Golder (2008)	16.7	3.9	0.7	N/A	0.24 U	0.7	30	137
LW-03E-S04-SD	GS	SED	Golder (2008)	14.6	5.8	0.25	N/A	0.13 U	0.3	27.6	163
LW-03E-S05-SD	GS	SED	Golder (2008)	9.3	3.7	0.7	N/A	0.14 U	0.4	26.7	90
U02-ER001	SP	OB	Golder (2008)	3.6	6.4	0.65 J	N/A	N/A	N/A	30.2	1,930
U02-ER002	SP	OB	Golder (2008)	5.6	6.83	0.83 J	N/A	N/A	N/A	32.1	2,510
U02-ER003	SP	OB	Golder (2008)	3.7	6.6	0.68 J	N/A	N/A	N/A	28.1	2,500
U02-ER004	SP	OB	Golder (2008)	3.5	6.73	0.7 J	N/A	N/A	N/A	26.7	2,040
U02-ER005	SP	BAR	Golder (2008)	16.1	7.65	0.34 J	N/A	N/A	N/A	18.1	1,680
U02-ER006	SP	BAR	Golder (2008)	3.9	7.66	0.34 J	N/A	N/A	N/A	36.4	1,360
U02-ER007	SP	BAR	Golder (2008)	4.5	7.54	0.24 J	N/A	N/A	N/A	33.6	1,220
U02-ER009	SP	BAR	Golder (2008)	5.3	7.61	0.54 J	N/A	N/A	N/A	27.7	1,460
U02-ER010	SP	BAR	Golder (2008)	4.1	6.4	0.55 J	N/A	N/A	N/A	30.1	886
U02-ER011	CTC	AC	Golder (2008)	12.2	7.77	0.25 J	N/A	N/A	N/A	15.5	958
U03-ER001	CTC	AC	Golder (2008)	13.8	7.16	0.4 J	N/A	N/A	N/A	20.2	335
U03-ER002	CTC	AC	Golder (2008)	11.3	7.68	0.27 J	N/A	N/A	N/A	14.4	979
U03-ER004	CTC	AC	Golder (2008)	15.2	7.1	0.33 J	N/A	N/A	N/A	20.3	707
U03-ER005	CTC	AC	Golder (2008)	6.2	7.33	0.24 J	N/A	N/A	N/A	14.7	24.2
U03-ER006	CTC	AC	Golder (2008)	8.1	7.39	0.26 J	N/A	N/A	N/A	14.5	43.2

Notes:

N/A: Not Available

U: Result not detected

J: Result estimated

AC = Active Channel, BAR = Channel Bar, CTC = Channel Transect Composite

GS = Grab Sample, OB = Overbank, SED = Sediment Sample

SP = Sample Point, TC = Tin Can Operation Sample

Terrace = Upland Terrace Sample, TRIB = Tributary Sample, YC = Yard Composite

Appendix Table 4 (A-4)
Foliage Sample Results
H/WCIU ERA

Analyte	Sample Type	Sample Location	Source	B45_8W-F-A	B47_2E-F-A	LW-03E-F-A	LW-03-F-A	LW-04-F-A	LW-05-F-A	LW-06-F-A	LW-07-F-A	O43_5W-F-A	O44_2E-F-A	O48_8E-F-A	SC-1-F	SC-2-F-A	SC-3-F
Aluminum (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	103 J+	126 J+	500 J+	201 J+	535 J+	115 J+	163 J+	262 J+	90 J+	120 J+	144 J+	466	1560 J+	3870
Antimony (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.1 UJ	0.2 J	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 U	0.1 UJ	0.1 U
Arsenic (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 UJ	0.15 U	0.15 UJ	0.15 U
Barium (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	3.1 J	8.6 J	6.1 J	3.7 J	7.5 J	2.9 J	2.8 J	10 J	9.9 J	7.1 J	7.2 J	10.3	18.4 J	30.3
Boron (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	44 J	27 J	39 J	14 J	40 J	8 J	18 J	40 J	28 J	9 J	55 J	26	39 J	34
Cadmium (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.7 J	0.5 J	0.56 J	0.12 J	0.31 J	0.025 UJ	0.1 J	0.39 J	2.53 J	0.74 J	0.92 J	0.98	1.95 J	3.18
Chromium (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.025 UJ	0.65 J	1.39 J	1.42 J	0.93 J	0.025 UJ	0.82 J	0.89 J	0.025 UJ	0.89 J	0.86 J	0.73	2.05 J	5.3
Cobalt (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	3	4 J	19
Copper (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	10.5 J	11.1 J	34.5 J	19.3 J	32.7 J	14 J	17.6 J	30 J	10.2 J	11.6 J	12.9 J	25.1	47.1 J	47.4
Iron (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	284 J	326 J	892 J	296 J	733 J	143 J	218 J	334 J	278 J	362 J	456 J	528	1540 J	4900
Lead (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.73 J	1.38 J	0.67 J	0.24 J	0.058 J	0.06 J	0.025 UJ	0.25 J	1.18 J	3.41 J	1.6 J	0.86	1.57 J	5.68
Manganese (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	29.4 J	54.9 J	92.2 J	70.7 J	89.5 J	50 J	49.5 J	56.9 J	45.3 J	63.1 J	60.7 J	280	487 J	1050
Mercury (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.035 UJ	0.05 UJ	0.045 UJ	0.05 UJ	0.05 UJ	0.045 UJ	0.035 UJ	0.05 UJ	0.03 UJ	0.04 UJ	0.035 UJ	0.04 UJ	0.04 UJ	0.045 UJ
Moisture Content (%)	Grab Sample	Foliage Sample	NewFields (2008)	64.2	54.5	55	52.6	43.2	42	52.5	48.4	38.7	33	56.2	65	55	67.1
Molybdenum (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	18 J	13.1 J	1.3 J	3.4 J	1 J	17.2 J	1 J	21 J	1.2 J	2.2 J	14.9 J	0.4	0.6 J	0.6
Nickel (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.15 UJ	0.3 J	2.4 J	1.2 J	1.9 J	0.4 J	0.5 J	0.6 J	0.3 J	0.3 J	0.4 J	3.4	4.9 J	10.5
Selenium (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	1.1 J	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 U	0.25 UJ	0.25 U
Thallium (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.025 UJ	0.025 UJ	0.025 UJ	0.06 J	0.025 UJ	0.025 UJ	0.025 UJ	0.28 J	0.025 UJ	0.025 UJ	0.09 J	0.18	0.025 UJ	0.06
Vanadium (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	0.25 UJ	0.25 UJ	2.3 J	1.6 J	1.1 J	0.25 UJ	0.25 UJ	0.7 J	1.5 J	0.7 J	0.25 UJ	0.7	1.6 J	8
Zinc (mg/kg)	Grab Sample	Foliage Sample	NewFields (2008)	101 J	112 J	77 J	56 J	89 J	18 J	31 J	81 J	98 J	152 J	123 J	65	90 J	123

Notes:

U: Result was not detected

J: Result estimated

J+: Matrix Spike/Matrix Spike Duplicate recoveries high

Appendix Table 5 (A-5)
Seed Head Sample Results
H/WCIU ERA

Analyte	Sample Type	Sample Location	Source	B45_8W-S	B47_2E-S	O43_5W-S-A	O44_2E-S	O48_8E-S
Aluminum (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	208	223	115	147	169
Antimony (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.2	0.1 U	0.1 UJ	0.1 U	0.1 U
Arsenic (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.15 U	0.03 U	0.15 UJ	0.035 U	0.03 U
Barium (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	8.2	10.9	14.3 J	8.3	11.1
Boron (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	15	21	13 J	17	25
Cadmium (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.23	0.17	0.13 J	0.1	0.11
Chromium (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.99	0.61	0.025 UJ	0.99	0.6
Cobalt (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	1	1	0.5 UJ	1	1
Copper (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	16.9	5.19	11.9 J	3.52	4.42
Iron (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	525	603	310 J	477	509
Lead (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	11.1	3.02	2.9 J	5.87	3.96
Manganese (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	93.3	74.9	114 J	90.8	67.5
Mercury (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.04 UJ	0.05 UJ	0.035 UJ	0.15 J	0.04 UJ
Moisture Content (%)	Grab Sample	Seed Sample	NewFields (2008)	51.7	48	9.5	55.7	60.1
Molybdenum (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	3.9	2.95	0.7 J	0.21	1.4
Nickel (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.7	0.13	0.4 J	0.17	0.19
Selenium (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	0.25 U	0.25 U	0.25 UJ	0.25 U	0.25 U
Thallium (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	.025 U	.005 U	0.025 UJ	.005 U	.005 U
Vanadium (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	.25 U	.25 U	0.25 UJ	.25 U	.25 U
Zinc (mg/kg)	Grab Sample	Seed Sample	NewFields (2008)	77	23.6	68 J	28.7	24.2

Notes:

U: Result was not detected

J: Result estimated

Appendix Table 6 (A-6)
Invertebrate Sample Results
H/WCIU ERA

Analyte	Sample Type	Sample Location	Source	B45_8W-I	B47_2E-I	LW-03E-I	LW-03-I	LW-04-I	LW-06-I	LW-07-I	O43_5W-I	O44_2E-I	O48_8E-I	SC-1-I	SC-2-I	SC-3-I
Aluminum (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	131	80	295	661	319	78	286	186	103	171	351	198	375
Antimony (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.2	0.05U	0.05U	0.1U	0.05U	0.05U	0.05U
Arsenic (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U	0.05 U
Barium (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	1.7	1.7	3.9	8.8	4.6	1.1	16.3	4.1	1.8	2.3	5.2	3.5	6.8
Boron (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	2.8	0.6	0.25U	0.25U	2.5	1.2	3.2	2.2	2.4	0.5U	4.8	1.5	5.3
Cadmium (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.88	0.22	0.17	0.3	0.09	0.15	1.2	0.61	0.81	0.32	0.11	0.2	0.11
Chromium (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.01 U	0.01U	0.01 U	0.015 U	0.015 U	0.01 U	0.015 U	0.015 U	0.01 U	0.025 U	0.01 U	0.01 U	0.01 U
Cobalt (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.5U	0.25 U	0.8	0.25U
Copper (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	79.7 J+	11.5 J+	21.1 J+	30.8 J+	78 J+	41.4 J+	95.1 J+	54.9 J+	28.1 J+	29.2 J+	49.3 J+	55.5 J+	32.8 J+
Iron (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	403	150	565	2000	512	107	329	775	495	468	623	394	646
Lead (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	2.24	1.85	0.42	2.19	0.47	0.01U	2.83	5.76	2.57	1.52	0.6	0.05	0.3
Manganese (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	28.7	41.5	35.6	73.1	26.5	12.8	16	61.3	42.5	44.5	18.7	15.6	24.3
Mercury (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.02U	0.015U	0.02U	0.015U	0.015U	0.02U	0.015U	0.015U	0.02U	0.02U	0.015U	0.015U	0.02U
Percent Solids (%)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.7	1.7	0.8	0.9	0.7	0.3	2.6	0.4	0.5	0.5	0.3	0.3	0.3
Molybdenum (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.2	0.05U	0.5	0.8	0.4	0.2	0.3	0.4	0.2	0.15U	0.7	1	1.1
Nickel (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	35.4	.05 U	29.6	31.1	38.5	32.8	0.1 U	34.8	34.4	0.15 U	35.4	35.7	38.9
Selenium (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.1U	0.1U	0.1U	0.15U	0.15U	0.1U	0.15U	0.15U	0.1U	0.25U	0.1U	0.1U	0.1U
Thallium (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.01U	0.01U	0.03	0.015U	0.015U	0.01U	0.09	0.015U	0.01U	0.025U	0.01U	0.01U	0.01U
Vanadium (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	0.3	0.1U	0.5	2.1	0.6	0.1U	0.8	0.3	0.1U	0.25U	0.9	0.4	0.7
Zinc (mg/kg)	Grab Sample	Invertebrate Sample	NewFields (2008)	94.3	42.9	114	125	55.5	73.2	86.1	102	90.4	85	42.4	58.2	40.7

Notes:
U: Result was not detected
J: Result estimated
J+: Matrix Spike/Matrix Spike Duplicate recoveries high
Invert- Invertebrate

APPENDIX B

WILDLIFE RISK CALCULATION DETAILS

Table B-1

Exposure Parameters

Hanover-Whitewater Ecological Risk Assessment

Small Ground-Feeding Bird		
Food Ingestion Rate (Calculated from Nagy (2001) for passerine birds assuming a 12 gram bird)		
Wet Weight	0.918	kg food/kg BW/day
Dry Weight	0.287	kg food/kg BW/day
Diet Composition		
Foliage	0%	
Seed	30%	
Invertebrate	70%	
Small Mammal		
Food Ingestion Rate (Calculated from Nagy (2001) for Deer Mouse)		
Wet Weight	0.665	kg food/kg BW/day
Dry Weight	0.212	kg food/kg BW/day
Diet Composition		
Foliage	11%	
Seed	43%	
Invertebrate	46%	

Table B-2

Risk Calculation Equations

Hanover-Whitewater Ecological Risk Assessment

Equation 1: $HQ = \mathrm{Intake}_{\mathrm{tota}l}/\mathrm{TRV}$

Where: HQ = Hazard Quotient
TRV = Toxicity Reference Value
$\mathrm{Intake}_{\mathrm{total}}$ = Amount of COPC ingested per day from all sources (mg COPC/kg BW/day)

Equation 2: $\mathrm{Intake}_{\mathrm{total}} = \mathrm{Intake}_{\mathrm{food}} + \mathrm{Intake}_{\mathrm{soil}} + \mathrm{Intake}_{\mathrm{water}}$

Where: $\mathrm{Intake}_{\mathrm{food}}$ = Amount of COPC ingested per day from food (mg COPC/kg BW/day)
$\mathrm{Intake}_{\mathrm{soil}}$ = Amount of COPC ingested per day from soil (mg COPC/kg BW/day)
$\mathrm{Intake}_{\mathrm{water}}$ = Amount of COPC ingested per day from water (assumed to be negligible)

Equation 3: $\mathrm{Intake}_{\mathrm{food}} = \mathrm{AUF} * \sum_{\mathrm{i}=1}^{\mathrm{m}} (\mathrm{IR}_{\mathrm{f}} * \mathrm{P}_{\mathrm{i}}) * \mathrm{C}_{\mathrm{ij}} * \mathrm{AF}_{\mathrm{ij}}$

Where: AUF = Area use factor (unitless)
m = total number of ingested prey types
IR_f = total ingestion rate of food (kg/kg BW/day)
Note: seed and invertebrate ingestion calculated using dry weight;
foliage ingestion calculated using fresh weight.
P_i = fraction of food as prey type_i
C_{ij} = concentration of COPC_j in prey type_i (mg/kg)
AF_{ij} = bioavailability factor of COPC_j in prey type_i (AFif = 1)

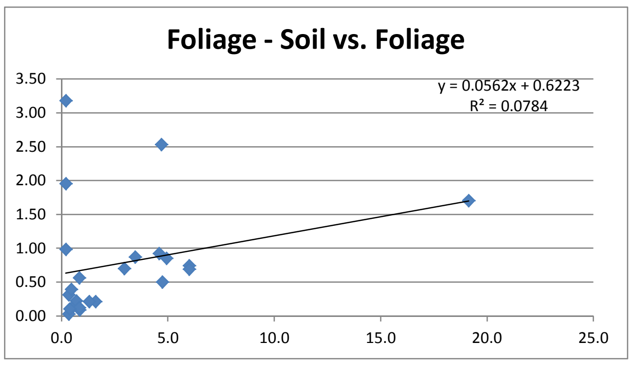
Equation 4: $\mathrm{Intake}_{\mathrm{soil}} = \mathrm{AUF} * (\mathrm{IR}_{\mathrm{f}} * \mathrm{P}_{\mathrm{s}} * \mathrm{C}_{\mathrm{js}} * \mathrm{AF}_{\mathrm{js}})$

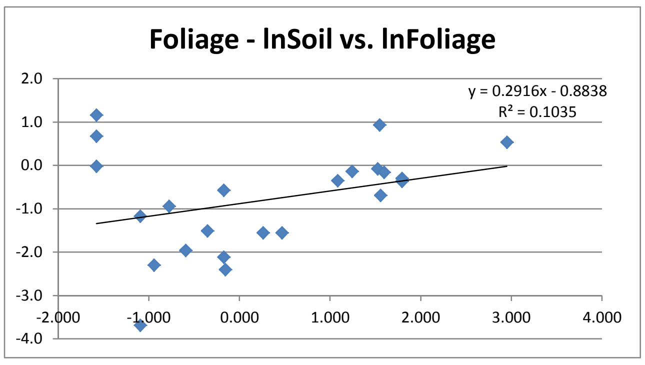
Where: IR_f = total dry weight ingestion rate of food (kg/kg BW/day)
P_S = fraction of total food as soil/sediment
C_{ij} = concentration of COPC_j in soil/sediment (mg/kg)
AF_{ij} = bioavailability factor of COPC_j in soil/sediment

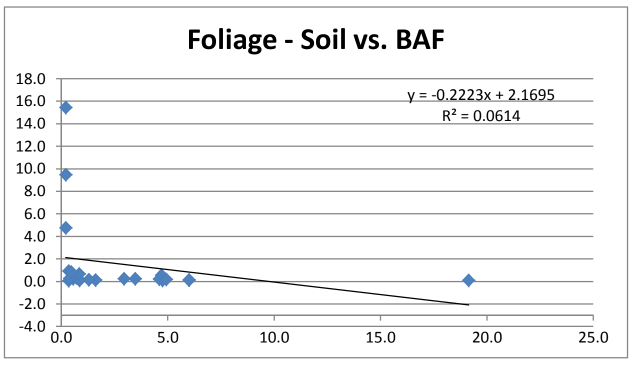
APPENDIX C

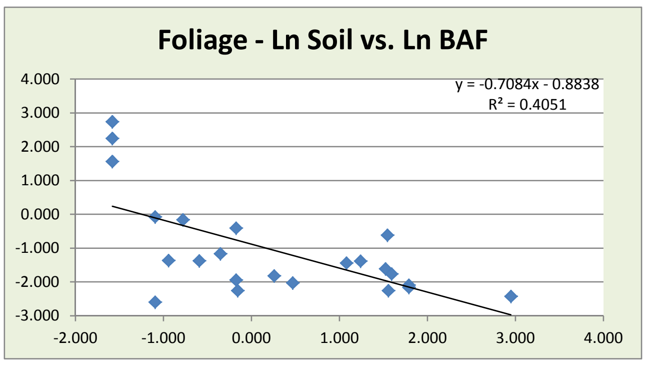
RELATIONSHIPS BETWEEN SOIL AND FOOD ITEM COPC CONCENTRATIONS

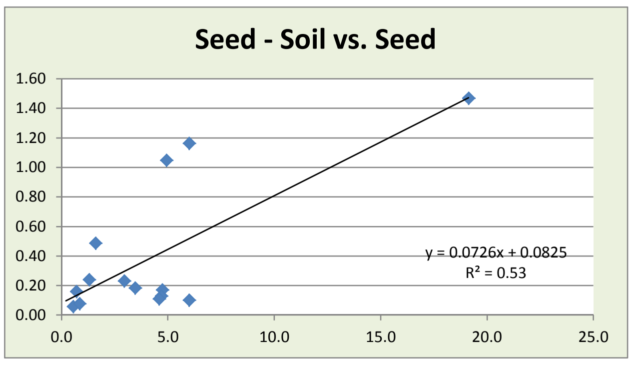
		Raw Data				Natural Log Transformation				Bioaccumulation Factors					
COPC	Location	Foliage (mg/kg)	Seed (mg/kg)	Invertebrate (mg/kg)	Soil Concentration (mg/kg)	ln(Foliage)	ln(seed)	ln(Invert)	ln(Soil)	Foliage BAF	Seed BAF	Invert BAF	ln(Foliage BAF)	ln(Seed BAF)	ln(Invert BAF)
Cadmium	B45.8W	0.70	0.23	0.88	3.0	-0.4	-1.5	-0.1	1.082	0.2	0.078	0.298	-1.438	-2.6	-1.2
Cadmium	B47.2E	0.50	0.17	0.22	4.8	-0.7	-1.8	-1.5	1.558	0.1	0.036	0.046	-2.251	-3.3	-3.1
Cadmium	O43.5W	2.53	0.13	0.61	4.7	0.9	-2.0	-0.5	1.548	0.5	0.028	0.130	-0.619	-3.6	-2.0
Cadmium	O44.2E	0.74	0.10	0.81	6.0	-0.3	-2.3	-0.2	1.792	0.1	0.017	0.135	-2.093	-4.1	-2.0
Cadmium	O48.8E	0.92	0.11	0.32	4.6	-0.1	-2.2	-1.1	1.526	0.2	0.024	0.070	-1.609	-3.7	-2.7
Cadmium	ERA-29	0.69	1.16	1.90	6.0	-0.4	0.2	0.6	1.792	0.1	0.194	0.317	-2.163	-1.6	-1.1
Cadmium	ERA-32	1.70	1.47	0.49	19.1	0.5	0.4	-0.7	2.952	0.1	0.077	0.026	-2.421	-2.6	-3.7
Cadmium	ERA-22	0.85	1.05	0.29	4.9	-0.2	0.0	-1.2	1.596	0.2	0.212	0.059	-1.759	-1.6	-2.8
Cadmium	ERA-28	0.87	0.18	0.24	3.5	-0.1	-1.7	-1.4	1.243	0.3	0.053	0.069	-1.382	-2.9	-2.7
Cadmium	ERA-23	0.21	0.49	0.48	1.6	-1.6	-0.7	-0.7	0.470	0.1	0.304	0.300	-2.031	-1.2	-1.2
Cadmium	ERA-26	0.14	0.06	0.14	0.6	-2.0	-2.8	-2.0	-0.592	0.3	0.105	0.250	-1.374	-2.2	-1.4
Cadmium	ERA-27	0.22	0.16	0.08	0.7	-1.5	-1.8	-2.5	-0.352	0.3	0.227	0.114	-1.162	-1.5	-2.2
Cadmium	SC-1	0.98		0.11	0.2	0.0		-2.2	-1.580	4.8		0.534	1.560		-0.6
Cadmium	SC-2	1.95		0.20	0.2	0.7		-1.6	-1.580	9.5		0.971	2.248		0.0
Cadmium	SC-3	3.18		0.11	0.2	1.2		-2.2	-1.580	15.4		0.534	2.737		-0.6
Cadmium	ERA-31	0.09	0.08	0.12	0.9	-2.4	-2.6	-2.1	-0.155	0.1	0.089	0.140	-2.253	-2.4	-2.0
Cadmium	LW-03-A	0.12		0.30	0.84	-2.1		-1.2	-0.174	0.1		0.357	-1.946		-1.0
Cadmium	LW-03E-A	0.56		0.17	0.84	-0.6		-1.8	-0.174	0.7		0.202	-0.405		-1.6
Cadmium	LW-04-A	0.31		0.09	0.3	-1.2		-2.4	-1.094	0.9		0.269	-0.078		-1.3
Cadmium	LW-05-A	0.03		N/A	0.3	-3.7			-1.094	0.1			-2.595		
Cadmium	LW-06-A	0.10		0.15	0.4	-2.3		-1.9	-0.942	0.3		0.385	-1.361		-1.0
Cadmium	LW-07-A	0.39		1.20	0.5	-0.9		0.2	-0.777	0.8		2.609	-0.165		1.0
Cadmium	ERA-33	0.21	0.24	0.17	1.3	-1.6	-1.4	-1.8	0.260	0.2	0.185	0.131	-1.820	-1.7	-2.0

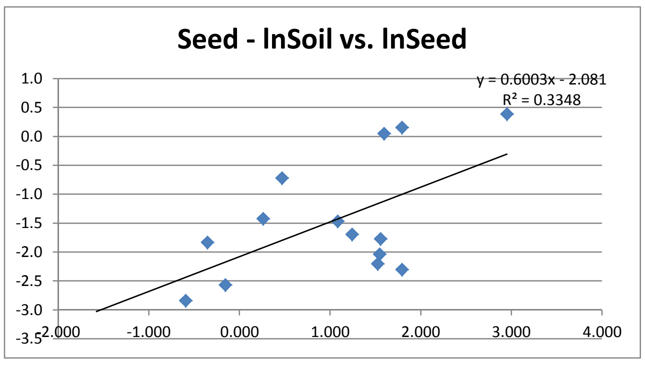


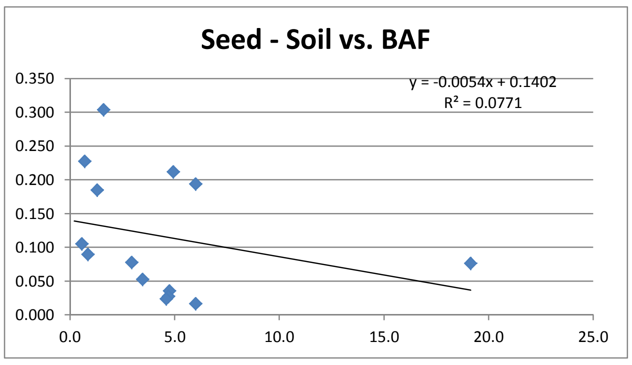


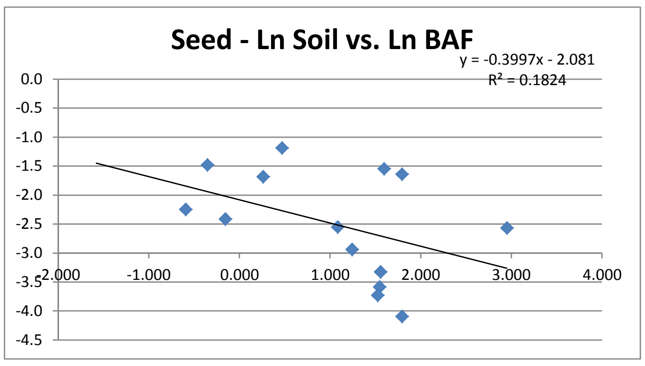


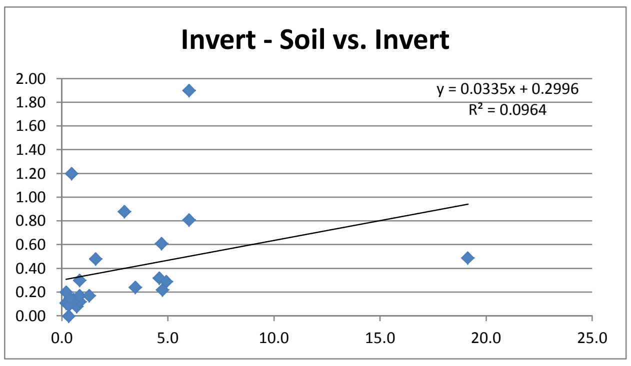


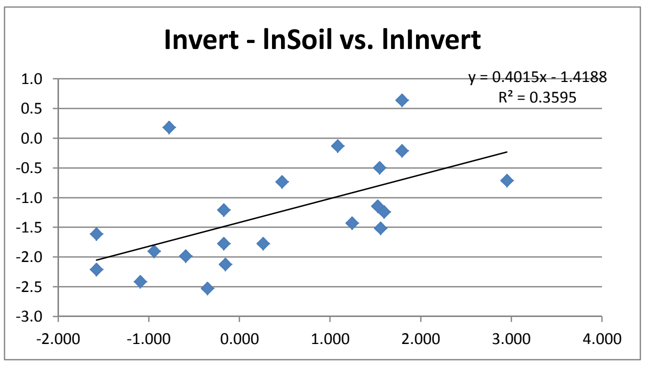


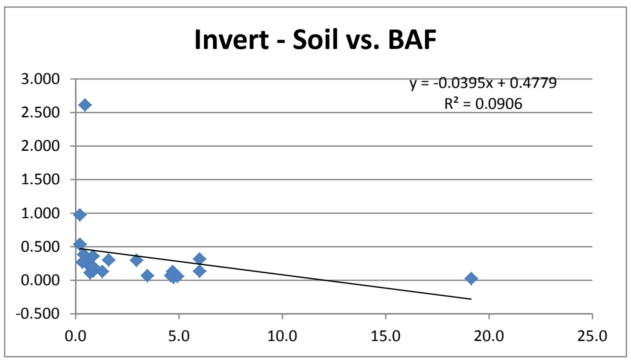


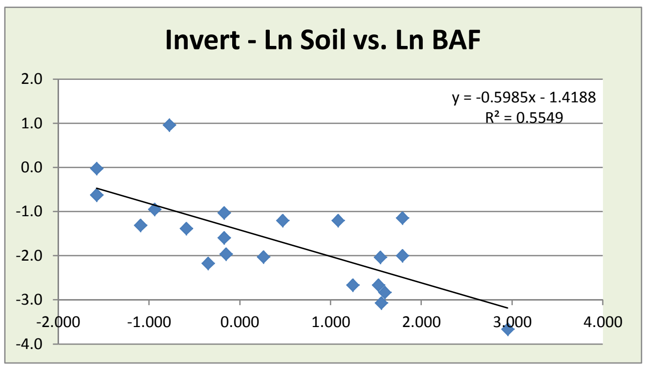




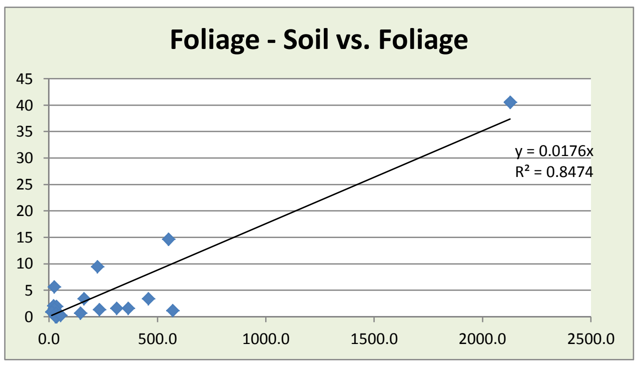


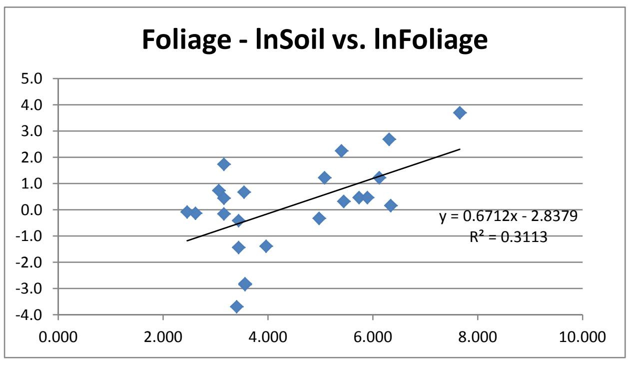


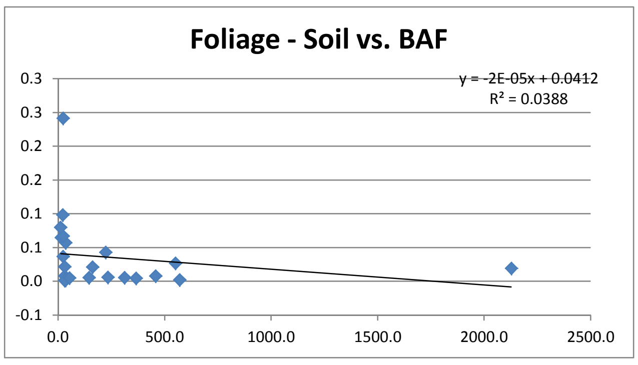


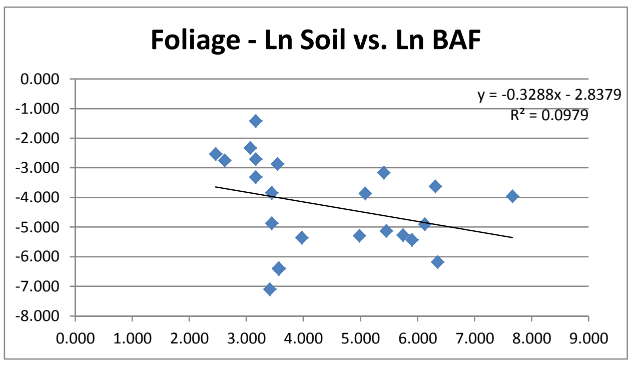


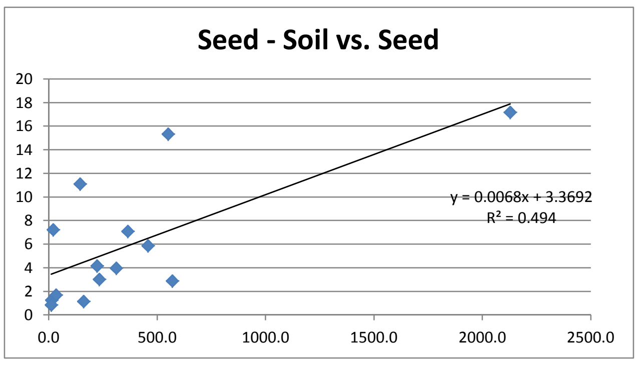
		Raw Data				Natural Log Transformation				Bioaccumulation Factors					
COPC	Location	Foliage (mg/kg)	Seed (mg/kg)	Invertebrate (mg/kg)	Soil Concentration (mg/kg)	ln(Foliage)	ln(seed)	ln(Invert)	ln(Soil)	Foliage BAF	Seed BAF	Invert BAF	ln(Foliage BAF)	ln(Seed BAF)	ln(Invert BAF)
Lead	B45.8W	0.73	11.1	2.2	145.5	-0.3	2.4	0.8	4.980	0.0	0.076	0.015	-5.295	-2.6	-4.2
Lead	B47.2E	1.4	3.02	1.9	233.0	0.3	1.1	0.6	5.451	0.0	0.013	0.008	-5.129	-4.3	-4.8
Lead	O43.5W	1.2	2.9	5.8	571.0	0.2	1.1	1.8	6.347	0.0	0.005	0.010	-6.182	-5.3	-4.6
Lead	O44.2E	3.4	5.9	2.6	458.0	1.2	1.8	0.9	6.127	0.0	0.013	0.006	-4.900	-4.4	-5.2
Lead	O48.8E	1.6	4	1.5	312.0	0.5	1.4	0.4	5.743	0.0	0.013	0.005	-5.273	-4.4	-5.3
Lead	ERA-29	1.6	7.1	0.8	365.7	0.5	2.0	-0.2	5.902	0.0	0.019	0.002	-5.432	-3.9	-6.1
Lead	ERA-32	40.6	17.2	4.6	2128	3.7	2.8	1.5	7.663	0.0	0.008	0.002	-3.959	-4.8	-6.1
Lead	ERA-22	3.4	1.1	0.8	161.3	1.2	0.1	-0.3	5.083	0.0	0.007	0.005	-3.860	-4.9	-5.4
Lead	ERA-28	9.5	4.2	0.3	223	2.3	1.4	-1.1	5.407	0.0	0.019	0.002	-3.156	-4.0	-6.5
Lead	ERA-23	2.1	7.2	0.2	21.4	0.7	2.0	-1.8	3.065	0.1	0.337	0.007	-2.323	-1.1	-4.9
Lead	ERA-26	0.9	1.3	0.2	13.7	-0.1	0.2	-1.8	2.617	0.1	0.092	0.012	-2.745	-2.4	-4.4
Lead	ERA-27	2.0	1.7	0.1	34.6	0.7	0.5	-2.1	3.545	0.1	0.049	0.003	-2.867	-3.0	-5.7
Lead	SC-1	0.9		0.6	23.6	-0.2		-0.5	3.160	0.0		0.025	-3.311		-3.7
Lead	SC-2	1.6		0.1	23.6	0.5		-3.0	3.160	0.1		0.002	-2.709		-6.2
Lead	SC-3	5.7		0.3	23.6	1.7		-1.2	3.160	0.2		0.013	-1.423		-4.4
Lead	ERA-31	0.9	0.9	0.2	11.7	-0.1	-0.1	-1.7	2.458	0.1	0.074	0.016	-2.531	-2.6	-4.1
Lead	LW-03-A	0.2		2.2	31.2	-1.4		0.8	3.442	0.0		0.070	-4.869		-2.7
Lead	LW-03E-A	0.7		0.4	31.2	-0.4		-0.9	3.442	0.0		0.013	-3.842		-4.3
Lead	LW-04-A	0.1		0.5	35.3	-2.8		-0.8	3.564	0.0		0.013	-6.411		-4.3
Lead	LW-05-A	0.1			35.3	-2.8			3.564	0.0			-6.377		
Lead	LW-06-A	0.03		0.01	30.2	-3.7		-4.6	3.406	0.0		0.000	-7.095		-8.0
Lead	LW-07-A	0.25		2.83	52.9	-1.4		1.0	3.968	0.0		0.053	-5.355		-2.9
Lead	ERA-33	14.7	15.3	1.9	551.3	2.7	2.7	0.6	6.312	0.0	0.028	0.003	-3.624	-3.6	-5.7

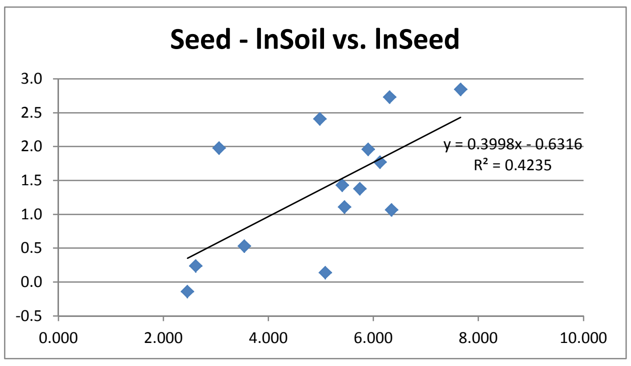


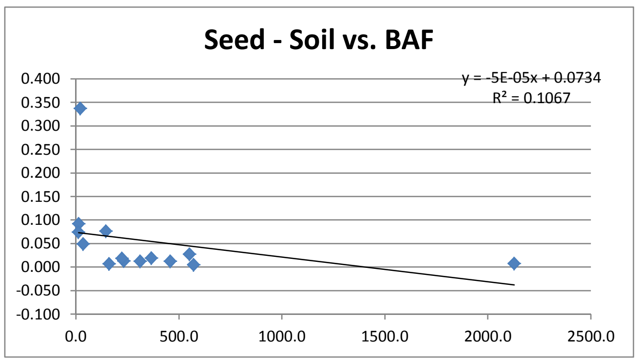


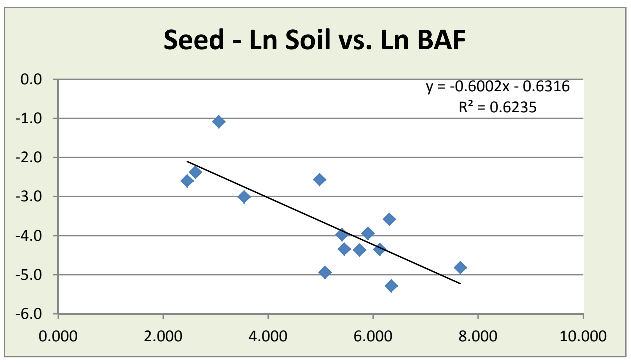


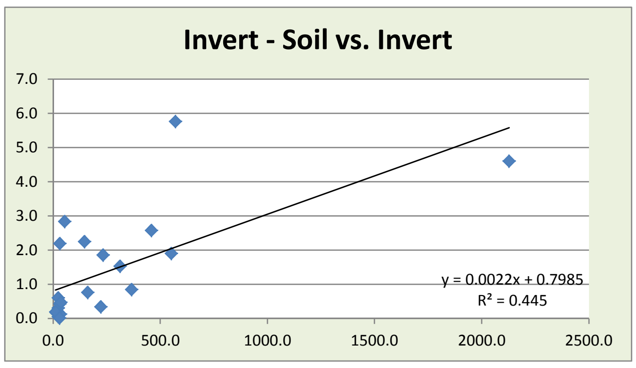


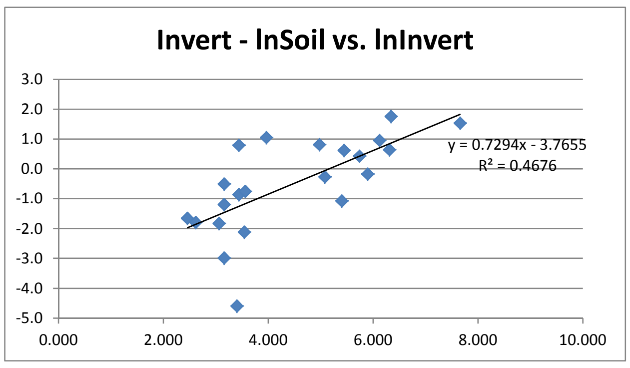


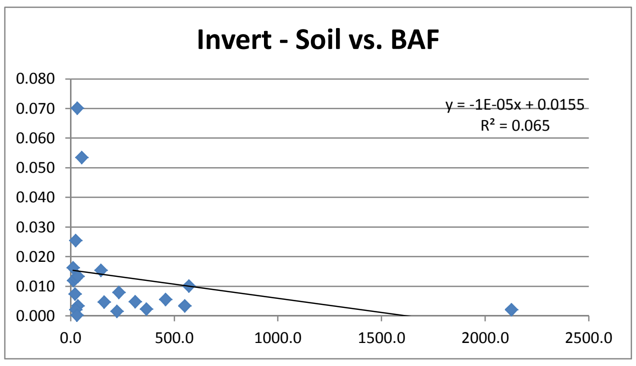


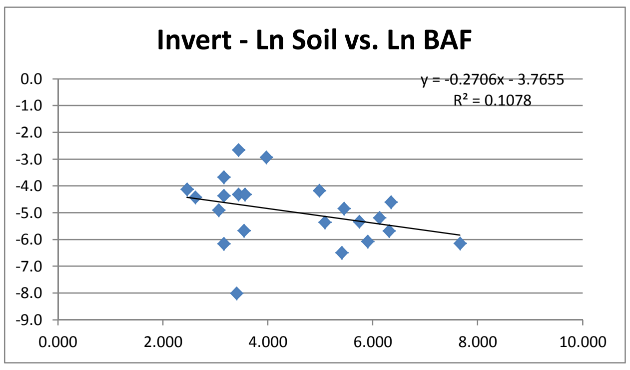




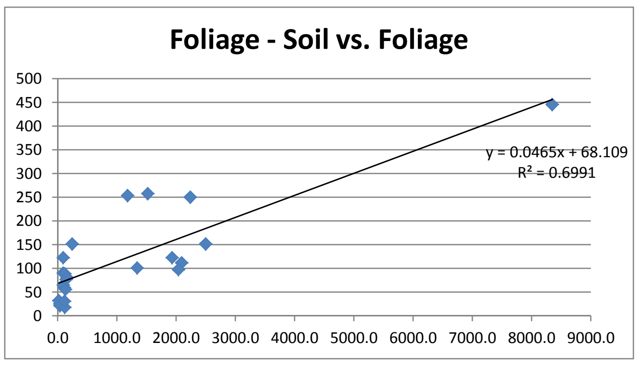


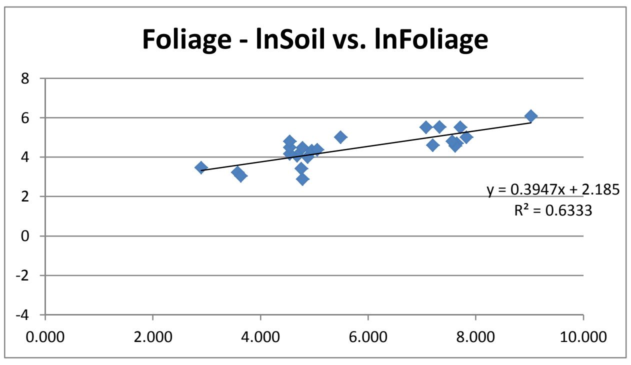


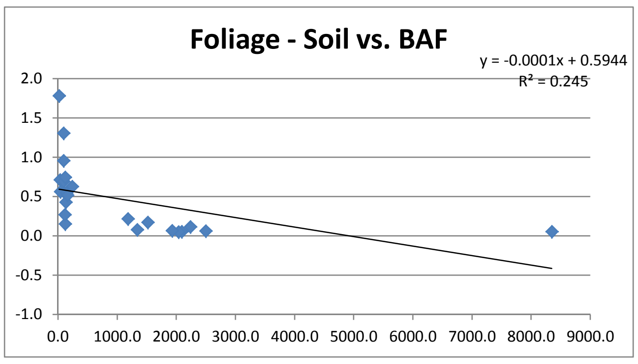


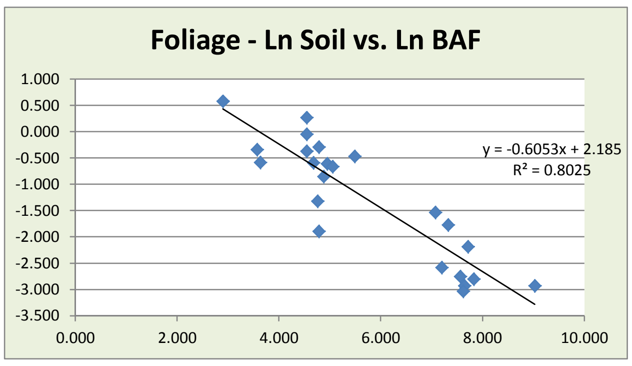


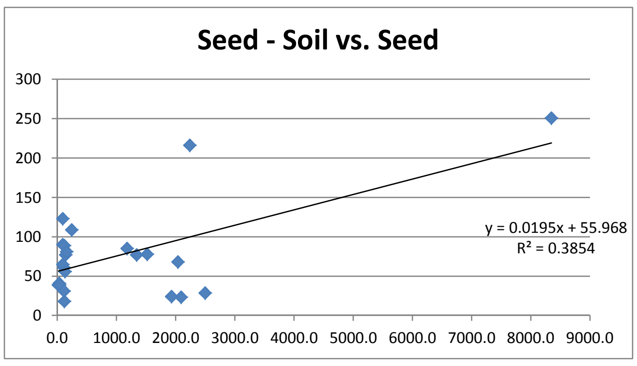
		Raw Data				Natural Log Transformation				Bioaccumulation Factors					
COPC	Location	Foliage (mg/kg)	Seed (mg/kg)	Invertebrate (mg/kg)	Soil Concentration (mg/kg)	ln(Foliage)	ln(seed)	ln(Invert)	ln(Soil)	Foliage BAF	Seed BAF	Invert BAF	ln(Foliage BAF)	ln(Seed BAF)	ln(Invert BAF)
Zinc	B45.8W	101	77	94.3	1340.0	4.615121	4.343805	4.546481	7.200	0.1	0.057	0.070	-2.585	-2.9	-2.7
Zinc	B47.2E	112	23.6	42.9	2095.0	4.718499	3.161247	3.758872	7.647	0.1	0.011	0.020	-2.929	-4.5	-3.9
Zinc	O43.5W	98	68	102	2040.0	4.584967	4.219508	4.624973	7.621	0.0	0.033	0.050	-3.036	-3.4	-3.0
Zinc	O44.2E	152	28.7	90.4	2500.0	5.023881	3.356897	4.504244	7.824	0.1	0.011	0.036	-2.800	-4.5	-3.3
Zinc	O48.8E	123	24.2	85	1930.0	4.812184	3.186353	4.442651	7.565	0.1	0.013	0.044	-2.753	-4.4	-3.1
Zinc	ERA-29	250.8	216.2	83.8	2240.0	5.524656	5.376204	4.428433	7.714	0.1	0.097	0.037	-2.190	-2.3	-3.3
Zinc	ERA-32	446	250.7	89.6	8349.7	6.100319	5.524124	4.495355	9.030	0.1	0.030	0.011	-2.930	-3.5	-4.5
Zinc	ERA-22	258	77.9	74.5	1520	5.55296	4.355426	4.310799	7.326	0.2	0.051	0.049	-1.774	-3.0	-3.0
Zinc	ERA-28	254	85.4	98.7	1181.7	5.537334	4.446956	4.592085	7.075	0.2	0.072	0.084	-1.537	-2.6	-2.5
Zinc	ERA-23	25.3	40.7	43.3	35.6	3.230804	3.707047	3.768153	3.572	0.7	1.144	1.216	-0.342	0.1	0.2
Zinc	ERA-26	32.3	39.0	22.3	18.1	3.475067	3.663562	3.104766	2.898	1.8	2.151	1.230	0.577	0.8	0.2
Zinc	ERA-27	59.7	61.0	41.0	107.9	4.089332	4.11142	3.713572	4.681	0.6	0.566	0.380	-0.592	-0.6	-1.0
Zinc	SC-1	65	*65*	42.4	94.2	4.174387		3.747148	4.545	0.7		0.450	-0.371		-0.8
Zinc	SC-2	90	*90*	58.2	94.2	4.49981		4.063885	4.545	1.0		0.618	-0.045		-0.5
Zinc	SC-3	123	*123*	40.7	94.2	4.812184		3.706228	4.545	1.3		0.432	0.267		-0.8
Zinc	ERA-31	21.2	39.0	42.4	37.9	3.054001	3.662707	3.747148	3.636	0.6	1.027	1.118	-0.582	0.0	0.1
Zinc	LW-03-A	56	*56*	125	131.4	4.025352		4.828314	4.878	0.4		0.951	-0.853		0.0
Zinc	LW-03E-A	77	*77*	114	141.4	4.343805		4.736198	4.952	0.5		0.806	-0.608		-0.2
Zinc	LW-04-A	89	*89*	55.5	119.5	4.488636		4.016383	4.783	0.7		0.464	-0.295		-0.8
Zinc	LW-05-A	18	*18*	N/A	119.5	2.890372			4.783	0.2			-1.893		
Zinc	LW-06-A	31	*31*	73.2	116.5	3.433987		4.293195	4.758	0.3		0.628	-1.324		-0.5
Zinc	LW-07-A	81	*81*	86.1	157.0	4.394449		4.455509	5.056	0.5		0.548	-0.662		-0.6
Zinc	ERA-33	152.0	108.6	58	242.7	5.023881	4.687978	4.060443	5.492	0.6	0.448	0.239	-0.468	-0.8	-1.4

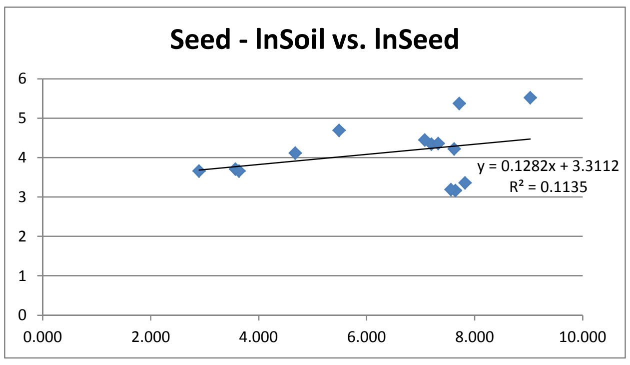

Foliage - Soil vs. Foliage

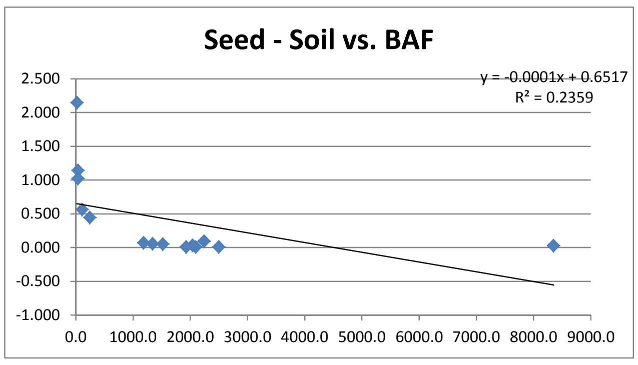

Foliage - lnSoil vs. lnFoliage

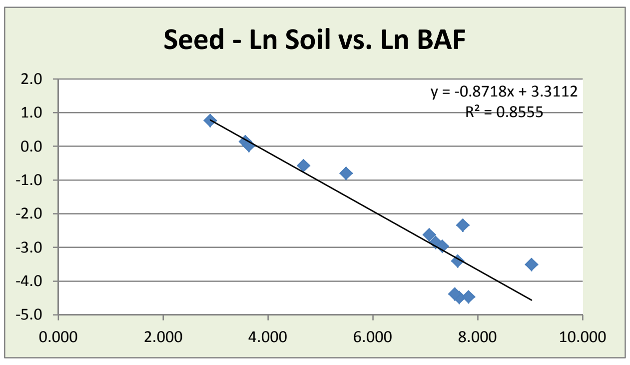

Foliage - Soil vs. BAF

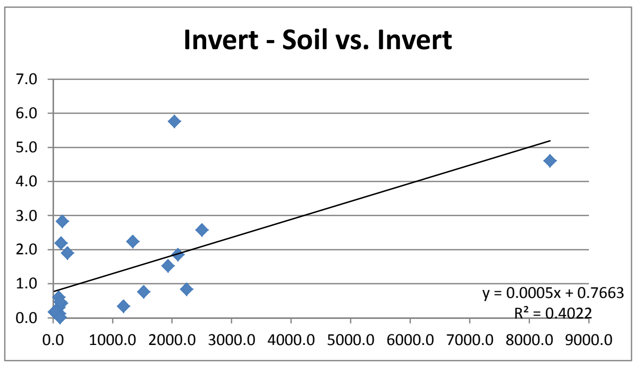

Foliage - Ln Soil vs. Ln BAF

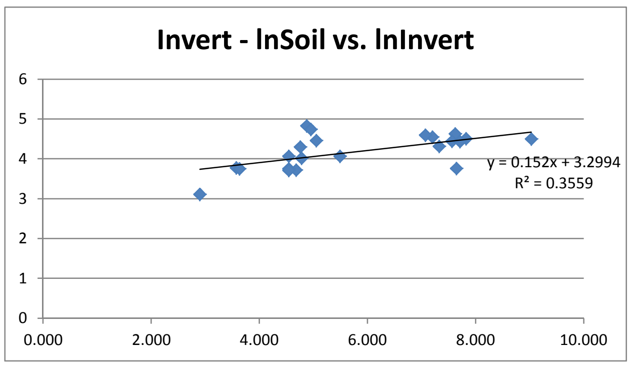

Seed - Soil vs. Seed

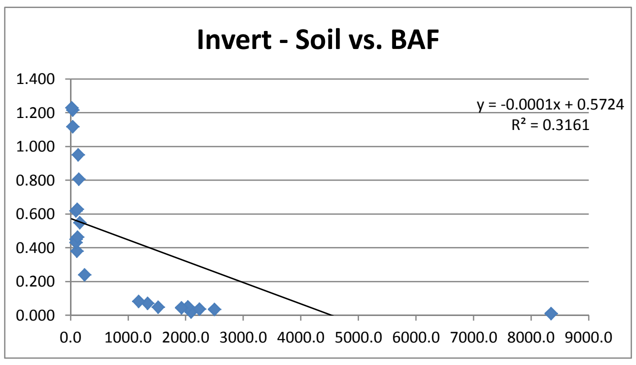

Seed - lnSoil vs. lnSeed

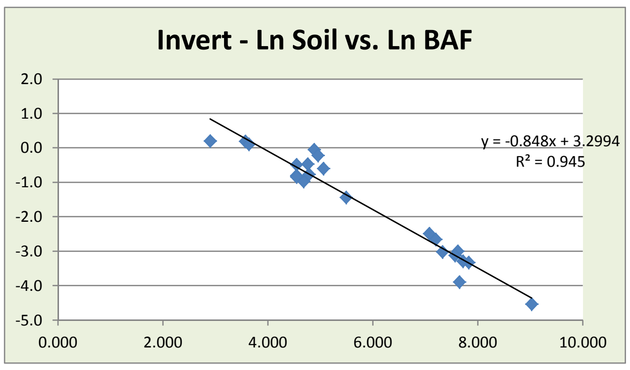

Seed - Soil vs. BAF


Seed - Ln Soil vs. Ln BAF


Invert - Soil vs. Invert


Invert - lnSoil vs. lnInvert


Invert - Soil vs. BAF


Invert - Ln Soil vs. Ln BAF

APPENDIX D

WATER QUALITY CRITERIA RECALCULATION

Appendix D – Arid West Water Quality Research Project Water Quality Criteria Calculation

Recalculated acute and chronic aquatic thresholds were derived for copper, cadmium, and zinc for use as risk based thresholds for the Hanover and Whitewater Creeks ERA. Due to the ephemeral/intermittent flow conditions of these streams, typical aquatic life criteria may not be applicable based on the species assemblages that makeup the criteria derivation which include many species that are not expected to be present in the Hanover and Whitewater Creeks Investigation Unit (HWCIU).

The Arid West Water Quality Research Project's (AWWQRP) "Evaluation of the EPA Recalculation Procedure in the Arid West Technical Report" (Parametrix et al. 2006a) was examined as a potentially viable approach to derive applicable copper and zinc risk thresholds using EPA's recalculation procedure. Cadmium was evaluated separately as described below.

Because of the unique features of arid west aquatic environments, the AWWQRP evaluated the current US criteria for copper, zinc, and several other chemicals. Making use of the EPA's recalculation procedure to derive new water quality criteria, the investigators examined the database of current species used to derive the ambient water quality criteria for each chemical. Each database was then augmented with new data not previously included in the AWQC documents. The revised database was used to derive new acute and chronic water quality criteria according to the methods of Stephen at al. (1985). Once these databases were updated and complete, they could be tailored to different conditions by species compositions to include or exclude different species as appropriate for the system to be evaluated.

In this Appendix, the recalculation procedures are documented to illustrate the derivation process. In addition, the species assemblages used and their chronic toxicity values are included for each metal. A key assumption in this process was that the ranking and presentation of data provided in each document was accurate and followed the process for inclusion or exclusion outlined in Stephan et al. (1985) and Evaluation of the EPA Recalculation Procedure In The Arid West : User's Guide (Parametrix et al. 2006b). These data were used as reported because an independent check of each new study was outside the scope of this ERA. However, the calculations were reproduced using these data to verify their accuracy.

Cadmium was not addressed in the AWWQRP documents, but was effectively evaluated using similar methods presented in Mebane (2010). Using a similar process of exclusion as above for copper and zinc, the revised cadmium database from Mebane (2010) was paired down to a representative set of species and toxicity values, and revised cadmium acute and chronic values were derived from the new data set.

Chronic values were derived from acute to chronic ratios (ACRs) and pooled slopes that were presented in each of the documents for each respective metal. In some cases, recalculation of the ACR may affect the final chronic values derived such that the recalculated chronic values are slightly higher or lower than the New Mexico State Standards. For example, the new copper ACR was higher than the ACR used in the New Mexico Standard for copper.

The general process using example data for derivation of the acute and chronic values is shown below as illustrated in Stephan et al (1985) and GEI (2008):

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Daphnia	10.42	2.3437	5.4931	0.0571	0.2390
3	Ceriodaphnia	8.64	2.1564	4.6501	0.0429	0.2070
2	Chydorus	4.84	1.5769	2.4867	0.0286	0.1690
1	Bosmina	2.05	0.7178	0.5153	0.0143	0.1195
		Sum	6.7949	13.1451	0.1429	0.7346

Acute Criterion

$S^2 = [\Sigma\ (\ln GMAV)^2 - (\Sigma \ln GMAV)^2/4\ ]\ /\ \Sigma P - (\Sigma\sqrt{P})^2/4$

$S = \sqrt{S^2}$

$L = [\Sigma \ln GMAV - S(\Sigma P)]/4$

$A = S\ (\sqrt{0.05}) + L$

Final Acute Value = FAV = e^A
CMC = ½ FAV

Site-Specific Acute Criterion (µg/L) = $CF{*}e^{\text{slope } [\ln \text{ (hardness)}] - \text{intercept}}$

Where CF = the conversion factor for total to dissolved metal
Slope = pooled slopes of regression relationships between hardness and acute or chronic effects value developed for each dataset relative to hardness
Intercept = ln (Criterion Maximum Intercept) = lnCMC - [pooled slope x ln(standardized hardness level)]

Chronic Criterion

Final Chronic Value (FCV) = FAV ÷ FACR
Site-specific Final Acute-Chronic Ratio (FACR) = Derived from data in the reports

Site-Specific Chronic Criterion (µg/L) = $CF{*}e^{\text{slope } [\ln \text{ (hardness)}] - \text{intercept}}$

Where CF = the conversion factor for total to dissolved metal
Slope = pooled slopes of regression relationships between hardness and acute or chronic effects value developed for each dataset relative to hardness
Intercept = ln (Criterion Continuous Intercept) = lnCCC - [pooled slope x ln(standardized hardness level)]

Copper

The revised database for copper presented in Parametrix et al. (2006) resulted in the use of toxicity test data for 69 species/genera which were ranked from lowest to highest in terms of their acute values (Table D-1). The four lowest GMAVs were used to derive a revised acute criterion according to the methods of Stephen et al. (1985). Using the data provided in Parametrix et al. (2006a), the calculation process was repeated to replicate the final values shown in Table 5-9 and 5-10 of the document. When the values could not be reproduced (particularly the range of hardness based numbers in Table 5-10), the calculation process was closely examined to evaluate the correctness of the values. A similar document was obtained that also conducted a recalculation of the copper criteria for copper (GEI 2008) for the Eagle River in Colorado using the same dataset. Examination of the GEI calculation procedure suggested that the Parametrix et al. (2006a) contained errors in the copper criteria derived at different hardness levels provided in its Table 5-10. Using the GEI (2008) document as a guide for the final acute criterion values for copper at different hardness levels, the values were recalculated and found to match the GEI (2008) acute copper criteria at various hardness levels using the same dataset.

Finally, as part of the recalculation procedure, the revised database was examined for relevant species likely to be present in several configurations to derive site-specific values for different watersheds (Parametrix et al. 2006a). The Salt/Gila River configuration of species was chosen as that species assemblage that most likely would be representative of an aquatic community found at the Chino Site. Based on this recalculation, the acute values for a range of hardness were derived. Tables D-2 and D-3 show the calculated values for both acute and chronic thresholds as well as provides acute and chronic thresholds derived for a range of hardness values.

Cadmium

A similar approach as described above for copper was utilized for cadmium, however, a revised cadmium dataset of acute toxicity values were not available in the Arid West Documents. Mebane (2010) conducted an in depth reassessment of the cadmium criteria updating the previous AWQC dataset more using recently published studies. In this revised database, acute toxicity values were available for 57 species (Table D-4). Similar to copper, the calculations were recomputed to verify being able to recalculate the numbers given the data provided (Table 8; Mebane 2010). Following the recalculation, using the approach and rationale presented in the Arid West documents for elimination of species, a new dataset was developed resulting a toxicity dataset for 42 species. Recalculation using this revised dataset is presented in Tables D-5 and D-6.

Zinc

The same process used to validate and confirm the data for copper was used also for zinc. Table D-7 presents the revised database for acute zinc toxicity from Parametrix et al. (2006b). Table D-7 also contains a more streamlined dataset for species likely to be present in the Salt/Gila River basins which may likely more be representative of species potentially present at the Chino site. Table D-8 and D-9 show the calculations for each data set used to derive new thresholds.

Summary

Collectively, this process revises the acute criteria for copper, cadmium, and zinc with updated toxicity data. By using a standardized process of species elimination as described in Parametrix et al. (2006a and b), new acute and chronic criteria for each parameter were derived. The process provides for a less conservative approach than the standard AWQC approach by crafting the species assemblages to something more representative of arid west steams.

References:

Parametrix, Chadwick Ecological Consultants, and URS Corporation. 2006a. Arid West Water Quality Research Project: Evaluation of the EPA Recalculation Procedure in the Arid West, Technical Report. Prepared for the Pima County Wastewater Management Department, funding provided by USEPA Region 9.

Parametrix, Chadwick Ecological Consultants, and URS Corporation. 2006b. Evaluation of the EPA Recalculation Procedure In The Arid West : User's Guide. Prepared for the Pima County Wastewater Management Department, funding provided by USEPA Region 9.

GEI Consultants. 2008. Evaluation of Potential Site-Specific Zinc, Cadmium, and Copper Standards for the Eagle River, Segment 5 and Cross Creek, Segment 7b, Technical Memorandum. Prepared for CBS Operations, Inc.

Mebane, C.A. 2010. Cadmium Risks to Freshwater Life: Derivation and Validation of Low-Effect Criteria Values using Laboratory and Field Studies. US Geological Survey Scientific Investigations Report 2006-5245, version 1.2.

Stephan, C.E., D.I. Mount, D.J. Hansen, J.H. Gentile, G.A. Chapman and W.A. Brungs. 1985. Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses. PB85-227049. National Technical Information Service, Springfield, VA.

Table D-1
Acute Toxicity Database for Copper, Species Acute Values and Rankings

GMAV Rank	SS Rank	Species	Common Name	GMAV (ug/L)	SMAV (ug/L)
69	43	*Notemigonus crysoleucas*	Golden shiner	59,017	59,017
68		*Acroneuria lycorias*	Stonefly	9,408	9,408
67		*Corbicula manilensis*	Asiatic clam	>7,485	>7,485
66	42	Trichoptera spp.	Caddisfly	6,200	6,200
65		*Anguilla rostrata*	American eel	5,748	5,748
64	40	*Zygoptera* spp.	Damselfly	4,600	4,600
63		*Procambarus clarkii*	Crayfish	2,073	2,073
62		*Campeloma decisum*	Snail	1,859	1,859
61		*Oronectes rusticus*	Crayfish	1,363	1,363
60	38	*Crangonyx pseudogracilis*	Amphipod	1,290	129
59	33	*Lepomis gibbosus*	Pumpkinseed	929	619
	39	*Lepomis macrochirus*	Bluegill		1,394
58		*Amnicola* spp.	Snail	900	900
57	36	*Gambusia affinis*	Mosquitofish	795.5	795.5
56		*Fundulus diaphanus*	Banded killifish	788.3	788.3
55	35	*Cyprinus carpio*	Common carp	746.6	746.6
54	34	*Tilapia mossambica*	Mozambique tilapia	663.1	663.1
53	31	*Ephemerella subuaria*	Mayfly	362.7	362.7
52	30	*Notropis chrysocephalus*	Striped shiner	314.9	314.9
51	29	*Carassius auratus*	Goldfish	288.7	288.7
50	32	*Chironomus tentans*	Midge	194.1	452.7
	6	*Chironomus* spp.	Midge		30.0
	37	*Chironomus decorus*	Midge		837.6
	25	*Chrionomus plumosus*	Midge		124.9
49	27	*Jordanella floridae*	Flagfish	189.8	189.8
48		*Tropocyclops prasinus*	Copepod	140.4	140.4
47	26	*Acrocheilus alutaceus*	Chiselmouth	132.6	132.6
46		*Ictalurus nebulosus*	Brown bullhead	128.6	66.2
	28	*Ictalurus punctatus*	Channel catfish		249.8
45		*Lophopodella carteri*	Bryozoan	128.3	128.3
44		*Salmo salar*	Atlantic salmon	114.6	114.6
43	41	*Morone americana*	White perch	95.3	5,842.5
	23	*Morone saxatilis*	Striped bass		95.3
42	19	*Poecilia reticulata*	Guppy	81.8	81.8
41	22	*Nais* spp.	Worm	90.0	90.0
40		*Etheostoma caeruleum*	Rainbow darter	87.7	82.2
		Etheostoma spectabile	Orangethroat darter		218.4
	16	*Etheostoma lepidum*	Greenthroat darter		79.7
		Etheostoma nigrum	Johnny darter		159.5
		Etheostoma rubrum	Fountain darter		18.4
		Etheostoma flabellare	Fantail darter		107.9
39	21	*Hybognathus amarus*	Rio Grande silvery	86.6	86.6
38	20	*Rhinichthys atratulus*	Blacknose dace	82.2	82.2
37	18	*Xyrauchen texanus*	Razorback sucker	81.0	81.0
36		*Semotilus atromaculatus*	Creek chub	79.7	79.7
35		*Pimephales notatus*	Bluntnose minnow	74.3	68.5

Table D-1
Acute Toxicity Database for Copper, Species Acute Values and Rankings

GMAV Rank	SS Rank	Species	Common Name	GMAV (ug/L)	SMAV (ug/L)
	17	*Pimephales promelas*	Fathead minnow		80.7
34	15	*Campostoma anomalum*	Central stoneroller	74.5	74.5
33		*Ptychocheilus oregonensis*	Northern pikeminnow	68.6	40.1
	24	*Ptychocheilus lucius*	Colorado pikeminnow		117.3
32		*Salvelinus fontinalis*	Brook trout	66.2	110.9
		Salvelinus confluentus	Bull trout		39.5
31		*Simocephalus vetulus*	Cladoceran	63.2	63.2
30	14	*Catostomus latipinnis*	Flannelmouth sucker	62.1	62.1
29	13	*Gila elegans*	Bonytail chub	59.3	59.3
28		*Oncorhynchus kisutch*	Coho salmon	55.41	115.58
		Oncorhynchus nerka	Sockeye salmon		132.6
		Oncorhynchus clarki (henshawi)	Cutthroat trout		65.19
		Oncorhynchus tshawytscha	Chinook salmon		33.23
		Oncorhynchus mykiss	Rainbow trout		27.70
		Oncorhynchus apache	Apache trout		21.22
		Oncorhynchus gorbuscha	Pink salmon		82.22
27		*Gyraulus circumstriatus*	Snail	54.75	54.75
26	12	*Limnodrilus hoffmeisteri*	Worm	51.71	51.71
25	11	*Poeciliposis occidentalis*	Gila topminnow	49.07	49.07
24		*Scaphirhynchus platorynchus*	Shovelnose sturgeon	49.07	49.07
23		*Lampsilis teres*	Yellow sandshell	47.21	44.80
		Lampsilis s. *clairbornensis*	Freshwater mussel		49.75
22		*Lumbriculus variegatus*	Worm	46.40	46.40
21		*Utterbackia imbecillis*	Paper pondshell mussel	41.83	41.83
20	8	*Physa heterostropha*	Snail	38.91	34.98
	10	*Physa integra*	Snail		43.28
19		*Bufo boreas*	Boreal toad	36.80	36.80
18		*Juga plicifera*	Snail	35.10	35.10
17		*Pectinatella magnifica*	Bryozoan	35.21	35.21
16		*Plumatella emarginata*	Bryozoan	35.21	35.21
15		*Villosa vibex*	Rainbow mussel	33.52	45.15
		Villosa vilosa	Freshwater mussel		24.89
14	7	*Tubifex tubifex*	Worm	33.28	33.28
13		*Physella gyrina*	Snail	27.26	27.26
12	5	*Gammarus pseudolimnaeus*	Amphipod	23.80	22.72
	1	*Gammarus pulex*	Amphipod		15.22
	9	*Gammarus* sp.	Amphipod		39.00
11		*Thymallus arcticus*	Arctic grayling	23.52	23.52
10	4	*Brachydanio rerio*	Zebrafish	22.27	22.27
9	3	*Ephoron virgo*	Mayfly	19.35	19.35
8		*Lithoglyphus virens*	Snail	18.72	18.72
7		*Scapholeberis* spp.	Cladoceran	17.32	17.32
6		*Actinonaias pectorosa*	Pheasantshell mussel	16.48	16.48
5	2	*Hyalella azteca*	Amphipod	16.35	16.35
4		*Daphnia galeata*	Cladoceran	10.42	6.02
		Daphnia magna	Cladoceran		14.93
		Daphnia pulex	Cadoceran		14.64

Table D-1
Acute Toxicity Database for Copper, Species Acute Values and Rankings

GMAV Rank	SS Rank	Species	Common Name	GMAV (ug/L)	SMAV (ug/L)
		Daphnia pulicaria	Cladoceran		8.98
3		*Ceriodaphnia reticulata*	Cladoceran	8.64	9.65
		Ceriodaphnia dubia	Cladoceran		7.74
2		*Chydorus sphaericus*	Cladoceran	4.84	4.84
1		*Bosmina longirostrus*	Cladoceran	2.05	2.05

Notes:

Revised database as presented in Parametrix et al. (2006)

Rank - GMAV ranking for complete revised data set (Parametrix et al. 2006)

SS Rank - Ranking for SMAV values based on expected species assemblage for Salt/Gila River (Parametrix et al. 2006)

GMAV - Genus Mean Acute Values

SMAV - Species Mean acute Values

Table D-2

Copper Recalculation using the Entire Revised Database from Arid West Document (Parametrix et al. 2006)

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Daphnia	10.42	2.3437	5.4931	0.0571	0.2390
3	Ceriodaphnia	8.64	2.1564	4.6501	0.0429	0.2070
2	Chydorus	4.84	1.5769	2.4867	0.0286	0.1690
1	Bosmina	2.05	0.7178	0.5153	0.0143	0.1195
		Sum	6.7949	13.1451	0.1429	0.7346

S2	1.602
	0.0079
	201.8011
S	14.2057
L	-0.9102
A	2.2662
FAV e^A	9.6424
CMC = 1/2 FAV	4.8212
FCV = FAV/FACR	3.3240

Acute Criterion (ug/L)	Chronic Criterion (ug/L)	Hardness (mg/l CaCO3)
2.35	**2.12**	25
4.63	**3.19**	50
6.89	**4.05**	75
9.13	**4.80**	100
13.58	**6.10**	150
18.01	**7.23**	200
22.41	**8.24**	250
26.80	**9.18**	300
31.17	**10.05**	350
35.53	**10.88**	400

Notes:

Final Acute-chronic ratio (FACR) = 2.9008

Total n = 69 genera

Pooled Slope

acute	0.9801
chronic	0.5897

Intercept

acute	-2.261151101
chronic	-1.1057367

Table D-3

Copper Recalculation using the Revised Database (Salt/Gila River subset) from Arid West Document (Parametrix et al. 2006)

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Brachydanio	22.3	3.1046	9.6385	0.0909	0.3015
3	Ephron	19.4	2.9653	8.7928	0.0682	0.2611
2	Hyalella	16.4	2.7973	7.8248	0.0455	0.2132
1	Gammerus	15.2	2.7213	7.4054	0.0227	0.1508
		Sum	11.5884	33.6615	0.2273	0.9266

S2	0.089
	0.0126
	7.0109
S	2.6478
L	2.2838
A	2.8758
FAV e^A	17.7397
CMC = 1/2 FAV	8.8698
FCV = FAV/FACR	6.1154

Acute Criterion (ug/L)	Chronic Criterion (ug/L)	Hardness (mg/l CaCO3)
4.32	**3.90**	25
8.52	**5.87**	50
12.67	**7.46**	75
16.80	**8.84**	100
24.99	**11.22**	150
33.13	**13.30**	200
41.23	**15.17**	250
49.30	**16.89**	300
57.34	**18.49**	350
65.36	**20.01**	400

Notes:

Final Acute-chronic ratio (FACR) = 2.9008

Total n = 43 genera

Pooled Slope

acute	0.9801
chronic	0.5897

Intercept

acute	-1.651516174
chronic	-0.496101773

Table D-4
Acute Toxicity Database for Cadmium, Species Acute Values and Rankings

GMAV Rank	SS rank	Species	Common name	GMAV (µg/L)	SMAV (µg/L)
1		*Oncorhynchus clarki**	Cutthroat trout	2.02	1.5
1		*Oncorhynchus mykiss**	Rainbow trout	2.02	2.04
1		*Oncorhynchus tshawytscha**	Chinook salmon	2.02	2.67
2		*Salvelinus confluentus**	Bull trout	2.13	2.13
3		*Salmo trutta**	Brown trout	2.61	2.61
4		*Cottus bairdi**	Mottled sculpin	2.61	2.56
4		*Cottus confusus**	Shorthead sculpin	2.61	2.67
5		*Etheostoma fonticola**	Fountain darter	3.32	3.32
6	1	*Hyalella azteca*	Amphipod	5.39	5.39
7		*Prosopium williamsoni**	Mountain whitefish	8.29	8.29
8	2	*Pimephales promelas*	Fathead minnow	16.5	16.5
9	3	*Diporeia sp.*	Amphipod	22.7	22.7
10		*Simocephalus serrulatus**	Cladoceran	26.2	26.2
11		*Daphnia ambigua**	Cladoceran	28.6	12.2
11		*Daphnia magna**	Cladoceran	28.6	22.3
11		*Daphnia pulex**	Cladoceran	28.6	87.1
12		*Lampsilis straminea claibornensis**	Southern fatmucket (mussel)	32.4	45.8
12	4	*Lampsilis teres*	Yellow sandshell (mussel)	32.4	23
13		*Ceriodaphnia dubia**	Cladoceran	32.9	32.9
14		*Actinonaias pectorosa**	Pheasant shell (mussel)	36.9	36.9
15		*Villosa vibex**	Southern rainbow (mussel)	38.8	38.8
16	5	*Utterbackia imbecilis*	Paper pondshell (mussel)	45.7	45.7
17	8	*Orconectes juvenilis*	Crayfish	47.8	66.8
17		*Orconectes placidus**	Placid crayfish	47.8	34.2
18	6	*Lirceus alabamae*	Isopod	59.2	59.2
19	9	*Gammarus pseudolimnaeus*	Amphipod	76.7	76.7
20	11	*Hydra oligactis*	Hydra	81.7	96.3
20	7	*Hydra viridissima*	Hydra	81.7	63.2
20	10	*Hydra vulgaris*	Hydra	81.7	89.6
21	12	*Aplexa hypnorum*	Physid snail	101	101
22	13	*Rhithrogena sp.*	Mayfly	103	103
23	14	*Physa gyrina*	Physid snail	129	129
24	15	*Gyraulus sp.*	Gyro snail	151	151
25	16	*Lumbriculus variegatus*	Oligochaete worm	179	179
26	17	*Lymnaea stagnalis*	Pulmonate pond snail, swamp lymnaea	193	193
27		*Potamopyrgus antipodarum**	New Zealand Mud snail	226	226
28	18	*Glossiphonia complanata*	Leech	226	226
29	19	*Baetis tricaudatus*	Mayfly	306	306
30		*Coregonus clupeaformis**	Lake whitefish	354	354
31		*Ambystoma gracile**	Northwestern salamander	512	512
32		*Asellus sp.**	Isopod	616	616
33	20	*Arctopsyche sp.*	Caddisfly	716	716
34	21	*Procambarus clarkii*	Red swamp crayfish	722	722
35	22	*Carassius auratus*	Goldfish	832	832
36	23	*Limnodrilus hoffmeisteri*	Tubificid worm	1026	1026
37	24	*Tubifex tubifex*	Tubificid worm	1332	1332
38	25	*Aelosoma headleyi*	Polychaete worm	1346	1346
39	26	*Branchiura sowerbyi*	Tubificid worm	1570	1570
40	27	*Ptychocheilus oregonensis*	Northern pikeminnow	1950	1950
41	28	*Quistadrilus multisetosus*	Tubificid worm	2093	2093

Table D-4
Acute Toxicity Database for Cadmium, Species Acute Values and Rankings

GMAV Rank	SS rank	Species	Common name	GMAV (µg/L)	SMAV (µg/L)
42	30	*Varichaetadrilus pacificus*	Tubificid worm	2485	2485
43	29	*Spirosperma sp. (“ferox”)*	Tubificid worm	2289	2289
43	32	*Spirosperma nikolskyi*	Tubificid worm	2595	2943
44		*Catostomous commersoni**	White sucker	2610	2610
45	30	*Poecilia reticulata*	Guppy	2617	2617
46	31	*Jordanella floridae*	American flagfish	2782	2782
47	33	*Stylodrilus heringlianus*	Oligochaete worm	3597	3597
48		*Perca flavescens**	Yellow perch	3913	3913
49	34	*Rhyacodrilus montana*	Tubificid worm	4120	4120
50	35	*Cyprinella lutrensis*	Red shiner	4226	4226
51	36	*Ictalurus punctatus*	Channel catfish	4986	4986
52	37	*Gambusia affinis*	Mosquitofish	4995	4995
53	38	*Lepomis cyanellus*	Green sunfish	5791	5540
53	39	*Lepomis macrochirus*	Bluegill	5791	6054
54	41	*Perlodidae*	Stonefly	7866	7866
55	40	*Chironomus riparius*	Midge	11742	6988
55	43	*Chironomus tentans*	Midge	11742	19730
56	41	*Gasterosteus aculeatus*	Threespine stickleback	12328	12328
57	42	*Dendrocoelum lacteum*	Planarian	15540	15540

Notes:

Revised database as presented in Mebane (2010)

* = Not found in New Mexico, species removal condcuted by Formation for criterion development.

SS Rank - Ranking for SMAV values based on expected species assemblage for Salt/Gila River using the Arid West protocols from Parametrix et al.(2006)

GMAV - Genus Mean Acute Values

SMAV - Species Mean acute Values

Table D-5

Cadmium Recalculation using the Revised Database from Mebane (2010)

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Cottus	2.61	0.9594	0.9204	0.0690	0.2626
3	Salmo	2.61	0.9594	0.9204	0.0517	0.2274
2	Salvelinus	2.126	0.7542	0.5689	0.0345	0.1857
1	Oncorhynchus	2.017	0.7016	0.4923	0.0172	0.1313
		Sum	3.3746	2.9018	0.1724	0.8070

S2	0.055
	0.0096
	5.7328
S	2.3943
L	0.3606
A	0.8959
FAV e^A	2.4496
CMC = 1/2 FAV	1.2248
FCV = FAV/FACR	0.7163

Acute Criterion (ug/L)	Chronic Criterion (ug/L)	Hardness (mg/l CaCO3)
0.6855	**0.4492**	25
1.1917	**0.6719**	50
1.6463	**0.8499**	75
2.0701	**1.0039**	100
2.8582	**1.2691**	150
3.5925	**1.4985**	200
4.2892	**1.7044**	250
4.9573	**1.8933**	300
5.6023	**2.0691**	350
6.2283	**2.2344**	400

Notes:

Final Acute-chronic ratio (FACR) = 3.42

Includes salmonids -acute

Total n = 57 genera

Pooled Slope

acute	0.8403
chronic	0.6247

Intercept

acute	-3.084491948
chronic	-2.777553159

Table D-6

Cadmium Recalculation using the Revised Database from Mebane (2010) and Species Eliminated using the Arid West Protocols

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Lampsilis teres	23	3.1355	9.8313	0.0930	0.3050
3	Diporeia sp.	22.7	3.1224	9.7492	0.0698	0.2641
2	Pimephales promelas	16.5	2.8034	7.8588	0.0465	0.2157
1	Hyalella azteca	5.39	1.6845	2.8377	0.0233	0.1525
Sum			10.7458	30.2770	0.2326	0.9373

S2	1.409
	0.0129
	109.0082
S	10.4407
L	0.2399
A	2.5745
FAV e^A	13.1244
CMC = 1/2 FAV	6.5622
FCV = FAV/FACR	3.8375

Acute Criterion (ug/L)	Chronic Criterion (ug/L)	Hardness (mg/l CaCO3)
3.6725	**2.4067**	25
6.3850	**3.5996**	50
8.8205	**4.5534**	75
11.0912	**5.3786**	100
15.3134	**6.7998**	150
19.2479	**8.0287**	200
22.9806	**9.1317**	250
26.5598	**10.1436**	300
30.0158	**11.0856**	350
33.3696	**11.9714**	400

Notes:

Final Acute-chronic ratio (FACR) = 3.42

Total n = 42 genera

Pooled Slope

acute	0.8403
chronic	0.6247

Intercept

acute	-1.405946348
chronic	-1.099007559

Table D-7
Acute Toxicity Database for Zinc, Species Acute Values and Rankings

GMAV Rank	SS Rank	Species	Common Name	GMAV (µg/L)	SMAV (µg/L)
64	38	*Argia* sp.	Damselfly	89,488	89,488
63	37	Trichoptera	Caddisfly	58,100	58,100
62		*Rhithrogena hageni*	Mayfly	55,890	55,890
61	36	*Gambusia affinis*	Mosquitofish	32,370	32,370
60	35	Zygoptera	Damselfly	26,200	26,200
59		*Chironomus* sp.	Midge	19,930	18,200
	34	*Chironomus plumosus*	Midge		21,825
58	33	*Crangonyx pseudogracilis*	Amphipod	19,800	19,800
57		*Xenopus laevis*	Frog	19,091	19,091
56	31	*Nais* sp.	Worm	18,400	18,400
55		*Asellus aquaticus*	Isopod	18,200	18,200
54		*Fundulus diaphanus*	Banded killifish	17,935	17,935
53		*Aeolosoma headleyi*	Worm	17,362	17,362
52		*Amnicola* sp.	Snail	16,817	16,817
51	29	*Lepidostoma* sp.	Caddisfly	>15,054	>15,054
50		*Anguilla rostrata*	American eel	13,627	13,627
49		*Baetis tricaudatus*	Mayfly	13,515	13,515
48	27	*Carassius auratus*	Goldfish	10,276	10,276
47	32	*Lepomis gibbosus*	Pumpkinseed	9,967	18,778
	18	*Lepomis macrochirus*	Bluegill		5,290
46		*Lumbriculus variegatus*	Worm	9,744	9,744
45	26	*Tubifex tubifex*	Worm	9,612	9,612
44		*Isoperla* sp.	Stonefly	>8,952	>8,952
43		*Caecidotea bicrenata*	Isopod	8,120	5,677
		Caecidotea communis	Isopod		11,614
42	24	*Cyprinus carpio*	Common carp	7,245	7,245
41	23	*Girardia tigrina*	Flatworm	7,004	7,004
40	22	*Echinogammarus tibaldii*	Amphipod	6,788	6,788
39	20	*Notemigonus crysoleucus*	Golden shiner	6,000	6,000
38	19	*Poecilia reticulata*	Guppy	5,926	5,926
37		*Corbicula fluminea*	Asiatic clam	4,892	4,892
36		*Mesocyclops hyalinus*	Copepod	4,847	4,847
35		*Stenocypris malcomsoni*	Ostracod	4,464	4,464
34	25	*Gammarus* sp.	Amphipod	4,322	8,100
	14	*Gammarus italicus*	Amphipod		2,306
33	16	*Xiphophorus maculatus*	Southern platyfish	4,308	4,308
32	15	*Pimephales promelas*	Fathead minnow	3,808	3,808
31		*Ptychocheilus lusius*	Colorado pikeminnow	3,790	2,211
	21	*Ptychocheilus oregonensis*	Northern pikeminnow		6,495
30		*Lirceus alabamae*	Isopod	3,242	3,242
29	13	*Gila elegans*	Bonytail	2,013	2,013
28		*Salvelinus fontinalis*	Brook trout	1,691	1,691
27		*Lophopodella carteri*	Bryozoan	1,688	1,688
26	11	*Jordanella floridae*	Flagfish	1,673	1,673
25	10	*Xyrauchen texanus*	Razorback sucker	1,651	1,651
24		*Plumatella emarginata*	Bryozoan	1,589	1,589
23		*Helisoma campanulatum*	Snail	1,579	1,579
22		*Cypris* sp.	Ostracod	1,484	1,484
21	12	*Physa gyrina*	Snail	1,354	1,686
	7	*Physa heterostropha*	Snail		1,087

Table D-7
Acute Toxicity Database for Zinc, Species Acute Values and Rankings

GMAV Rank	SS Rank	Species	Common Name	GMAV (µg/L)	SMAV (µg/L)
20		*Pectinatella magnifica*	Bryozoan	1,292	1,292
19	9	*Drunella grandis*	Mayfly	>1,264	>1,264
18	8	*Limnodrilus hoffmeisteri*	Worm	>1,258	>1,258
17	6	*Ranatra elongata*	Water scorpion	830	830
16	5	*Tilapia mossambica*	Mozambique tilapia	786	786
15		*Oncorhynchus mykiss*	Rainbow trout	750	582
		Oncorhynchus kisutch	Coho salmon		1,635
		Oncorhynchus nerka	Sockeye salmon		1,510
		Oncorhynchus tshawytscha	Chinook salmon		449
		Oncorhynchus clarki	Cutthroat trout		368
14		*Salmo salar*	Atlantic salmon	>647*	2,194
		Salmo trutta	Brown trout		>647
13		*Heliodiaptomus viduus*	Copepod	638	638
12	4	*Catostomus latipinnis*	Flannelmouth sucker	600*	600
	17	*Catostomus commersoni*	White sucker		5,263
11		*Bryocamptus zschokkei*	Copepod	343	343
10		*Moina irrasa*	Cladoceran	320	667
		Moina macrocopa	Cladoceran		153
9		*Anodonta imbecillis*	fw mussel	296	296
8		*Daphnia magna*	Cladoceran	275	299
		Daphnia pulex	Cladoceran		253
7	3	*Hyalella azteca*	Amphipod	241	241
6	2	*Agosia chrysogaster*	Longfin dace	226	226
5		*Tropocyclops prasinus*	Copepod	205	205
4		*Thymallus arcticus*	Arctic grayling	199.2	199.2
3		*Cottus bairdi*	Mottled sculpin	181.7	181.7
2	1	*Morone saxatilis*	Striped bass	119*	118.9
	28	*Morone americana*	White perch		13,439
1		*Ceriodaphnia dubia*	Cladoceran	94.2	175.0
		Ceriodaphnia reticulata	Cladoceran		50.7

Notes:

Revised database as presented in Parametrix et al. (2006)

Rank - GMAV ranking for complete revised data set (Parametrix et al. 2006)

SS Rank - Ranking for SMAV values based on expected species assemblage for Salt/Gila River (Parametrix et al. 2006)

GMAV - Genus Mean Acute Values

SMAV - Species Mean acute Values

Table D-8

Zinc Recalculation using the Entire Revised Database from Arid West Document (Parametrix et al. 2006)

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Thymallus	199.2	**5.2943**	28.0297	0.0635	0.2520
3	Cottus	181.7	5.2024	27.0645	0.0476	0.2182
2	Morone	119	4.7791	22.8400	0.0317	0.1782
1	C dubia	94.2	4.5454	20.6608	0.0159	0.1260
		Sum	19.8212	98.5951	0.1587	0.7744

	0.375
S2	0.0088
	42.5023
S	6.5194
L	3.6932
A	5.1510
FAV e^A	172.5962
CMC = 1/2 FAV	86.2981
FCV = FAV/FACR	72.7455899

Acute Criterion (ug/L)	Chronic Criterion (ug/L)	Hardness (mg/l CaCO3)
46.70	**39.69**	25
84.40	**71.73**	50
119.31	**101.39**	75
152.52	**129.62**	100
215.60	**183.23**	150
275.63	**234.24**	200
333.47	**283.40**	250
389.63	**331.12**	300
444.43	**377.70**	350
498.09	**423.30**	400

Notes:

Final Acute-chronic ratio (FACR) = 2.3726

Total n = 62 genera

Pooled Slope

acute	0.8537
chronic	0.8537

Intercept

acute	1.118113465
chronic	0.947274245

Table D-9

Zinc Recalculation using the Revised Database (Salt/Gila River subset) from Arid West Document (Parametrix et al. 2006)

Rank	Genus	GMAV	ln GMAV	(ln GMAV)^2	P = R/(N+1)	√P
4	Catostomus	600	6.3969	40.9207	0.1026	0.3203
3	Hyallela	241	5.4848	30.0830	0.0769	0.2774
2	Agosia	226	5.4205	29.3822	0.0513	0.2265
1	Morone	119	4.7791	22.8400	0.0256	0.1601
		Sum	22.0814	123.2259	0.2564	0.9842

S2	1.329
	0.0143
	93.2474
S	9.6565
L	3.1444
A	5.3036
FAV e^A	201.0558
CMC = 1/2 FAV	100.5279
FCV = FAV/FACR	84.74072528

Acute Criterion (ug/L)	Chronic Criterion (ug/L)	Hardness (mg/l CaCO3)
54.40	**46.24**	25
98.32	**83.55**	50
138.98	**118.11**	75
177.67	**150.99**	100
251.16	**213.45**	150
321.07	**272.86**	200
388.45	**330.13**	250
453.87	**385.72**	300
517.71	**439.98**	350
580.22	**493.10**	400

Notes:

Final Acute-chronic ratio (FACR) = 2.3726

Total n = 38 genera

Pooled Slope

acute	0.8537
chronic	0.8537

Intercept

acute	1.270741484
chronic	1.099902264