Ginn Battle North, LLC

Responses to Comments

Received in regards to the

Colorado Department of Public Health and Environment's and U.S. Environmental Protection Agency

comments on Ginn Battle North's Draft Human Health Risk Assessment,

Bolts Lake Area and Areas within OU-1 of Eagle Mine Site for

the North Property

October 26, 2006

Introduction

The following are Ginn Battle North, LLC's ("Ginn Battle North") Responses to Comments ("Responses") that have been prepared to address comments received from the Colorado Department of Public Health and Environment ("CDPHE") and U.S. Environmental Protection Agency ("EPA") in response to the Draft Human Health Risk Assessment ("RA") for the North Property dated September 15, 2006. The RA was prepared by Environmental Resources Management ("ERM"). A human health risk assessment describes the potential for site-related risks to human receptors. It contains quantitative estimates of exposure compared to estimates of cancer and noncancer health effects in order to develop risk estimates.

Comments were received from the CDPHE and EPA, and the Responses to these comments are listed below. After each individual comment, the Response of Ginn Battle North is provided in italics. The RA was revised based on the comments received. Language added to the RA to address the specific comments is included within each appropriate Response in quotes. Also, the section and page number of the RA on which the revised language may be found is provided within each Response.

The Eagle Mine Superfund Site ("Eagle Mine Site") was classified as a Superfund site in 1986, and in 1988 the state of Colorado, through CDPHE, and the previous mine owner/operator, Gulf + Western Industries, entered into a Consent Decree to conduct remedial actions. In 1993, the EPA identified additional site investigation and remedial actions to be implemented at the Eagle Mine Site; and in 1995 the EPA, CDPHE, and Viacom International, Inc. ("Viacom"), successor to liability at the Eagle Mine Site, entered into a subsequent Consent Decree. Remediation activities at the Operable Unit-1 ("OU-1") of the Eagle Mine Site have included: removal of tailing materials from the Old Tailings Pile, Rex Flats and Maloit Park areas to the Consolidated Tailings Pile ("CTP"); construction of the Water Treatment Plant and a lined sludge pond; capture and treatment of ground water; capping the CTP; ground and surface water monitoring; and revegetation of disturbed areas. Operation and maintenance of remediation systems at the OU-1 area of the Eagle Mine Site continues today, and is the responsibility of Viacom. Soil and ground water beneath these areas were not remediated and are potentially impacted by the former tailings placement.

Environmental investigations were conducted at the North Property by ERM on behalf of Ginn Battle North in 2005 and pursuant to the "Final Work Plan for Site Investigation of Bolts Lake and Eagle Mine Site OU-1 Development Areas, Battle Mountain North Development", dated July 6, 2005 ("Final Work Plan"), and approved by the U.S. Environmental Protection Agency ("EPA") and the Colorado Department of Public Health and Environment ("CDPHE"). A detailed description of the background of the Eagle Mine Site and its current condition is presented in the Final Work Plan, *and is not reproduced herein.* The reader is directed to that document for a description of key terms, the EPA/CDPHE review process, and the project scope.

The Final Risk Assessment

Along with the Responses, the Final Risk Assessment is being distributed to CDPHE and EPA, and will be placed in the public repository in the town of Minturn.

Thank You

Ginn Battle North appreciates all of the time CDPHE and EPA took to review and provide comments on the Final Risk Assessment .

CDPHE

Colorado Department of Public Health and Environment
Comments on the Draft Human Health Risk Assessment ("RA") for the North Property

Comment 1: Section 2.6.4, page 16 – Sediment-Tier I risk estimates - It is important to identify the text that these are Eagle River sediments. In addition, it is not clear why sediments from other surface water bodies such as diversion trench and seeps are not included as potential exposure media.

> ***Response:*** *We acknowledge this comment. Section 2.3 (Data Evaluation) states that the sediment samples are from the Eagle River, and that sediment samples were not collected from other surface water features, such as the seeps or the diversion trenches. These other surface water bodies are small in area, have intermittent flow, do not support fish, and therefore are not included in potential exposure area as related to surface water. In general, the area of the seeps and OTP diversion trenches are included in the overall evaluation of surface soil and related potential exposure. The language stating that the sediment samples are from the Eagle River and the reasoning for not including sediments from other sources is included on page 8 and 9 of the RA is presented below.*
>
> *Page 8, 4th bullet: "Saturated sediment from the Eagle River."*
>
> *Page 9, last paragraph: "It is noted that sediment samples were not collected from other surface water bodies, such as the seeps or the diversion trenches. These other surface water bodies are small in area, have intermittent flow, do not support fish, and therefore are not included in potential exposure areas as related to surface water."*

Comment 2: Section 3.1.3, page 63 – Exceeding Background Concentrations In accordance with the current national guidance on background comparison (EPA, 2002: *Guidance on Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*), it is not appropriate to conduct background comparisons without statistical hypothesis testing. To encourage national consistency, Appendix B of the current national guidance entitled, "*Policy Considerations for the Application of Background Data in Risk Assessment and Remedy Selection: Role of background in the CERCLA Cleanup Program (EPA, 2002)*" recommends,

> "baseline risk assessment approach that retains constituents that exceed risk-based screening concentrations. This approach involves addressing site-specific background issues at the end of the risk assessment, in the risk characterization. Specifically, the COPCs with high background should be discussed in the risk characterization, and if data are available, the contribution of background to site concentrations should be distinguished."

Response: *We acknowledge this comment. Section 3.1.3. (Exceeding Natural Background Concentrations) of the Risk Assessment (RA) describes how the data were evaluated statistically to determine which analytes exceeded naturally occurring background conditions (Appendix A of the RA). The revised language in Section 3.1.3 is presented below.*

Page 65: "All background sampling locations visually appeared unimpacted and were collected off site of site-related activities. However, metals may be elevated throughout the Eagle River watershed due to natural mineralization in this region.

The data were evaluated statistically to determine which analytes exceeded naturally occurring background conditions (Appendix A). The data were divided by exposure area, since some exposure areas may have had more mine-site impacts than others, and Bolts Lake was expected to be unimpacted. The data were analyzed with Statgraphics. Summary statistics were estimated, including indications of kurtosis and skewness. A one-way Analysis of Variance (ANOVA) and a nonparametric Kruskal-Wallis test were run on the data. Box and whisker plots with a median notch to indicate 95th percent confidence limits were constructed to compare the data by exposure area to the background data (Appendix A). If the data were indicated as nonnormal, the appropriate statistical test is the Kruskal-Wallis test. If the data were normal, the ANOVA is the preferred statistical test. All Tier II COPCs were carried forward to estimate risks, and the results of this background analysis are presented in the Risk Characterization section and Appendix A."

Comment 3: Section 3.1.5, page 64- Summary of Tier II COPCs – As noted in the above Comment # 1, it is important to identify sediments as "Eagle River Sediment" and include sediments from other surface water bodies (e.g., diversion trench and seep) as potential exposure media.

Response: *We acknowledge this comment. Please see the response to Comment #1. Section 3.2.3 (Page 93) (Identification of Potential Exposure Pathways) includes sediment within the Eagle River. Tables 37 (Page 111) (RME Parameters) and 58 (Page 162)(Cumulative Cancer and Noncancer Risk) include the sediment pathway. The revised language from Page 93 is presented below.*

Page 93: "The potential exposure media are identified in the Conceptual Site Model ("CSM") (Figure 4). These exposure media are:

- *Surface Soil*
- *Subsurface Soil*
- *Surface Water*
- *Seeps/springs*

- *Sediment within the Eagle River*
- *Ground water*
- *Boulders*
- *Diversion trench water*
- *Fish*

Comment 4: Section 3.2.5, page 91 – Fines Fraction Analysis in Soil - Please note the following Comments:

(a) It is not appropriate to ignore significantly higher concentrations (<1 to10-fold) of metals in the fines only fraction as compared to the total soil sample. Additionally, the justification provided in the text in support of ignoring the fines only fraction data is insufficient because the sampling procedures used at this site are similar to traditional sampling methods that are generally used at various sites and cannot be considered exceptionally biased towards the presence of the tailings-like material.

(b) Please clarify the calculation of percent difference provided in Appendix A. For example, the percent difference is calculated as 66.67 % when the measured concentrations in the total soil and fines only fraction are 200 and 400 mg/kg, respectively. For this particular example (i.e., 200 vs. 400 mg/kg), the difference is 2-fold between the fines fraction and the total bulk soil and this value should be used to account for the higher concentration of metals in the fines fraction. Another method to account for differences between the fine fractions and total soils used at the VB-I-70 Superfund risk assessment by EPA Region 8 (2001) was based on calculating the slope of the best fit linear regression line through the combined data set for the fines fraction and total soil for individual metals. For example, the slope of 1.09 for lead was used as the correction factor for the fines fraction.

(c) It is important to note that the IEUBK model for lead recommends the use of lead concentrations in the fines fraction as an input parameter for calculating the predicted blood lead concentrations for children

(d) Recommendations should be made for risk management decision-making to take into account significantly higher concentrations of metals in the fines only fraction

Response: *We acknowledge this comment.*

(a) *We respectfully disagree with the comment that the sampling method was similar to traditional sampling methods. The Work Plan was specifically written, approved, and implemented in a manner that modified a standard sampling grid in order to collect the <u>most</u>-impacted appearing material. The following text is from Attachment 1 (the Field Sampling Plan) of the* ***Final Work Plan for Site Investigation of Bolts Lake and Eagle Mine Site OU-1 Development Areas dated July 6th, 2005*** *approved by the CDPHE and EPA. This text explains the fact that the most-impacted appearing material was sampled:*

Section 5.0 and 5.1: All the surface soil samples will be documented/staked using a handheld Global Positioning System ("GPS") unit. The stake will have the location number on the stake. Surface soil samples will be collected from 0 to 6-inches bgs at each location as shown on Figure 2. However, if visual observations indicate soil may be impacted by mining activities within a 50-foot radius of the staked sampling location, this area will be sampled and documented in the field book. The new sampling location will be delineated by GPS coordinates. The surface soil sampling is described in detail in the following sections.

Field personnel will observe the color of the soil collected from the ground surface to 6-inches deep. At the OTP, Rex Flats, Sump 3 Area, and Maloit Park, the soil sample will be collected at the 0 to 6-inch interval. Additionally, soil samples collected in five locations at the Rex Flats, and OTP boulder areas will be collected from 0-6 inches and .3 to 3.0 feet bgs or near the top of native soil with a hand auger. The procedure to be used at Bolts Lake (where metals impact is not anticipated) is as follows: If the soil at the deepest level collected (6 inches) is stained (red, orange, yellow – see discussion in the next section), or may be loess-like and indicative of mine tailings, field personnel will extend the depth of the hole.

At locations in Bolts Lake that are not intended as soil borings, the sample location will be deepened to either:

a) 2 feet deep, or

b) until impact/staining is no longer observed.

A second sample will be collected from these deeper sample locations. The second sample will be collected from either:

a) the non-impacted/non-stained soil (if encountered) beneath the impacted soil, or

b) the deepest one-foot interval.

Five surface soil samples will be collected from the former Roaster Pile # 5 area, which is 0.7 acres. Samples will be analyzed for the primary indicator metals, and three samples will be analyzed for the extended list of inorganic constituents. In addition to the surface soil samples, the locations will be dug with a hand auger to about three feet, or shallower depending on the presence of rocks, to visibly assess the potential for waste rock or impacted subsurface soil.

Identification of Impacted Soil

Field personnel are aware of the characteristics of mine tailings and soil that may be impacted by leaching of mine-related wastes, and will be able to visually identify tailings and mine-impacted soil based on knowledge of these characteristics. Mine tailings in this area can be very fine grain, similar to loess deposits, and red to orange to yellow in color. Soils affected by leaching can also exhibit these colors. Vegetation could be stained these colors and could also indicate leaching of mine-related wastes.

A 50-foot radius around the area at the site will be visually inspected for indications of impact. If an impacted area is not identified, a sample will be collected at the stake. If an impacted area is observed within a 50-foot radius of the stake, the sample will be collected from this area. In addition to sampling in this area, the field person will:

- *walk the outline of the impacted area;*
- *measure its lateral extent;*
- *note the center of the impact;*
- *document the impacted area in the field note book and with photographs;*
- *determine the most visually-impacted portion and stake that location for sampling; and*

Note the location on the sample map.

(b) The formula used to calculate relative percent difference in the draft RA Appendix A was :

$$RPD = \frac{(Value\ 1 - Value\ 2)}{\frac{1}{2}(Value\ 1 + Value\ 2)} * 100\%$$

For the RA, the data for the total and fines fractions is presented in Appendix B without comparison.

(c) Section 3.4.7 (Lead) notes that the fines only fraction was collected for a subset of the surface soil samples. The IEUBK lead model was run with those data only. The RA states that it is difficult to recommend using the fines only fraction as the basis of risk. This is because the soil samples consist of approximately 50% fines. Therefore, any receptor who contacts bulk soils, contacts large rocks, pebbles, gravels, which do not adhere to the skin. Therefore a person in contact with the total soil fraction would have no exposure for 50% of the soils. The uncertainty analysis of the RA discusses this in more depth.

Section 3.4.7:
Data were collected for the fines only fraction for a subset of the surface soil samples (Appendix B). The IEUBK lead model was run with these data only. The dust fraction and the GSD were varied in order to display a range of results based on highly conservative (GSD of 1.6; MSD of 0.7) to more realistic (GSD of 1.4; MSD of 0.7) exposure parameters. The results, or the mean child blood lead concentration (micrograms per deciliter (ug/dl) and the percent above the target blood lead concentration of 10 ug/dl are as follows:

Exposure Area	***Css (mg/kg)***	***Dust Fraction***	***GSD***	***% Above 10 ug/dl***	***Geometric Mean (ug/dl)***
Maloit Park	*1600*	*0.43*	*1.6*	*58.5%*	*11.07*
		0.43	*1.4*	*61.8%*	*11.07*
		0.7	*1.6*	*69.6%*	*12.73*
		0.7	*1.4*	*76.3%*	*12.73*
Old Tailings Pile (OTP)	*1100*	*0.43*	*1.6*	*35.6%*	*8.41*
		0.43	*1.4*	*30.4%*	*8.41*
		0.7	*1.6*	*47.6%*	*9.72*
		0.7	*1.4*	*46.6%*	*9.72*
Rex Flats	*2100*	*0.43*	*1.6*	*99.2%*	*31.21*
		0.43	*1.4*	*100%*	*31.21*
		0.7	*1.6*	*99.6%*	*34.94*
		0.7	*1.4*	*100%*	*43.94*

All areas for which fines data were collected exceed an acceptable level of lead in fines. It is difficult to recommend using the fines only fraction as the basis of risk, however. This is because the soil samples consist of at most, 50% fines. Therefore, any receptor who contacts bulk soils, contacts large rocks, pebbles, gravels, as well as fines. The uncertainty analysis discusses this in more depth.

(d) Appendix C of the RA presents a site-specific remediation goal evaluation. This is too lengthy to insert into this response to comments.

Comment 5: Section 3.2.6.2, page 105 - Exposure Parameters - Please note the following comments regarding Table 37 for Reasonable Maximum Exposure parameters:

(a) *Dermal contact with sediment and surface water (including seeps and diversion trench)* - It is not clear why dermal contact pathway during wading and/or swimming is not evaluated for surface water and sediments based on the previously agreed-upon exposure pathways and exposure parameters (dated April,

2006). For example, child sediment ingestion rate of 50 mg/day (or per event) was proposed. These pathways should be evaluated.

(b) *Exposure Frequency For Fish Intake* – It was agreed-upon to use the exposure frequency of 225 days (vs. 180 days used) based on the site-specific information provided by the DOW (email dated 6/27/06 from Windy Naugle to Carolyn Fordham).

(c) *Rock Chip Ingestion Rate* – This intake parameter was not included in the draft table of the proposed exposure parameters (April, 2006). No justification is provided in support of the assumption of 25 mg/day and 10 mg/day ingestion rate for rock chips by children and adults, respectively. These ingestion rates, especially, for children appear to be too low. This issue should be further discussed between the parties.

(d) *Exposure Duration for Construction Workers* – The exposure duration of 2 years used in this assessment seems to be inconsistent with the site-specific needs. It was generally agreed in one of the meetings with the ERM that it is reasonable to use the exposure duration of 5 years for the construction workers.

(e) *Exposure to Maintenance Workers* – It was agreed-upon to evaluate exposure to maintenance workers using the exposure duration of 25 years and other default exposure/intake parameters.

Response: *We acknowledge this comment.*

(a) and (b) Table 37 includes these inputs.

(c) Section 2.3, Table 37 contains the boulder (i.e., rock chip) ingestion rate based on professional judgment. This value was not modified from the draft version, but more explanation was added. (Data Evaluation) explains that the rock chips are from boulders (literally hammering at the boulders to collect a sample of the discolored material coating the boulders). Also, Section 7.0 (page 18) of the Field Sampling Plan is included as Attachment 1 of the ***Final Work Plan for Site Investigation of Bolts Lake and Eagle Mine Site OU-1 Development Areas dated July 6th, 2005*** *and was approved by the CDPHE and EPA. Section 2.6.6 (Rock Chips from Boulders) explains that the rock chips from boulders are an unlikely exposure medium. The rock chips were obtained by repeated chiseling of the boulder by an adult to obtain a sample. The rock chips are not therefore accessible to children. However, they are evaluated since 1) boulders were stained and children may climb on them, and 2) to help identify appropriate disposal possibilities. Therefore, the values in the RA were not changed.*

(d)and (e) Section 2.5.3 (Daily Intakes) states that construction workers are assumed to be potentially exposed to surface soil (including waste rock or tailings) and subsurface soil for 8 hours per day, 250 days/year, for a period of 2 years. However, other workers could be employed for a longer period of time, including golf course maintenance workers, groundskeepers, or forest management workers; these workers are unlikely to remain in any one exposure area 250 days per year, whereas a construction worker could potentially remain in one exposure area for a year or two. The value for Table 37 remains at 2 years. It is noted that

the Site is frozen or snow-covered for at least 5 months of the year, so that exposure time frames are very conservative. The intakes were compared in the text to verify and document that the construction worker was adequately protective of other workers as shown below:

Page 124:The ingestion noncancer intake for construction workers is protective of other workers as shown for the intakes per unit of soil below:

Receptor	***Cs*** *	***IRS*** *	***CF*** *	***EF*** *	***ED/***	***(BW*** *	***ATn)***	**=**	***x***
Construction Worker	*1*	*330*	10^{-6}	*250*	*2*	*70*	*730*	=	*3.22E-6*
Other Worker	*1*	*100*	10^{-6}	*250*	*25*	*70*	*9125*	=	*9.78E-7*

Parameters defined in Table 37

Comment 6: Section 3.4.1.1, page 140 – Surface Soil Noncancer Risks – It is not appropriate to consider Bolts Lake as a reference area because of historical mining in the vicinity and ignore HQs >1 for thallium, iron, and antimony. In addition, there is no supporting evidence to demonstrate that Bolts Lake area was never impacted historically by mining activities.

> ***Response:*** *We acknowledge this comment. Bolts Lake is situated within the North Property; however, Bolts Lake is not included in the Eagle Mine Superfund Site. Historic background information confirms that the Bolts Lake area did not receive mine tailings from the Eagle Mine operations. Bolts Lake was filled with water from Cross Creek, which was not impacted by mining, as demonstrated by water supply. Bolts Lake was drained in the 1990s when a portion of the eastern dam was excavated. Elevated metals in the sediment of the dry lake bed are likely elevated by concentrations due to annual evaporation of the residual lake.*
>
> *Although we respectfully disagree, the mention of Bolts Lake as a reference area was removed from all tables as well as the RA text (with the exception of one bullet in Section 3.2.1 where exposure areas are identified which states "Bolts Lake (an unimpacted reference area, not part of original Superfund site, or included in Record of Decision [ROD])").*

Comment 7: Section 3.4.3, page 145 – Surface water, Fish, and Sediments- Please note the following comments regarding noncancer and cancer risks:

(a) It is important to take into account risks due to dermal contact with surface water sediment of Eagle River.

(b) It is stated that incidental ingestion of arsenic in sediments produced an HQ marginally above one (Table 53). This HQ value of >1, however, is inconsistent with Table 53. Please correct this discrepancy.

> ***Response:*** *We acknowledge this comment. Section 3.4.3 (Surface Water, Fish, and Sediment) takes into account dermal contact. Dermal contact with arsenic in sediments by children and child hikers produces an HQ marginally above one. The revised language may be found on page 149 of the RA, and is presented below:*
>
> *"Dermal contact with arsenic in sediments by children and child hikers produced an HQ marginally above one (Table 53)." The values shown in Table 53 are 7 for the resident child, 1.5 for the age averaged resident, and 4.8 for the child hiker.*

Comment 8: Section 3.4.6, page 150/151 – Diversion Trench and Seep Water – Please note the following comments regarding noncancer and cancer risks:

(a) As noted above for the selection of COPCs, it is important to evaluate risks for sediments as potential exposure media.

(b) Risks due to dermal contact pathway with water and sediments of diversion trench and seep should be evaluated.

Response: *We acknowledge this comment. As noted in Comment #1, these surface water features exist only intermittently and are very small in area. They do not support aquatic life, and in the case of the OTP diversion trench, the substrate is partially grouted with no sediment. The assessment of these features is included in the overall risk evaluation of surface soils. The pertinent language may be found on page 148 of the RA, and is presented below.*

"3.4.3 Surface Water, Fish, and Sediment

Noncancer Risks

There were no HQs above one for any receptor for incidental ingestion of surface water (Table 52). There was one HQ above one for ingestion of trout from the Eagle River (Table 52). Dermal contact with arsenic in sediments by children and child hikers produced an HQ marginally above one (Table 53). There were no other receptors or other COPCs for which HQs for sediment exposure exceeded one.

Cancer Risks

There were no excess cancer risks for any receptor for incidental ingestion of surface water (Table 52) because there were no COPCs that were identified as carcinogens in surface water. Arsenic in sediments produced excess cancer risks for nearly all receptors potentially exposed to sediments (Table 53)."

Comment 9: Section 3.4.7, page 151 – Lead – In general, the EPA national guidance (EPA Technical Review Workgroup for Lead; TRW) recommends use of default values in the IEUBK and the adult lead models unless site-specific data are available to indicate that the default values are not appropriate for a particular site. Therefore, the current lead calculations for children and adults need to be revised by using: (i) the TRW recommended default values for all input parameters (i.e., other than the site-specific input parameters) in the IEUBK and the ALM models for the risk characterization, and exploring the impact of alternate input parameters in the uncertainty analysis; and (ii) the more appropriate values for exposure frequency and averaging time for certain exposure scenarios. Please note the following specific comments regarding lead blood level calculations:

(a) The text should be corrected to state that the table shows blood lead concentrations and probability of exceeding a blood lead level of 10 ug/dL in children (vs. lead PRGs).

(b) Alternate parameters for GSD and Mass fraction Dust should only be applied for the uncertainty analysis discussions in a separate section. When alternate parameters are used, a justification for the adjustment must be included.

Response: *We acknowledge this comment. The RA text is modified as follows, and the revised language text can be found on page 158 of the RA (Section 3.4.7. Lead, and is presented below.:*

"Because even low concentrations of lead have been linked to subtle neurological effects in children, lead is regulated on blood lead concentration. Residential

screening values for lead derived with the IEUBK Model were used in Tier I. The default residential screening value for lead in soil that correlates to a blood lead level of 10 µg/dL no more than 5% of the time is 400 mg/kg.

Adjustments to model assumptions regarding the geometric standard deviation of lead in soils were made for Tier II, which in turn influence risk estimates. The revised FDA dietary parameters were downloaded from the TRW website (http://www.epa.gov/superfund/lead/ieubkfaq.htm#FDA) and loaded into the model. The contribution of soil lead ("PbS") to indoor household dust ("PbD") is known as the Mass Fraction ("MSD") in the IEUBK model. The MSD was reduced from the default value of 0.70 to 0.43 per direction from EPA Region 8. The geometric standard deviation ("GSD") for EPA Region 8 for children is 1.4 and this was used in addition to the national default of 1.7. The following risk estimates were obtained by running the IEUBK model with the site lead data for soil and ground water and varying the exposure parameters from highly conservative (GSD of 1.6; MSD of 0.7) to more realistic (GSD of 1.4; MSD of 0.7). The results, or the mean child blood lead concentration (micrograms per deciliter (µg/dl) and the percent of children in the exposure area with blood lead above the target blood lead concentration of 10 µg/dl are as follows:" The table is presented in Section 3.4.7

Comment 10: Section 3.4.8, page 152- Cumulative Risk Estimates – It is not clear why risk due to ingestion of Rock Chips is not included in the cumulative risk estimates. In addition, the cumulative risks are underestimated because certain exposure pathways such as dermal contact with surface water and sediments as well as sediments of diversion trench and seeps are not evaluated in this assessment. Please revise risk calculations.

Response: *We acknowledge this comment. Ingestion of boulders as well as dermal contact with surface water and sediments from the Eagle River were included in the cumulative risk estimates. Cumulative risks are overestimated, not underestimated, due to the overall conservative inputs required by the CDPHE in addition to the method of calculating risk (including RME versus CTE), as discussed in response to Comment #11.a.*

Boulder chips are not a reasonable exposure medium since they could only be obtained with a chisel (See the response to Comment 5c). Sediments in trenches and seeps are assessed in the soil pathway, even though the trench at the OTP has NO sediment due to grouting. Surface water of the Eagle River is evaluated through potential exposure to water, sediment, and fish consumption. Please see responses to Comments #1 and #5c. Table 58 includes dermal contact with boulders (from which the rock chip samples were collected), surface water, and Eagle River sediment.

Comment 11: Section 3.4.9, page 159 – Site-Specific Preliminary Remedial Goals - Please note the following comments:

(a) Incorporation of background in PRG calculation/discussions – It is not appropriate to take into consideration background concentrations during PRG calculations (e.g., Bolts Lake discussions).

(b) Arsenic PRGs – It is not appropriate to derive arsenic PRGs based on only ingestion and inhalation exposure pathway without taking into account the dermal contact pathway for surface/subsurface soils, sediments and surface water. In addition, all exposure media should be addressed. For example, rock chip ingestion, surface water, and sediments are not addressed for PRG calculation for residents. The assumption of 50% relative bioavailability in the derivation of arsenic PRG needs to be justified because of the site-specific differences in soil types. It is important to stress that PRGs calculated based on the relative bioavailability of 50% are uncertain. This uncertainty arises from a number of factors; for example, more information is needed on the appropriate animal model for measuring the relative bioavailability and variations in the relative bioavailability based on different types of soil. It appears that the available information is not yet adequate to derive reliable conclusions regarding the default assumption of relative bioavailability of 50%. Therefore, the uncertainty associated with the relative bioavailability of arsenic should be addressed qualitatively and quantitatively by: (i) providing the discussion regarding the state-of- science of the relative bioavailability of arsenic; and (ii) calculating a range of PRGs based on the relative bioavailability of 50% as well as 100%. Additionally, in the derivation of PRGs, consideration should also be given to the uncertainty associated with the cancer slope factor for arsenic. The current EPA IRIS oral cancer slope factor is under evaluation and the various cancer slope factors derived by the NRC (2001), CAL EPA (OEHHA, 2004), and the EPA IRIS SAB Review Draft (July, 2005) are more conservative than the current EPA IRIS cancer slope factor of 1.5 per mg/kg/day (or Unit Risk Factor of 5x10-5 per ug/L). For example, CAL EPA calculated the oral cancer slope factor of 9.5 per mg/kg/day (or Unit Risk Factor of 2.7x10-4 per ug/L); the NRC (2001) calculated cancer slope factors of up to 23.4 per mg/kg/day; and the EPA IRIS SAB Review Draft cancer calculated the slope factor of 5.5 per mg/kg/day (or Unit Risk Factor of 1.6x10-4 per ug/L).

(c) Lead PRGs – It is not appropriate to calculate lead PRGs using alternate parameters for the IEUBK model or the central tendency values. Please revise these calculations as per the above noted Comment # 9 and providing the default PRG and a range of PRGs based on the uncertainty analysis. Also, PRGs should be estimated using the RME as well as CTE parameters. Furthermore, it is not clear why the GSDi was set at 1.5 (vs. the EPA default value of 2.1). In summary, the calculated PRGs are not adequately protective of public health and should be re-calculated using the default parameters. The adult ALM should be revised using the default parameters for the following:

- GSDi = 2.1 (vs. 1.5)
- Exposure Frequency for recreational adults = 100 days (vs. 50 days)
- Averaging Time for recreational adults = 150 days (based on the assumption 5 months for outdoor activities) (vs. 365 days)
- Exposure Frequency for construction workers = 250 days (vs. 125 days).
- Averaging Time for construction workers = 150 days (vs. 365 days) if the exposure frequency will be adjusted to 150 days based on summer months for outdoor work

(d) *Consideration of cumulative exposures to site-specific media and pathways of potential concern*– As noted above for arsenic, PRGs for all COPCs should be derived based on all exposure pathways and potential media of concern. For example, fish ingestion for manganese should be addressed in the PRG derivation.

Response: *We acknowledge this comment.*

(a) The RA text no longer has a discussion of PRGs. Instead, a Site Specific Remediation Goals Evaluation is presented in Appendix C, separate from the Risk Assessment discussion.

(b) Arsenic Remediation Goals (RG) have been further discussed with CDPHE and a range of values based on different underlying assumptions is presented in Appendix C. The CDPHE prefers the RG of 38.9 milligrams per kilogram (mg/kg) in soil. For reference, this value is greater than the calculated 10^{-6} risk of 0.39 mg/kg and equal to the calculated 10^{-4} risk of 38.9 mg/kg for the Reasonable Maximum Exposure (RME) risk scenario, inclusive of a dermal component, and assuming 100% arsenic bioavailability. An RG of 40 mg/kg for arsenic, rounded up from 38.9 mg/kg, is proposed at the Site for the following reasons.

The arsenic Remedial Investigation (RI) Remediation Goal of 40 mg/kg is protective at a 10^{-4} cancer risk under all of the other risk scenarios of : a) RME, dermal component, and 100% bioavailability; b) RME, no dermal component, and 50% bioavailability; c) CTE (Central Tendency Exposure method), dermal component, and 50% bioavailability; d) CTE, no dermal contact, and 100% bioavailability; and e) CTE, dermal component, and no arsenic bioavailability. These are presented in Appendix C of the RA. A value of 50% bioavailability of arsenic has been used by EPA/CDPHE at other mining sites in Colorado, and the use of 100% bioavailability is conservatively used here.

It is also noted that some of the assumptions imposed by CDPHE are conservative given actual Site conditions, some examples are:

(i) An on-site resident would come into contact with the elevated arsenic 350 days per year. This time frame is about 5 months (150 days) too long given that the site surface soil is under snow approximately from December through April.

(ii) An on-site resident would be exposed to stream sediment with elevated arsenic 150 days per year. This time frame is at least 1 month (30 days)

too long given the shorter summer season in the mountains. Additionally, this type of daily exposure is likely more appropriate at a beach setting versus the river setting at the Site.

(iii) An on-site resident would consume a fish, impacted by arsenic, from the river 225 days per year. The assumption that people could catch and eat fish for 225 continuous days is overly conservative and does not consider the likelihood that the river would be over-fished.

(iv) An on-site resident would have a lifestyle that would lead to the maximum possible exposure under all scenarios is unrealistic especially given the planned site use for recreational visits versus year-round residency.

The Remediation Goal of 40mg/kg also is very conservative (highly protective) when compared with recently applied arsenic clean up values for other mine sites and processing facilities in Colorado:

(i) 70 mg/kg for arsenic in residential soil at the Asarco Globe Site,

(ii) 130 mg/kg for arsenic risk to human health at the Central City / Clear Creek Superfund Site,

(iii) 100 mg/kg for arsenic in residential soil at the Whitewood Creek Superfund site.

It should also be noted that the Site will first be remediated to the Remediation Goal, and <u>then</u> the remaining remediated soil will be covered / capped per the Feasibility Study plans. Some examples from the Feasibility Study are:

(i) Concrete capping in areas beneath buildings and parking structures,

(ii) Evapotranspiration covers to manage precipitation and moderate irrigation in landscaped areas,

(iii) Liner systems consisting of sand or clay, covered by a single flexible membrane liner, covered by a protective sand layer for areas of high irrigation at the tees and greens of the golf course.

In summary, the RI Remediation Goal for arsenic of 40 mg/kg is protective if that soil were to remain at the surface in contact with human receptors, and is even more protective in that a barrier will be placed between this remediated soil and potential receptors.

(c) The residential risk-based value for lead was calculated to be 658 mg/kg. As a conservative measure, the State wide lead standard of 400 mg/kg is selected as the Site RG.

(d) Appendix C of the RA considers multiple exposure pathways and media, as requested by CDPHE. The Site-specific RGs (Appendix C of the RA) were based on site specific receptors, conservative exposure values, and site background data. By applying this approach, the RGs are protective and also discern between naturally occurring higher metals concentrations and mine waste.

Comment 12: Section 3.5, page 161 - Uncertainty Analysis – Please note the following comments to enhance the uncertainty discussion:

(a) Section 3.5.3 –Uncertainty in Toxicity Criteria-The text should be clarified by stating that the relative bioavailability was taken into account for lead and arsenic which are two major risk driving chemicals of concern. This section should also discuss the uncertainty associated with the relative bioavailability of arsenic and toxicity values (e.g., cancer slope factor), as noted in the above comment.

(b) Section 3.5.4.1- Receptor Identification – Please revise the text to state that outdoor workers in Table 59 (vs. table 58) are evaluated for 25 years (vs. 30 years).

(c) Section 3.5.4.2 – Exposure Parameters – The text emphasizes overly conservative nature of all exposure parameters. It would be beneficial to provide a more balanced discussion by including a statement regarding the uncertainty associated with certain exposure parameters for which EPA default values are not available (e.g., exposure frequencies for recreational scenarios, fish ingestion, and soil ingestion rate for recreational receptors). These exposure assumptions could lead to over-or underestimation of risk to an unknown degree.

(d) Section 3.5.4.3 – Exposure Point Concentration – It is not agreed that concentrations of site related analytes are likely to be overestimated because sampling was systematically biased. Please provide a more balanced discussion of over- and under-estimations. For example, there could be potential underestimation due to the sampling frequency of one sample per acre. Also, the use of concentrations based on the total bulk soil (vs. the fines fraction) has resulted in the underestimation of potential risks.

Response: *We acknowledge this comment.*

(a) Language regarding Bioavailability is contained within Section 3.5.3 on Page 170 (Uncertainty in the Toxicity Criteria), and is presented below.

"Bioavailability data was considered for arsenic and lead. Data for both metals indicates that bioavailability in a soil matrix is less than 50%. The lead IEUBK model incorporates default values of bioavailability; these were used in the current analysis. No bioavailability factor for arsenic was applied in the forward risk analysis for soil, water, boulders, or sediment media. Given the known relatively low bioavailability of arsenic in soil at other sites, this approach is believed to be very conservative."

(b) Table 59 makes a distinction between outdoor worker (25 years) and golf course worker (30 years). The text on page 171 states:

"Table 59 compares risks for various worker receptors based on different exposure assumptions. The construction worker has a short duration (2 years) because the site is small and construction will not take long, but a high soil ingestion rate (330 mg/d). The outdoor worker employed at the site for 25 years, was assumed to be involved in landscape duties and also was modeled with a soil ingestion rate of 330 mg/d. The golf course worker is modeled as working for 30 years but at a soil ingestion rate of only 100 mg/d. "

(c) *Section 3.5.4.3 (Exposure Parameters) in part reads as follows:*

"When exposure parameters were unavailable from EPA, attempts were made to obtain them elsewhere. In the event data were lacking, professional judgment was used to estimate an exposure parameter. This could lead to over- or under-estimation of risk to an unknown degree."

(d) *We respectfully disagree with this comment. The sampling was in fact very biased towards tailing contaminated areas. The use of bulk soils as opposed to fines did not result in underestimation as the reviewer stated because the concentrations in fines varied and the fines represent a small portion of the total surface soil contacted, explained as follows within Section 3.5.4.1 on Page 171 (Fines Fraction in Surface Soil) of the RA:*

"A total of 70 surface soil samples were analyzed for the seven primary metals from: a) the total volume of soil collected from a sample location and b) the fines only fraction of that sample. These two analyses were conducted to assess whether the fines fraction of a soil sample contained a higher, lower, or equal portion of the metals as compared to the total soil sample. These samples were collected from the OTP, Rex Flats, and Maloit Park, and the comparisons of the total to fines fractions metals concentrations are presented in Appendix B.

The data show that the metals concentrations in the fine fraction are typically, but not always, greater than the concentrations in the total sample. This is not unexpected considering the method by which the sample locations were selected. Specifically, and in accordance with the work plan, the sample section was biased towards the presence of the tailings-like material. This was accomplished by the field team: a) approaching the pre-selected sample grid point, b) then surveying the ground within a 50-foot radius of the pre-selected grid point for indications of tailings-like material (very fine grained soil and/or yellow to orange color soil), and c) then sampling from the area with the greatest visual indication of tailings like material. Also, samples in addition to the prescribed work plan locations were collected from areas exhibiting tailings-like material.

Grain size analysis was conducted for 10 samples located throughout the North Property at various concentrations of arsenic (Appendix B). The data showed that the samples were biased towards tailings like material, that the fines fraction percentage varies, and that the overall average of the fines fraction is 52%. That is:

Total Sample = 100%
Fines Fraction = 52%
Coarse Fraction = 48%

Even though the fines fractions is more likely to adhere to the skin than the coarse fraction, the fines fraction does not account for a large majority of the sample and is not totally available to the skin. Subsequently, using the fines fraction to represent 100% of the sample concentration would overestimate risk due to the surface soil."

Please see the response to Comment #4c.

Comment 13: Section 4.0, page 167 – Conclusions – Please modify the conclusions regarding the cancer and noncancer risks at Bolts Lake and its consideration as a representative of naturally occurring ambient conditions, as per the above noted comments.

> ***Response:*** *We acknowledge this comment. The language in Section 4.0 on page 180 of the RA (Conclusions) has been revised, and is presented below.*
>
> *"All exposure areas demonstrate excess noncancer and cancer risks for at least one receptor. The major contributors to noncancer risk are arsenic, iron, manganese, and thallium. The major contributor to cancer risk is arsenic. Lead causes excess risk levels at all locations except Bolts Lake and the OTP.*
>
> *The results of this risk assessment were incorporated into the selection of site-specific remediation goals for the North Property (Appendix C)."*

EPA

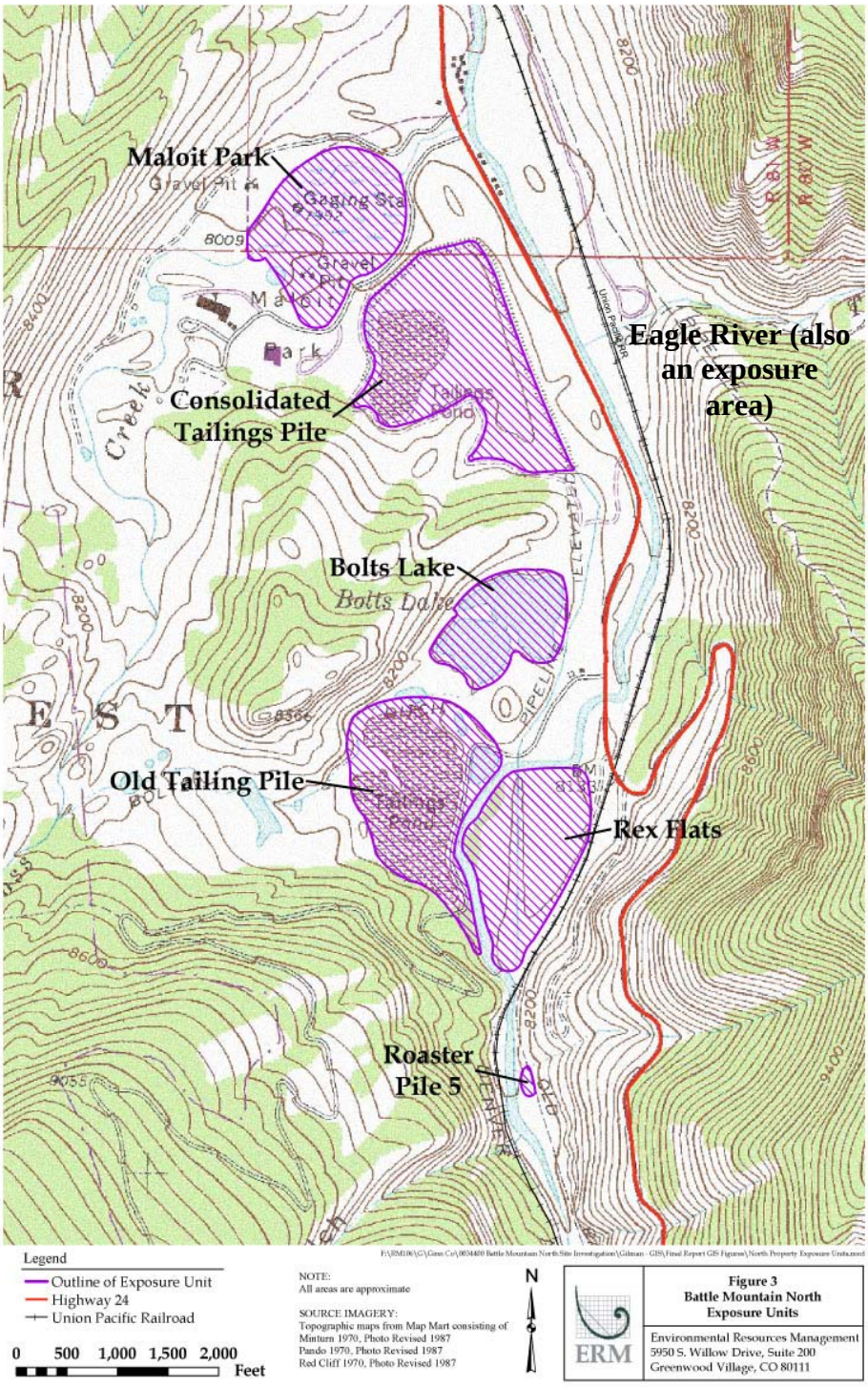
Environmental Protection Agency
Comments on Draft Human Health Risk Assessment ("RA") for the North Property

Comment 1: Pages 56 and 63, Comparison to Background - A comparison to the upper 95th percent confidence limit on the mean of the background data set was used to eliminate contaminants during the screening process. This is inconsistent with the current national EPA Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (9/2002) and the Region 8 guidance for Selecting Contaminants of Concern (http://www.epa.gov/region8/r8risk/). In both of those guidances, statistical hypothesis testing is recommended when comparing site concentrations to background levels. Based on previous Battle North site meetings, it was my understanding that an upper tolerance level (such as the 95th % upper confidence limit) would be used in the RI report to graphically show areas which are not considered to be impacted by mining-related wastes. In the risk assessment, however, the hypothesis testing would and should be used for this background comparison.

> ***Response****: We acknowledge this comment. Section 3.1.3. (Exceeding Natural Background Concentrations) on Page 66 of the RA discusses that the data were evaluated statistically to determine which analytes exceeded naturally occurring background conditions (Appendix A of the RA). The language may be found on page 66 of the RA, and is presented below.*
>
> *Page 66: "The data were evaluated statistically to determine which analytes exceeded naturally occurring background conditions (Appendix A). The data were divided by exposure area, since some exposure areas may have had more mine-site impacts than others, and Bolts Lake was expected to be unimpacted. The data were analyzed with Statgraphics. Summary statistics were estimated, including indications of kurtosis and skewness. A one-way Analysis of Variance (ANOVA) and a nonparametric Kruskal-Wallis test were run on the data. Box and whisker plots with a median notch to indicate 95th percent confidence limits were constructed to compare the data by exposure area to the background data (Appendix A). If the data were indicated as nonnormal, the appropriate statistical test is the Kruskal-Wallis test. If the data were normal, the ANOVA is the preferred statistical test. All Tier II COPCs were carried forward to estimate risks, and the results of this background analysis are presented in the Risk Characterization section and Appendix A."*

Comment 2: Page 86, Section 3.2.1, Characterization of Exposure Setting - It was very helpful to have a description of the exposure unit areas used in the exposure evaluation. It would be even more helpful if a map or figure showing the exposure unit areas was provided.

Response: *We acknowledge this comment. Figure 3 Battle Mountain North Exposure Units has been added to Section 3.2.1 (Characterization of Exposure Setting). Figure 3 from Page 91 is presented below.*



Comment 3: Page 110, Figure 4 - There is a typographical error in the figure heading. It should read "Equations" and not "quotations". It would be helpful to add a footnote to the equation figures (e.g., Figures 4, 6, and 7) explaining that the definitions for these equation abbreviations can be found in Table 37.

> ***Response:*** *We acknowledge this comment. Figure 4 (now labeled Figure 5 due to the Figure added as Figure 4 as discussed in Comment 2), is labeled Noncancer Intake Equations and Residential Receptors. Additionally, explanations of abbreviations have been added throughout the text and tables.*

Comment 4: Page 145, Section 3.4.3.1, Noncancer Risks - The third sentence states that ingestion of arsenic in sediments by children produced an HQ marginally above one. Yet Table 53 shows all non-cancer arsenic risks to be below one. Please resolve the discrepancy.

> ***Response****: We acknowledge this comment. The HQ marginally above one is noted for dermal contact with arsenic in sediments by children and child hikers. The values shown in Table 53 are 7 for the resident child, 1.5 for the age averaged resident, and 4.8 for the child hiker. The text is now on Page 149 of the RA, and is presented below.*
>
> *Page 149: "There were no HQs above one for any receptor for incidental ingestion of surface water (Table 52). There was one HQ above one for ingestion of trout from the Eagle River (Table 52). Dermal contact with arsenic in sediments by children and child hikers produced an HQ marginally above one (Table 53). There were no other receptors or other COPCs for which HQs for sediment exposure exceeded one."*

Comment 5: Page 152, 1st line - The first line states that *"the following table shows the lead PRG……."*. The table actually shows the geometric mean blood lead and probability of exceeding a blood lead of 10 ug/dl when the groundwater concentrations are reduced to default levels. This should be corrected.

> ***Response:*** *We acknowledge this comment. The text and table within Section 3.4.7 (Lead) have been revised. The text is now on page 157, and is presented below.:*
>
> *"The results, or the mean child blood lead concentration (micrograms per deciliter (ug/dl) and the percent of children in the exposure area with blood lead above the target blood lead concentration of 10 ug/dl are as follows:"*

Comment 6: Page 159, 2nd full paragraph, last sentence - The last sentence states that PRGs (preliminary remediation goals) for iron and thallium should default to the concentrations seen at the Bolt Lake area and not the risk-based numbers. This comment may be premature. Although Bolt Lake is thought to be unimpacted by mining activities, it is surrounded by tailings piles. And it is conceivable that the area was impacted in the past. It's also conceivable that these levels are background, and re-analyzing the background samples would be helpful. Perhaps it would be better to highlight the concern (e.g., high background levels of iron and thallium) and leave the next steps to the risk managers.

Response: *We acknowledge this comment. Bolts Lake is situated within the North Property; however, Bolts Lake is not included in the Eagle Mine Superfund Site. Historic background information indicates that the Bolts Lake area did not receive mine tailings from the Eagle Mine operations. Historically, Bolts Lake was filled with water from Bolts Ditch, and it was drained in the 1990s when a portion of the eastern dam was excavated. The discussion of Bolts Lake as a reference area was removed from the RA text. RGs are now discussed within Appendix C (Site Specific Remediation Goals Evaluation) of the RA.*