Alaska Department of Environmental Conservation

Comments on the *Draft Baseline Risk Assessment, Red Devil Mine*

Commenter: Ted Wu, ADEC **Comments Developed: August 16, 2012~~August 13, 2012~~**

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1.	6-4	6.2.2.1	If appropriate move to eco section.	This section relates to screening for compounds of potential concern (COPCs) for the human health risk assessment. A summary of the screening level ecological risk assessment is provided in Section 6.3.3.
2.		Table 6-3	Are sediment results based on dry weight? If so please note in the footnotes.	Units are in dry weight. A footnote will be added to table.
3.	6-5 6-25	6.2.2.1 6-2.6.4	Futher evulation of 4-bromophenyl phenyl ether was mention in page 6-5 In the uncertainty section one short paragraph is provided stating again no toxicity information. Please provide more discussion on the compound. Was it frequency detected? What was the highest value? What media was it detected in? What information is out there	Additional information will be added in Section 6.2.6.4. 4-bromophenyl phenyl ether was only detected once in surface soil, out of 12 samples. The detected concentration was 1.9 ug/kg and was an estimated value (i.e., J-flag). 4-Bromophenyl phenyl ether is primarily used for research purposes. In the past it was used as a flame retardant.
4.	6-7	6.2.3.1	Surface and subsurface soil data is presented in the RI report. The CSM only presented soil as one group. If significant concentrations are present between surface and subsurface data it may be warranted to include surface and subsurface in the CSM and risk assessment to obtain a better understanding of soil exposure to the different human receptors..	Consistent with EPA guidelines and DEC regulations, all soil up to 15 feet below ground surface was evaluated for ingestion, dermal and inhalation exposure. This is a health protective approach. Screening was conducted on surface and subsurface soil (up to 15 ft bgs) to show the difference in depth but assessed as a single exposure media.
5.	6-19	6.2.3.5	Comments were made on proposed draft for Approach to Evaluating Consumption for Wild Foods at the Red Devil Mine Site, Alaska Version 2. Those comments have not been addressed to date and should be addressed and incorporated into the section.	Comments on the Technical Memorandum were received after incorporation into the draft HHRA was possible. Comments on the memo are included in this set of response to comments and will be incorporated into the Draft Final HHRA, as appropriate.
6.		Table 6-8 to 6-17	Suggested placing the table in the landscape format for easier viewing. Tables should also be updated based on incorporation of updated CSM to include	Frequency of detection are provided in Tables 6-1 through 6-6 but will be reiterated here. Landscape format will be used for these tables. See

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			surface and subsurface soil. In addition the frequency of detection to verify the appropriate use of the 95% UCL.	response to Comment #4 regarding surface and subsurface soil evaluation.
7.		Table 6-15	Please include frequency of detection and put in landscape format. Also in the footnotes please mention if the analysis is from whole fish or tissue.	Additional information will be added.
8.	6-24	6.2.3.5 & Table 6-22	Please provide the numerical data that was used to generate the wild food ingestion rate. Just based on the non-salmon fish the IR number seem grossly underestimated at 0.271 g/d for adults based on prior two tables. Approximately 15 to 36% fish catch is non salmon based on Table 6.20 and using the most conservative mean IR in Table 6-21 of 63 g/day a non-salmon fish consumption on the low end would be approximately 9 g/day compared to 0.271 g/day for Red devil. Something doesn't add up. According to dietary reference intake, 56 g of protein per day for men is recommended; here a daily intake of 0.395 g/day is consumed based on the wild food IR table. It is difficult to comprehend that 99.99% of daily intake for protein in the area is not a result of wild food for the subsistence population.	This data was provided to BLM by ADF&G via EPA (e-mail from David Koster, ADF&G on March 15, 2012). DEC was included in this correspondence but BLM can provide the data to DEC, if needed. The value used in the risk assessment is 0.271 **kg/day** (Table 6-19 of the risk assessment) and is consistent with Mr. Koster's calculations. Table 6-22 will be updated.
9.	6-28	6.2.3.7	Is the sculpin fish tissue concentrations based on whole fish or a portion of the fish. Please insert information into text.	Sculpin data is based on whole fish analysis. This detail will be incorporated into the section.
10.	6-28	Also Table 6-15 & 6-24	No Methyl mercury data was presented for fish, although it is noted in the literature that a large	As stated in Section 6.2.4.2, for the current HHRA, mercury in fish was assumed to be 100 percent in the methylmercury form. A footnote will be

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			percentage of total mercury detected in fish is methylmercury. If analytical data do not contain methylmercury resultsthan total mercury results should be considered 100% methylated for exposure calculation.	added to the tables.
11.	6-29	6.2.3.7	Paragraph 1 "Using the sculpin data from Kuskokwim River is a health protective approach etc…" Is the sculpin from Kuskokwim River or Red Devil Creek? Based on prior text the sculpin should be from Red Devil Creek.	The statement in the second sentence of the first paragraph on page 6-29 is, "Using the sculpin data to estimate game fish concentrations in the Kuskokwim River is a health-protective…" This statement is accurate. The sculpin data from Red Devil Creek was used to model COPC concentrations in game fish.
12.	6-29	6.2.3.7	It is not understood why the modeling data for sculpin is being extrapolated to northern pike from different location. Just by inserting the sculpin data without any modeling from Table 6-40 the 3 metal EPC are much higher than the northern pike from Kuskokwim Table 6-24. In order to determine if a model is valid both fish species would have to inhabit the same area than extrapolated and compared.	As directed by DEC, BLM used fish data from Red Devil Creek to estimate concentrations of COPCs in fish to evaluate impacts to people consuming these fish. Based on the ADF&G report, households in Red Devil Village currently harvest fish primarily from the Kuskokwim River. As shown in Table 6-24 of the risk assessment, the modeled fish COPC concentrations based on data from Red Devil Creek greatly exceed the actual concentrations of antimony, arsenic and mercury in Northern Pike, a primary harvested food, from the Kuskokwim. The comparison of modeled fish concentrations from Red Devil Creek and actual Kuskokwim River fish concentrations is important to show the health-protective approach taken in the risk assessment.
13.	6-31	6.2.3.7	Please explain where the berry fruit for the 95UCL was generated for insertion into the formula to obtain the model data for the soil model numbers. These numbers could easily be inserted into a column for Table 6-25 and formatted as landscape. The transfer coefficient would also be useful in the table. Is the comparison valid between using data generated from a different time and study for comparison to another study? Using actual soil data	This issue has previously been discussed with DEC and EPA during development of the work plan. The data from Bailey and Gray 1997 does not provide soil comparisons and only provides data for mercury, not any of the other COPC. Although berry data collection was attempted in 2011, there were not sufficient samples for use in the HHRA. Additional sampling will be attempted again in 2012. Without berry data, modeled data was used. Transfer coefficients will be added to Draft Final HHRA.

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			from Bailey and Gray 1997 in soil and generating blueberries from that data set with the model for comparison to actual blueberry data collected would be a far better comparison with fewer uncertainties if your question is does the model represent the data.	
14.	6-31	6.2.3.7	Disagree with the statement grossly underestimated. By using just the data from 1997 Bailey and Gray the results are not grossly overestimated. For mercury the Br= 0.20. Soil from the mining area = 1200 on the high end when inserted into the equation the blueberry model data = 240 compared to150 (actual data collected). On the other side for the unmined area the blueberry model concentration for mercury is underestimated when inserted into the equation (high range model=24; actual=330).	The qualification, "grossly underestimated" was not used in this assessment. As stated in Section 6.2.3.7, the modeled mercury concentrations in blueberries are significantly higher, by at least one order of magnitude, than the highest detected mercury concentration found in blueberry fruit, although the soil concentrations are within the same range as those from the Bailey and Gray study (1997). Therefore, the modeled values likely overestimate the true mercury concentration in blueberry fruit." Discussion of potential underestimations of levels will be added to the discussion.
15.	6-32	6.2.3.7	"As with soil, the total mercury results were used as the EPC for elemental Mercury. Elemental mercury can be estimated to be much lower." Words like "much lower" should not be used in the report. Interpretation of these words can vary greatly from person to audience reading the report. One should provide more concrete numbers by citing a peer reviewed paper examining total mercury and elemental mercury and stating the differences detected. (i.e. Revis et al 1989 "The distribution of mercury species in soil from a mercury – contaminated site" where only 6% was detected in the elemental form).	Additional detail will be provided for comparison descriptions in this section and elsewhere.

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16.		Table 6-25	The numbers for the range from Bailey and Gray 1997 doesn't match up to what was presented in Table 1.3.	Correct. Values in Table 1.3 of the RI are incorrect and will be updated.
17.	6-36	6.2.4.2	"For the mercury in fish was assumed to be 100% in the methylmercury form" Is the statement true? Based on the D tables for HHRA calculation no methylmercury results were presented for fish.	This is true. Mercury EPCs are presented in Table D correctly and methylmercury reference doses were used to calculate hazards. This is consistent with Section 6.2.4.3. A footnote will be added to Appendix D tables to clarify.
18.	6-42	6.2.5.3	As mention earlier the direct comparison of sculpin data to northern pike was different without the model. The comparison is invalid for the different area. Generalized words like "Greatly exceed" should be avoided in a report. More factual numbers should be provided (i.e. exceeded by a factor of 3).	See response to comment #12. Where appropriate, generalized comparisons will be replaced with actual levels of difference between compared values.
19.	6-47	6.2.6.1	While a risk assessment was performed on background concentrations no detail comparison was made to determine if the risk from site concentrations were significantly different from background. The information is important in determining contribution from mining operation. Please provide more narrative on the background vs the site contribution to risk.	Additional detail will be provided.
20.		Table 6-40	Methylmercury is underestimated based on results from total mercury concentration. It is well document that in fish tissue a large portion of the total mercury detected is methylated. The EPC for total mercury was 2.1 mg/kg compared to methylmercury at 0.312 mg/kg for the one	Does this comment refer to the HHRA or ERA? For the HHRA, 100% of the total mercury concentration was assumed to be in the methylated form. This does not underestimate methylmercury concentrations but more than likely overestimates the true concentration. This is supported by comparison to the single methyl mercury sample but that was not used in the HHRA due to low sample number. Also, it should be noted that total and methylmercury were analyzed for in sculpin sample 2-RD-9-SC from Red

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			composite sample.	Devil Creek (collected August 2010). The total mercury and methylmercury results for this sample were 0.68 and 0.16 mg/kg (wet weight), respectively. Methylmercury was 24% of total mercury in this sample. It is not uncommon for aquatic biota from mercury contaminated systems to contain a substantial fraction of inorganic mercury.
21.		Table 6-40	Why isn't a HQ calculated for antimony when a RfD at 4.0E-4 is listed on Table 6-26 from IRIS.	Table 6-40 is for the ERA. The reference dose listed in Table 6-26 is for human receptors and was used in the HHRA. Hazard quotients for antimony based on fish ingestion were evaluated in the HHRA and shown in Appendix D. A tissue screening concentration for antimony for effects on fish will be developed based on information provided by USEPA and incorporated into Table 6-40.
22.	General		To insure the risk calculation tables are correct and timely response from ADEC the following info is needed as stated in the ADEC risk assessment guidance: "The following list details the deliverables required to be submitted to the DEC project manager for human health risk assessments: numerical data in Microsoft Excel. risk screening evaluation tables in Microsoft Excel. RME calculations in Microsoft Excel or as ProUCL output (note all summary and data input pages must be included). risk calculations tables in Microsoft Excel. all modeling inputs and outputs. ACL calculations in Microsoft Excel."	Data will be provided in the Draft Final HHRA.
23.	6-49		Disagree with the statement that site characterization resulted in higher EPC. Site characterization usually includes locating hotspots and delineating out to find the boundary of the	Examples specifically cited in Sec 6.2.6.1, ore zone soil samples and the spring sediment sample, were collected primarily to understand fat and transport of metals at the site. Sampling of these features was not intended to delineate hot spots; no attempt was made to delineate boundaries of

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			contamination. The end result is actually having more samples with lower concentrations on the boundaries.	higher concentration zones associated with these features. Pooling of sample results for the ore zones and spring yellowboy sediment for EPC calculation therefore results in high-biased soil and sediment EPCs.
24.	6-50	6.2.6.2	Why was the modeling data higher? Discussion should be more focused on the cause of the higher numbers. For example in the fish data sculpin was taken from the red devil creek and modeled for comparison to northern pike from Kuskokwim river. Direct comparison without modeling resulted in higher numbers. The comparison is difficult since the fish could be accumulating contaminants from different sources. Blueberry model comparison was made from different time and studies. It is unknown if the soil concentrations are directly in contact with the blueberry plant concentrations for comparison. These uncertainties and extrapolating model data from differently developed sources should be discussed.	Additional details will be provided.
25.	6-50	6.2.6.2	Environmental condition can influence the metal concentrations in the ground water and should be discussed. (i.e pH organic matter etc…)	Additional text will be added.
26.	6-54	6.3.1	Ecoscoping Guidance: A Tool for Developing an Ecological Conceptual Site Model. (ADEC 2012) should also be included in the list of documents.	ADEC (2012) will be included in the document list in the BERA Introduction.
27.	6-66	6.3.6.4	In accordance with dec memo Sediment Quality Guidelines (SQG) March 2004, for sediment the department is recommending the use of the TEL	The TEL and PEL sediment benchmarks from NOAA will be used in place of the TEC and PEC benchmarks from MacDonald et al. (2000).

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			and PEL Sediment Quality Guidelines (SQGs), as published in the NOAA Screening Quick Reference Tables (SQuiRTs). SQG TEL/PEL values are listed for both fresh and marine water. The reference tables and pertinent information are located at: http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html.	
28.	6-81	6.4.1	The text "exceeds a target cancer risk of 1 in 100,000 and an HI of 1.0 etc…" is not consistent with what was reported in prior tables for listing of COC. Does a HI = 1 and 1e10-5 also include the chemical in the COC list? This was the case for HQ = 1 (i.e table 6-40 methymercury =1). Not sure what the actual numbers come out to in table 6-66 for the individual chemical as they were not reported.	Yes, this is accurate. Section 6.4.1 refers to the results of the human health risk assessment. Table 6-40 is part of the ecological risk assessment.
29.	6-81	6.4.1	While table 6-66 and 6-67 only contain major chemical of concern the cumulative risk from the other COCP with the clean up level could still exceed a HQ of 1 and these numbers do not include the exposure pathway of wild food. Also is the calculation based on the individual media? If this is the case a summation of HI for soil + sediment + water could = 3 and be considered RAO. For the cumulative risk and hazard index from all exposure pathways not to exceed the respective numbers (10-5 or 1) the RBCL would be less than what is calculated for the individual media.	Cumulative risk was taken into account to derive risk-based cleanup levels provided in Table 6-67. This will be expanded on in the text of Section 6.4.1. Compounds of concern (COCs) in wild foods will be added to Table 6-66. Risk based concentrations levels in wild foods will be calculated and included in the HHRA.

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30.	6-81	6.4.2	Calculating the RAO for the target HI and cancer risk for wild food consumption would be useful.	See response to comment #29.
31.	Table 2-26,27,28		In accordance with DEC policy when speciation of metals are not analyzed the most toxic from is considered present. Chromium 6 is the more toxic form of chromium and should be used as the RfD. Insure all other calculations with the incorrect numbers are updated. IRIS doesn't have an oral RfD for metallic Vanadium? ADEC uses a RfD from HEAST set at 7.00E-3. Please provide the proper citation for review or use the HEAST value. Also correct all calculations with the correct dermal and oral reference dose. CalEPA has calculated a chronic inhalation reference exposure level of 0.00005 milligrams per cubic meter (mg/m^3) for nickel based on respiratory and immune system effects reported in rats exposed to a soluble nickel salt. Not 9E-5 mg/m3 in Table 6-27 non-cancer inhalation. CalEPA has established a chronic reference exposure level of 0.00001 milligrams per cubic meter (mg/m^3) for cadmium based on kidney and respiratory effects in humans. Not 2.0E-5 in Table 6-27 noncancer inhalation. There are two RfD for cadmium and manganese provided, please insure the calculations in other	Assume referencing Tables 6-26 through 6-28. All values will be rechecked prior to the Draft Final HHRA. Values will be updated consistent with the hierarchy provided in Section 6.2.4.1. The primary sources of hexavalent chromium in the atmosphere are chromate chemicals used as rust inhibitors in cooling towers and emitted as mists, particulate matter emitted during manufacture and use of metal chromates, and chromic acid mist from the plating industry (ATSDR, 1993). There are no known releases of hexavalent chromium at that site but per DEC's request, total chromium will be conservatively evaluated as hexavalent chromium. The vanadium value is correct but additional text will be added explaining the derivation which is consistent with USEPA's Regional Screening Level assessments. Specifically, The oral RfD toxicity value for Vanadium was derived from the IRIS oral RfD for Vanadium Pentoxide by factoring out the molecular weight (MW) of the oxide ion. Vanadium Pentoxide (V205) has a molecular weight of 181.88. The two atoms of Vanadium contribute 56% of the MW. Vanadium Pentoxide's oral RfD of 9E-03 mg/kg-day multiplied by 56% gives a Vanadium oral RfD of 5.04E-03 mg/kg-day. The nickel RfC is correct but the reference was inaccurately identified as CalEPA instead of ATSDR. The ATSDR value is listed higher on the agreed hierarchy listed in Section 6.2.4.1 and the USEPA RSL than CalEPA (included as "other criteria as needed") and was used in this assessment. The California EPA Inhalation reference exposure level 0.02 ug/m3 (respirable) with critical effects of kidney effects (proteinuria) and respiratory effects (reduction in forced vital capacity and reduction in peak

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			Tables are using the proper one for groundwater exposure and soil/dermal exposure. PLEASE UPDATE ALL OTHER TABLES WITH THE PROPER TOXICITY VALUES FOR EXPOSURE CALCULATION.	expiratory flow rate) in occupationally exposed humans (Cal EPA 2000). This value is also consistent with the USEPA RSLs. The value is used in this assessment. The correct values for cadmium and manganese were used in this assessment. Additional discussion will be added to Section 6.2.4.or as a footnote to Tables 6-26 through 6-28, to clarify.
32.	Table 6-4		The improper screening concentration is used for Chromium 6. ADEC is 100ug/L and EPA RSL = 3.1E-2ug/L for total and dissolved screening levels in ground water.	See response to comment #32.
33.	Table 6-5		The improper screening concentration are used for Chromium 6 ADEC is 100ug/L and EPA RSL = 3.1E-2ug/L for total and dissolved screening levels in surface water.	See response to comment #32.
34.	Table D-6 & D-12		The more conservative value for chromium should be used "VI" oral RfD = 3E-3. Please correct all incorrect values for the individual exposure routes and medium. The dermal numbers should also be corrected.	See response to comment #32.