BIO

Dr. Margrit von Braun is professor emerita and former Dean of College of Graduate Studies at the University of Idaho. Dr. von Braun is a visiting professor at the American University of Armenia's School of Public Health. She is a member of the Collegium Ramazzini, an international scientific community of 180 experts in the fields of occupational and environmental health.

Margrit von Braun is an environmental engineer, and holds degrees from the Georgia Institute of Technology, University of Idaho, and Washington State University. After working for USEPA in Atlanta, Margrit moved to Idaho to work for the Dept. of Environmental Quality. She joined the University of Idaho faculty in 1980. She chaired the Dose Evaluation Review and Assessment (DERA) Advisory Panel to the Idaho Department of Health and Welfare. She taught courses in environmental science, engineering, and risk assessment, and founded and directed the interdisciplinary Environmental Science Program.

Dr. von Braun has taught Human Health Risk Assessment at the senior/graduate level for over 25 years both at the University of Idaho and the American University of Armenia. She has also conducted numerous Risk Assessment workshops and trainings for the Department of Energy and for Médecins sans Frontieres (Doctors without Borders). She is co-founder and board member of TerraGraphics International Foundation (TIFO), a non-profit organization that assists community leaders, local and traditional governments, universities, and other non-governmental organizations (NGOs) to improve environmental health in mining communities around the world.

1. **Previous Human Health Assessments at SGP**

1.A. URS Corp. completed the *Stibnite Area Risk Evaluation Report* prepared for Stibnite Area Site Characterization Voluntary Consent Order Respondents in August 2000 (URS 2000). The report assessed whether chemical or physical stressors described in the Draft Site Characterization Report (Stibnite Group 2000) posed unacceptable risks to the environment or to human health. It was based on then current site conditions. The in-depth analysis by URS was part of a preliminary investigation for USEPA as the site was a candidate for CERCLA.

The URS report analyzed many exposure pathways – ingestion and dermal exposure to soil; inhalation; ingestion of sediment; ingestion and dermal exposure to surface water and ingestion of fish. The URS report also included numerous exposure scenarios for recreational users and workers including some conservative/worst case scenarios. These included reclamation workers and recreational visitors potentially exposed at numerous locations. Over 20 metals and other chemicals were included in the exposure analysis. The URS report also included a qualitative uncertainty analysis of factors that may affect numerical risk estimates and their impact on results and conclusions of the risk evaluations. The report follows the general guidance of a Human Health Risk Assessment (HHRA), a type of Human Health Assessment, as described below.

1.B. *Public Health Assessment, Stibnite/Yellow Pine Mining Area, Facility ID: IDD980665459* was prepared by the Idaho Department of Health and Welfare's Bureau of Environmental Health and Safety (BEHS) under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) on September 5, 2003. The purpose was to fulfill ATSDR's Congressional mandate for preparing a public health assessment within one year of EPA proposing a site to the National Priorities List (NPL).

The exposure pathways were surface soil, surface water, airborne particulates and sediments; ingestion of surface soil and inhalation of airborne particulates were identified as primary. BEHS assumed that the exposure dose from inhalation is the same as from ingestion of surface soil, because air data were lacking. Consumption of fish was identified as a potential exposure pathway, while subsurface water and ground water were eliminated.

The analysis was fairly comprehensive and concluded with Recommendations and a Public Health Action Plan ("Plan") to identify current and potential exposure pathways and related health hazards, and to provide a plan of action to mitigate and prevent adverse human health effects resulting from exposures to hazardous substances in the environment. Notably, the BEHS "will review additional environmental sampling data as it becomes available" (Item #4 in Plan) and will explore the feasibility of conducting an exposure investigation with regard to site biota (Item #5 in Plan). Items #6 and #7 in the Plan states that "IDEQ is negotiating institutional controls with the current site owners to prevent future development of the site"… and is "negotiating with the site owners about how to prevent public exposure to the onsite contamination."

1.C. The *Hazardous Materials Baseline Study* was completed June 2015 (HDR, Inc.) and updated April 2017 by Brown and Caldwell in order to identify and document the historical and existing conditions prior to the start of proposed restoration and mining operations. Previous mining activities, removal and reclamation activities were identified; a list of areas with existing hazardous materials was provided. This study is intended to be used to support the U.S. Forest Service (USFS) environmental impact statement (EIS) for the Project.

1.D. *Public Health and Safety Baseline Study* was completed in April 2015, and revised in April 2017 by HDR, Inc. characterize existing conditions prior to the start of mine operations at SGP. The study describes natural and man-made public health and safety hazards, ranging from naturally-occurring hazards such as avalanches and wildfire to hazardous materials related to past mining operations and present-day fuel transportation. The remote nature of the study area is described as presenting "…numerous challenges for emergency operations, which include emergency management services and evacuation procedures."

Although they were not reviewed in detail due to the time constraints for the DEIS review, the 4 reports described above generally follow prescribed methodologies. However, as described in Section 3 below, the SGP DEIS does not comprehensively build on this work to update and expand current and future risks to health. Instead a qualitative framework, prescribed by the mining industry, is used with no consideration of uncertainty and without providing recent environmental contamination data.

2. Types of Human Health Assessments

There are many types of assessments used to evaluate impacts on human health. The two most relevant in this discussion are Health Impact Assessments (HIA) and Human Health Risk Assessment (HHRA).

2A. Health impact assessment (HIA) is a systematic process used to evaluate the public health consequences of a proposed policy, plan, program, or project on the health of a population and whether the health effects are distributed evenly within the population. HIAs provide practical recommendations to minimize negative health effects and maximize beneficial health effects https://doi.org.10.17226/13229. HIAs examine both potential positive and negative human health impacts, as well as socioeconomic and environmental impacts. https://www.ncsl.org/research/health/health-impact-assessments.aspx

2B. A human health risk assessment (HHRA) is a quantitative, analytic process to estimate the nature and risk of adverse human health effects associated with exposure to specific chemical contaminants or other hazards in the environment, now or in the future https://www.epa.gov/risk/human-health-risk-assessment. A typical USEPA risk assessment compares contaminant concentrations (measured or predicted) to published health criteria for appropriate exposure scenarios. This is generally accomplished through an exposure assessment in which route-specific intake estimates are developed for each contaminant of concern. Exposures to select populations, including sensitive sub-populations (e.g., young children) are presented. For non-carcinogens, these intakes are then related to the appropriate RfDs (Reference Doses). For carcinogens, the cancer risk associated with the intake is calculated using the appropriate Slope Factor (SF).

Generally, there are significant uncertainties in the risk assessment process. Understanding those uncertainties is important to evaluate risk and to develop risk management or mitigation measures. Uncertainty analyses can either be quantitative or qualitative. Quantitative uncertainty analyses require collection of large numbers of samples and confirmatory procedural and analytical measures, which are resource demanding and expensive. Qualitative uncertainty analyses discuss each step in the risk assessment, indicating significant unknowns, assumptions, potential errors, data reliability and levels of confidence in the knowledge base; and indicates whether the manner in which those uncertainties are addressed tend to over- or under-estimate risk. The resultant risk assessment and recommended risk management or mitigation measures are then designed to be health protective, or to err on the side of over-estimating risk https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part.

3. **SGP APPROACH**

The SGP approach is closer to an HIA in that it is qualitative in nature and summarizes both positive and negative health impacts. The SGP follows guidance by the International Council on Mining and Metals (ICMM), a notable detour from a more typical USEPA approach. As stated in Section 4.18, p. 4.18-3, "…when analyzing the overall public health impact, the magnitude of the consequence is combined with the possibility that the consequence will occur. There is no universally agreed upon formula for assessing overall public health impact (ICMM 2010). Characterization of public health effects relies on qualitative and quantitative evidence (National Resource Council of the National Academies [NRC] 2011) and the assessments of the magnitude of the impact or possibility of occurrence are often based on a subjective judgement (ICMM 2010)." (SGP DEIS Section 4.18 p. 4.18-3).

The use of ICMM guidelines to evaluate health risks at Stibnite is surprising and inappropriate. The ICMM are a set of guidelines agreed to by "… 27 mining and metals company members and over 35 national, regional and commodity association members..." typically to employ in poor and middle income countries that lack the sophisticated governmental environmental protection and public health capacity to ensure that mining and mineral refining is conducted with appropriate safeguards. These guidelines are largely irrelevant to the US, that has the assessment capacity and enforceable regulatory structure to compel responsible operations.

The principles and policies advocated in NRC 2011 are incorporated in the human health and environmental and ecologic assessment protocols required by the USEPA and other federal and State agencies. Rather than broad references to policy, this DEIS should follow those US federal and State protocols rather than offer an analysis more appropriate to a middle-income country. Simply stated, the health assessment should be a state-of-the-art evaluation, conducted according to federal and State methods and requirements, building on previous more rigorous historic studies. The DEIS health analyses fall far short of these requirements and should be rejected.

As indicated in Section 3.18, Public Health and Safety, possible public health impacts associated with the following environmental resources were noted: air, soil, groundwater, and surface water quality.

Section 4.18 Public Health and Safety provides a public health impact Table 4.18-3 for Alternative 1. The discussion regarding Table 4.18-3 (p. 4.18-16) states: "the magnitude of the health impact related to soil quality is rated as "medium" on Table 4.18-3, because some exposure of legacy contamination and/or release of hazardous materials (ranging from small to large quantities) is possible." No details on these quantities are provided and the reviewer is left to imagine the size of this range "from small to large." Is it from zero to a million tons? The discussion continues (p. 4.18-16) to conclude that impact will be "minor" because exposure is limited due to access controls and that there are "no differences in impact findings between the construction and operation phases of the SGP."

In Table 4.18-5, the impacts of all 5 alternatives are summarized, primarily in comparison to Alternative 1; indicating there is no alternative offered in this DEIS with respect to public health. The single alternative analysis is qualitative without substantiating data or explanation; and critically without an uncertainty discussion.

This is an example of general assertions throughout the DEIS that lack quantitative support, despite the large accumulation of site-specific data. This document lacks clarity transparency and is not coherent. There is no demonstrated internal consistency regarding toxic metal contaminant levels among the various component analyses. Only shallow analyses and generalizations are presented in the main text with references to support documents that are challenging to review. Any data supporting internal coherence in contaminant evaluations is largely confined to references exceedingly difficult to coherently organize. There is no overall material balance with respect to toxic metals, making it impossible to assess contaminant sources, transport and transformation, exposure pathways and receptor relationships. Supplemental analyses should require a material balance format for toxics similar to the Conceptual Site Model (CSM) methodology required under CERCLA, with appropriate uncertainty analyses.

4. Analysis of Appendix M *SGP Appendix M Public Health and Safety - Calculation of Site-Specific Recreational Risk-based Screening Levels for Soil.*

Because the only quantitative health risks in the entire DEIS are provided in Appendix M and relate to exposure to contaminants in soil, this review will provide some focus on exposure to soil contaminants.

Approach used in SGP:

- Developed Recreational Risk-Based Screening Levels (RBSLs) for arsenic, antimony, and mercury
- Used recreational exposure frequency of 16 days/year, based on the Payette National Forest camping limits, for visitors over a period of 26 years. Two of the 16 years were assumed to be for a child (4 to 6 years old) and 24 years as an adult (> 6 years of age).
- Calculated exposure over 26 year period using pathways of incidental ingestion of soil, inhalation of fugitive dust and dermal contact with soil. The soil was identified as "reclamation cover material."
- Used EPA Reference Doses and Slope Factors, as appropriate, for As, Sb and Hg to calculate soil concentrations.

Reviewer's assumptions:

- The RBSLs calculated are soil concentrations that would be optimal/acceptable/do not exceed levels for the soil to be used as cover in reclamation. These surface soils are described as the exposure points in Appendix M.

Conclusions regarding Appendix M:

Appendix M does not present a human health risk assessment associated with construction or operations of the facility at Stibnite. Instead, the assessment in Appendix M uses RfDs and SFs, https://www.epa.gov/isa/integrated-science-assessment-isa-leadmaterial to be acceptable from a human health risk perspective. This method establishes "cleanup standards" for reclamation, using the recreational visitor scenario.

Appendix M has no evaluation for the most vulnerable subset of the population – younger children and pregnant women/fetus. Two to three-year old children are more susceptible than 4 year-olds, as they ingest more soil, have smaller bodies, higher blood to body weight ratios, and more sensitive to heavy metal neurotoxins https://www.epa.gov/isa/integrated-science-assessment-isa-lead.

A more typical risk assessment would have considered expected concentrations in air, soil, and water, during operations. The Stibnite approach is to ask, "how clean does the soil need to be at reclamation to be safe?" It is not clear how the surface soil used for the reclamation cover relates to the camping site in the Payette National Forest. Moreover, the implicit assumption in these analyses that it is acceptable for children to recreate in soils containing 240 mg/kg for any length of time is irresponsible.

5. Recommended Approach

The assessment should use expected exposure point concentrations and pathways/migrations of contaminants and determine risk to appropriate populations under a variety of scenarios. The 4 studies described in Section 1 are more comprehensive and typical for such a project; it is not clear why the SGP did not build on and improve the human health assessment in 2020.

Risk assessment scenarios can be constructed over a wide range of possibilities. For example, in assessing the risk of exposure to inhaling dust from a tailings pond, the scenarios could be of a healthy young male riding a bicycle very quickly past the pond. The exposure, despite heavy respiration, would only be for a few seconds, resulting in an immeasurably small risk. On the other extreme, an exposure scenario of a pregnant woman, camping for a summer next to the pond, could result in a high risk to both her and the fetus. Both of these exposure scenarios have occurred along contaminated areas in the Coeur d' Alene river floodplain, the latter resulting lead poisoning of children https://nepis.epa.gov/Exe/tiff2png.cgi/91000XXB.PNG?-r+75+-g+7+D%3A%5CZYFILES%5CINDEX%20DATA%5C91THRU94%5CTIFF%5C00001894%5C91000XXB.TIF.

This comparison demonstrates the importance of identifying both typical and reasonable maximum exposure (RME) scenarios. USEPA recommends that risk scenarios be constructed at a RME level accompanied by an uncertainty analysis https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part.

The Stibnite exercise in Appendix M uses a reasonable *average* exposure, if nothing goes wrong, with no consideration of uncertainty. It appears to be a "cherry-picked" scenario with no assumptions of a reasonable maximum or a worst case exposure. Such an exercise would be expected to yield results favorable to the proposed operation. However, the resulting recreational risk-based screening levels (RBSLs) for arsenic, mercury and antimony are, in fact, much higher levels than any reasonable person would consider tolerable for 16 days of recreation (DEIS Table M-4; USEPA RSL from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-table).

	Antimony	**Mercury**	**Arsenic**
	USEPA RSL: 31 mg/kg	EPA RSL: 23 mg/kg	USEPA RSL: 35 mg/kg
Optimal	684 (NC)	240 (NC)	27 (Carc)
Acceptable	684	240	268
Do not Exceed	684	240	763

Additional recommendations to address shortcomings:

1) A comprehensive presentation of current environmental contaminants at the site – in environmental media should be presented. Where are the contaminants now? How will they be mobilized during construction, operation and reclamation of the SGP? That hazard identification can then be used to complete the exposure pathway/toxicity assessment to provide a risk characterization under various scenarios at the site.
2) Assess the potential health risks to Stibnite personnel performing their normal duties in the proposed project and living in the affected communities
3) Recommend precautionary or corrective actions to mitigate those risks
4) Present a Conceptual Site Model and diagram clear exposure pathways before selecting exposure scenarios
5) Identify if there residences (both seasonal and permanent) near the site, downwind and downstream? Include residential scenarios, not just recreational scenarios.
6) Discuss how mercury methylation downstream could affect fish population/food consumption in this risk assessment.
7) Include a worker scenario that accounts for incidental ingestion, dermal contact and inhalation of disturbed vapors and particulates, assuming a forty-hour work week not including construction or agricultural activities.
8) Include an occupational scenario to consider adult workers' exposures outside the workplace if their residences and/or recreational activities add to their worker exposure. Because Stibnite workers could be community residents, the residential criteria applied should be protective for women of reproductive age or for any children present.
9) Consider specific advocacy, dietary precautions, and work restrictions for pregnant women or those considering pregnancy.
10) Describe the pathway of mercury particulate migration into residential and recreational areas from tailings ponds.
11) In order to improve the approach in Appendix M, include a worst case recreational scenario rather than one assuming only Payette campgrounds will be utilized under camping stay limits. Explain how the campers relate to the concentrations on the cap.

12) Include scenarios for campground workers who presumably work for more than 16 days/year; for people NOT at campground, but recreating in national forest; for people foraging and/or fishing and/or hunting on the land.
13) Include scenarios unique to Native American populations for ceremonies/hunting/fishing/gathering.
14) Special consideration must be given to Antimony. Although the toxicities of mercury and arsenic are quite understood, antimony's toxicity is not. The SGP is likely the largest supply of Sb in the US. The SGP estimates that 1-2 million tons Sb in waste rock will be extracted.
15) Without a material balance, showing environmental releases (measured and/or predicted) for at least the primary 3 contaminants (Sb, As and Hg) it is not possible to predict human health impacts.
16) The status described in the reports in Section 1 should be the starting points for the 2020 SGP analysis - not a retreat from it. A responsible approach would be to build upon those analyses not to start over with a minimal qualitative approach. The approach should be more sophisticated, not less, than previous studies. By reverting to the ICMM qualitative approach to health impacts, the Idaho site is being treated like a mining company would approach a third world country.
17) The No Action Alternative for the DEIS should be CERCLA. Numerous mining sites offering lower contamination levels have been remediated by CERCLA throughout the western US. If the Stibnite Project is not undertaken, the site will likely be addressed by CERCLA or the abandoned mines programs as State of Idaho priorities evolve. Both the URS 2000 and ATSDR 2003 studies were CERCLA, indicating the site is under consideration for continuing action. Other federal agencies are currently evaluating resolution of CERCLA responsibilities regarding this site. This is not to support the SGP conclusion that the proposed project will only make things better; that is possible but it is not substantiated in the DEIS.

6. Concluding Remarks

Idaho is rich in resources and has a long and rich mining history; and suffered some of the world's most severe heavy metals poisoning epidemics and is home to one of the country's largest Superfund sites, that poisoned thousands of children during and post-operations. DEIS Table 25.2 pp 25-9 General Opportunity G01 - Permit Acquisition states: *Idaho is characterized as having a low jurisdictional risk, and as a mining friendly state. In addition, the brownfields nature of the Project site may provide a significant impetus to see the Project, with the extensive remediation of legacy impacts built into the design, accelerated.*

Based on the health and toxic metals assessment aspects presented in the DEIS, the SGP does not demonstrate the intent to be good citizens and appears primarily to exploit a pro-mining political climate. Instead of building on the health risk evaluations done since 2000, the SGP has retreated to a minimalist approach to health impacts, reminiscent of middle income country protocols, focusing on environmental tradeoffs for economic benefits. Despite Midas' claim of "10 years of study, 11 agencies, 4 years of regulatory review and $61 million in studies/permitting", the shallow analyses and lack of transparency/coherence in the DEIS are disappointing and insufficient.

Respectfully submitted,

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