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BEFORE THE BOARD OF ENVIRONMENTAL QUALITY
STATE OF IDAHO

IN THE MATTER OF AIR QUALITY PERMIT TO CONSTRUCT P-2019.0047	)	Agency Case No. 0101-22-01
	)	OAH Case No. 23-245-01
NEZ PERCE TRIBE, IDAHO CONSERVATION LEAGUE, and SAVE THE SOUTH FORK SALMON	)	**EXPERT DECLARATION OF IAN H. VON LINDERN, P.E., Ph.D.**
Petitioners,	)	
v.	)	
IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY,	)	
Respondent,	)	
and	)	
PERPETUA RESOURCES IDAHO, INC.	)	
Intervenor-Respondent.	)	

I, Ian H. von Lindern, P.E., Ph.D., hereby declare under penalty of perjury and pursuant to the law of the State of Idaho that the foregoing is true and correct:

QUALIFICATIONS

Name and Affiliation

1. My name is Ian von Lindern. I reside in Moscow, Idaho. I am a licensed Professional Engineer in Chemical Engineering in Idaho (License # 3044). I have practiced in the disciplines of Environmental Engineering and Risk Assessment in Idaho for the last 50 years. I was President and Principal Scientist for TerraGraphics Environmental Engineering with offices in Moscow, Kellogg, and Boise, Idaho for 30 years, retiring in 2016. TerraGraphics was the Idaho Department of Environmental Quality's (DEQ) prime consultant for the Bunker Hill Superfund Site (BHSF) and I was Project Manager and lead risk assessor for both the BHSF and the Coeur d'Alene Basin Superfund Sites from 1984 to 2014.

2. Since retiring from the consulting business, I co-founded the non-profit humanitarian organization TerraGraphics International Foundation (TIFO) and have continued to work in mining-related health and safety issues in low-income countries. TIFO's mission is to assist mining and mineral processing communities to operate as safely as practicable while maintaining essential economic activities. In that regard, we support scientifically sound and transparent analyses of the environmental and human health issues faced by mining communities, and the development of local solutions implemented within community socio-economic and cultural capabilities. Under my direction in the last ten years, TIFO has conducted and completed site characterization, risk assessment, and risk mitigation projects in

Russia, China, Peru, Dominican Republic, Senegal, Nigeria, Kyrgyzstan, Uzbekistan, and the Duck Valley Shoshone Paiute Reservation in Idaho and Nevada.

Education and Experience

3. I hold a B.S. degree in Chemical Engineering from Carnegie-Mellon University, Pittsburgh, Pennsylvania and Masters and Ph.D. degrees in Environmental Science and Engineering from Yale University, New Haven Connecticut, specializing in air pollution and public health. I have served on numerous advisory committees and the U.S. Environmental Protection Agency's (EPA) Science Advisory Board and Clean Air Science Advisory Committee on several occasions from 1975 to 2018, advising on topics relating to exposure and risk assessment in childhood heavy metal poisoning. During that tenure, I directed more than 30 major environmental health investigations at mining and smelting sites, both nationally and internationally. A current C.V. is attached.[1]

Relevant Projects and Assignments

4. I was the Regional Environmental Engineer for DEQ's predecessor agencies in both the Coeur d'Alene and Twin Falls offices. In that capacity, I processed air quality permits for the Agency for several years at the major mining and smelting operations in the State during the 1970s, and early 1980s, including the Bunker Hill Mining and Metallurgical Complex, the last U.S. operational antimony smelter at Big Creek, Idaho, and numerous mining operations in North and Central Idaho. I designed and directed the implementation of the Silver Valley Lead Health Study that investigated and provided emergency response to the childhood lead poisoning epidemic in the Coeur d'Alene mining district in the 1970-80s.

[1] Exhibit A.

5. I have particular experience with implementing EPA risk assessment guidance in Idaho. Beginning in 1984, DEQ's predecessor, Idaho Department of Health and Welfare-Division of Environment (IDHW-DOE) was the lead agency implementing the Risk Assessment and Cleanup Management Plan developed for the populated areas of the Bunker Hill Superfund Site (BHSS). The BHSS was the U.S. second largest Superfund site, and IDHW-DOE was among the first health/environmental agencies to implement the EPA Risk Assessment Guidance for Superfund (RAGS) in the late 1980s.

6. As Project Manager, I was responsible for developing and implementing the risk assessment/risk management protocols, and cleanup plan for the BHSS in collaboration with several State, federal, tribal, local governments, and industry. The project was monitored and collaboratively developed by several entities including EPA Regions VIII and X, the EPA National Center for Environmental Assessment (NCEA), EPA Headquarters, the Coeur d'Alene Tribe, the Panhandle Health District, and the States of Montana and Washington. I also served on a sub-committee of the EPA Science Advisory Board evaluating the consistency of heavy metals regulation across EPA Program Offices in the early 1990s.

7. Based on that experience, IDHW-DOE requested that I participate on the advisory committee regarding development of the toxic air pollutant (TAP) rules for the State. As a result, I had a diverse perspective in the development of the TAPS rules that afforded reasonable health protectiveness while relieving the regulators and industry of the burden of the risk assessment and risk management protocols evolving at the time. I continued as DEQ BHSS lead risk assessor until 2014.

8. In my most relevant recent experience, I am working with the international humanitarian organization Médecins Sans Frontières (MSF, or Doctors Without Borders) assisting the Kyrgyz Republic Ministry of Health in developing health protective strategies to reopen both mercury and antimony smelters in Batken, Kyrgyzstan. These facilities were among the largest mercury and antimony producers in the former Soviet Union and are essential to the regional economy.

9. TIFO is currently engaged with MSF, the U.S. Department of State, the Massachusetts College of Pharmacy and Health Sciences, and the Kyrgyz Ministry of Health in conducting risk assessment and risk mitigation activities in active and abandoned Kyrgyz antimony and mercury mining communities. Biological monitoring of the local populations indicates many children and reproductive aged women have arsenic and antimony blood and urine levels exceeding international norms. The principal source of metals contamination are mining-related fugitive dusts contaminating the community water, soil, air, and food sources.

10. I am the lead risk assessor for these projects and have produced several major reports in the last five years. The project is currently engaged in implementing medical, environmental, public health advocacy and educational interventions to reduce exposures and health risks. As such, I have considerable insight and experience with the issues associated with the proposed antimony-gold operation at Stibnite.

11. Over the past five years, I have monitored the development of the U.S. Forest Service Draft Environmental Impact Statement (DEIS) for the Stibnite Gold Project (SGP) and have reviewed and submitted comments regarding the several revisions of the Draft Permit to Construct (PTC) and associated support documents. As a result, I am familiar with the many

related issues, and particularly those related to contaminants of potential human health and environmental toxicity concerns.

ASSIGNMENT

12. My understanding is that the Board of Environmental Quality has remanded the PTC to the Hearing Officer for additional consideration of DEQ's analyses of ambient air arsenic and carcinogenic risk issues. The Petitioners in this case have requested that I provide an expert opinion regarding the Board of Environmental Quality conclusions and the Respondent's and Intervenor-Respondent's Declarations. I understand the purpose of my opinion is to assist the Hearing Officer regarding additional factual evidence on the ambient air concentration analysis performed by DEQ for the PTC analysis.

DOCUMENTS REVIEWED

13. For this assignment, I have reviewed the transcript of the May 1, 2024 special meeting of the Idaho Board of Environmental Quality in the matter of Air Quality Permit to Construct Issued to Perpetua Resources Idaho, Inc. (agency case number 11 0101-22-01)[2], the May 9, 2024 FINAL ORDER FROM THE BOARD, Case Docket No. 010-22-01 OAH Case No. 23-245-01 (Final Order in the Matter of Air Quality Permit to Construct P-2019.0045)[3], the subsequent May 23, 2024 Memorandum in Support of Joint Motion for Reconsideration and/or Clarification of Final Order,[4] the subsequent June 12, 2024, ORDER ON PETITIONS FOR RECONSIDERATION AND/OR CLARIFICATION OF FINAL ORDER[5], and the July 8, 2024 Scheduling Order.[6]

[2] TR 0156.
[3] REC 3695.
[4] REC 3731.
[5] REC 3835.
[6] REC 3867.

14. I have also reviewed the two DEQ Respondent Declarations and attached materials: EXPERT DECLARATION OF KEVIN SCHILLING and EXPERT DECLARATION OF NORKA E. PADEN, Ph.D., two Perpetua Intervenor-Respondent Declarations and attached materials: EXPERT DECLARATION OF KEVIN LEWIS and EXPERT DECLARATION OF THERESA LOPEZ, and the Petitioner Declaration and attached materials: DECLARATION OF WILL TIEDEMANN.

SUMMARY OF CONCLUSIONS

15. I have reviewed Idaho Board of Environmental Quality's Final Order and understand and agree with the Board's conclusions that:

a. DEQ Did Not Act Reasonably and in Accordance with Law When it Analyzed the Ambient Arsenic Air Concentrations for the SGP;

b. DEQ did not Act Reasonably in Using a Five-Year Rolling Average for T-RACT that was not Properly Supported by Permit Conditions;

c. There was Insufficient Evidence to Support the T-RACT Analysis Limiting the Non-West End Pit Production Limit; and

d. DEQ Did Not Act Reasonably and in Accordance with Law When it Applied the 16/70 Calculation to the Ambient Arsenic Air Concentration Analysis.

16. I have reviewed the transcript of the May 1, 2024 special meeting of the Idaho Board of Environmental Quality. I also concur with Vice Chair McMillan's testimony that:

> . . . DEQ has misinterpreted how the acceptable ambient concentration for carcinogens, the AACC, must be applied if it is to comply with our air quality rules.
>
> … DEQ's creation and application of a project-specific adjustment factor is not supported by Idaho's air quality rules.

> … the creation of a project-specific adjustment factor suggests that there is a significant ignorance about cancer, carcinogens, and carcinogenesis.
>
> … the short-sighted project-specific adjustment factor to the Stibnite Gold Project, DEQ created a misleading risk analysis that greatly underestimates the actual cancer risk.[7]

17. This report supports the Board of Environmental Quality's findings in the Final Order and concludes that:

a. DEQ's application of the 16/70 SGP Project-specific adjustment factor underestimates cancer risk and is inappropriate science and public health policy;

b. Ambient air arsenic concentrations and cancer risk are underestimated for the SGP by use of 5-year rolling average in the air quality modeling input factors;

c. Ambient air arsenic concentrations and cancer risk are underestimated for the SGP by improper application of the non-WEP emissions scenario;

d. The combined application the SGP 16/70, 5-year rolling average, and non-WEP Project-specific adjustment factors increase cancer risk and negate the health protectiveness of the TAPs rule; and

e. DEQ's SGP Project-specific adjustment factors represent a significant change in the regulation of carcinogenic risk in Idaho that increases both cancer risk and regulatory burden.

[7] TR 0159.

OPINIONS

A. DEQ's application of the 16/70 Project-specific adjustment factor is inappropriate science and public health policy.

18. DEQ has failed to properly implement Section 586 and T-RACT for the SGP PTC by introducing a 16/70 SGP Project-specific adjustment factor to allocate the full 70-year lifetime allowable cancer risk to the 16-year Life of Mine (LOM). The calculation averages the risk resulting from SGP emissions over the life of the receptor. This adjustment allows the SGP to emit as much as 70 years of allowable carcinogenic emissions in 16 years. This type of "adjustment factor," also known as risk amortization or cancer dose-averaging, undermines both the health protectiveness and the regulatory certainty of the TAPs rule. In the context of the existing TAPs rule, as applied the last 30 years, using the 16/70 Project-specific adjustment factor is an incorrect interpretation and represents unsound science and public health policy.

19. Specifically, DEQ misinterprets the purpose and function of the **maximum one-year annual average ambient air carcinogen concentration** in implementing the TAPs rule. It is important to review the development of the TAPs rule in understanding the strategy represented by this one-year annual standard. The Schilling Declaration asserts that the TAPs rule was developed nearly thirty years ago to accommodate DEQ's predecessor agency IDHW-DOE and the regulated communities' request to adopt rules that are: 1) are reasonably protective of public health, but still afford flexibility to facilities and projects; 2) are relatively easy to understand and implement; and 3) do not require excessive expenditure of time and resources by DEQ and the permittee during the permitting process.[8]

[8] Schilling Decl. ¶ 13.

20. I was invited by the IDHW-DOE Air Quality Bureau to engage in development of those rules at that time in an advisory committee role based on my previous experience outlined above. My recollection is that much of the IDHW-DOE's and regulated industries' initial experience with risk assessment analyses was in implementing Risk Assessment Guidance for Superfund at CERCLA sites.[9] Both IDHW-DOE and the regulated community were supportive of avoiding the onerous burden of incorporating similar risk assessment and risk management protocols into Idaho's TAPa rule. In short, after considerable effort, IDHW-DOE was successful in developing the Section 586[10] and T-RACT[11] rule with a strategy that simultaneously avoids requiring PTC applicants to submit risk assessment and risk management protocols, yet is protective of human health.

21. The resultant TAPs Section 586 and T-RACT rules are highly prescriptive. Strict adherence to the rules is requisite to simultaneously afford regulatory certainty and simplicity for the regulated community and provide health protectiveness to the public. The key aspects of the simple, yet protective, rules are: 1) the incremental nature of the rule relieves industry and DEQ of the burden of assessing multiple sources and exposures, and greatly simplifies the permitting process; and 2) a significant **margin of safety (MOS)** is provided to ensure surrounding communities are not subjected to industry-generated ambient air TAP concentrations exceeding health-based risk criteria.

22. The purpose and function of the MOS is to protect the community from those other sources and exposures, risk cofactors, and uncertainties that would otherwise be evaluated in comprehensive risk assessment and health impact analyses. The DEQ and the regulated

[9] Exhibit B. U.S. EPA, *The Risk Assessment Guidelines of 1986* (Aug. 1987).
[10] IDAPA 58.01.01.586.
[11] IDAPA 58.01.01.210.12.

community have successfully employed these TAPs rule in a productive and protective manner since the 1990s.

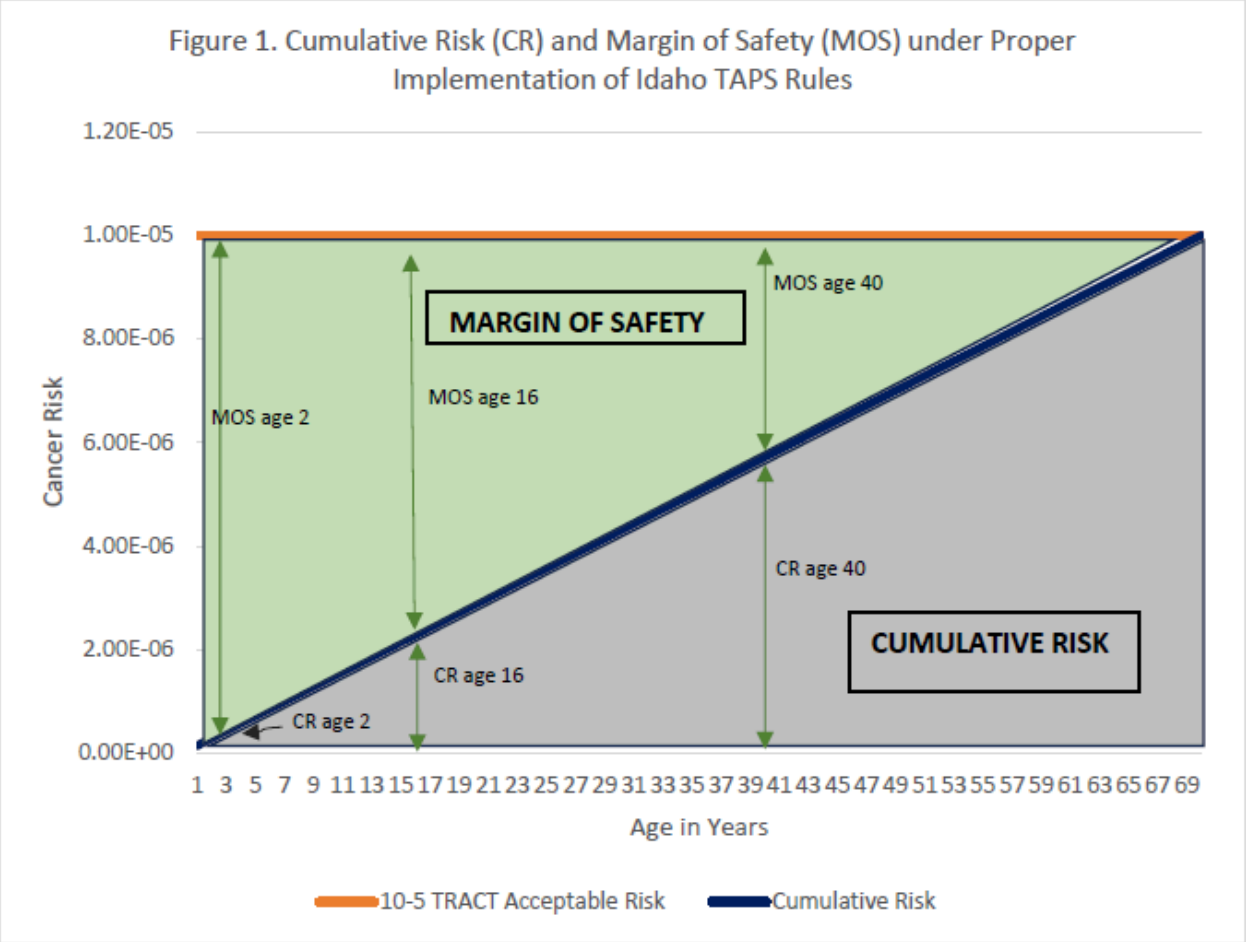
23. This prescriptive strategy specifically depends on protecting the public air space against the potential one-year annual maximum TAP emissions scenario throughout the life of the project. The one-year maximum emissions scenario is used to estimate **the maximum one-year annual average ambient air carcinogen concentration**. Ensuring that the maximum one-year annual ambient air carcinogen concentration does not exceed the acceptable ambient concentration for carcinogens (AACC) at the critical receptor location ensures that no receptor will be exposed to greater than the AACC by the incremental TAPs source for any year. The AACC is provided in Section 586 and is the ambient air concentration determined by dividing $1x10^{-5}$ lifetime risk by the Unit Risk Factor (URF). The URF is the lifetime cancer risk per 1.0 $\mu g/mg^3$ ambient air. Section 586 defines the AACC as an annual average.[12]

24. Ensuring that the criteria is achieved every year of the project guarantees the MOS will protect the individual receptors from other potential sources of the carcinogen that are not addressed in the incremental PTC analysis. Applying these criteria and MOS collectively to all individual sources assures that these health protections extend statewide.

25. Figure 1 illustrates the MOS and the cumulative lifetime risk at the critical receptor expected under the prescribed TAPS Section 586 maximum annual ambient concentration. The vertical axis is the carcinogenic risk. The horizontal axis represents the critical receptor's age commencing at the introduction of the incremental TAPs source. The

[12] *See* IDAPA 58.01.01.586 ("The AACC in this section are annual averages.").

maximum allowable lifetime risk is shown as the horizontal line at the top of the Figure ($1x10^{-5}$ T-RACT risk in this example).



26. If the TAPs rule is properly implemented, the cumulative incremental risk is shown by the diagonal line proceeding from birth to age 70 years (i.e., risk is allowed to accumulate at an annual rate of $(1x10^{-5})/70$ per year, or (AACC*URF/70) under T-RACT. The gray area below the diagonal line represents the portion of allowable lifetime risk accumulating from the incremental source. Risk increases proportional to the receptor age and the individual will have received the full allowable lifetime T-RACT exposure, and have a 10^{-5} carcinogenic risk burden at age 70-years.

27. The green area above the diagonal line represents the margin of safety (MOS) for the receptor to accommodate other contaminant exposures, risk cofactors, or uncertainties that might increase cancer risk from sources other than the incremental emissions regulated under TAPs Section 586 and T-RACT. Specifically, the large MOS safely accommodates those risk considerations that would otherwise be addressed in onerous risk and health assessment protocols. In this manner Idaho's TAPs compliance strategy purposefully, but safely, avoids requiring risk analyses.

28. The strategy also extends maximum protection to those population sub-groups most sensitive to carcinogenesis. Important life-stages of the receptor are indicated by the vertical lines at ages 0-2 years for infants and toddlers, ages 3-16 for children and adolescents, ages 17- 40 for reproductive-aged women and the fetus, and ages 41-70 years for older adults. This Idaho TAPs rule strategy affords minimal cumulative risk and maximal MOS protection during early life stages and pregnancy, acceptable risk levels during most of adulthood, with lesser protection at advanced ages when incremental cancer risk has limited effect on lifetime cumulative risk.

29. In the case of arsenic under the T-RACT criteria, the allowed annual rate of risk accumulation is a direct function of the .0023μg/m^3 T-RACT AACC multiplied by URL/70. As a result, contrary to Respondents' assertions, the AACC functions as an annual standard as historically applied in the TAPs rule. DEQ's and Perpetua's Declarations contend the Section 586 comparison of average annual ambient air arsenic concentration should utilize the average 70-year concentration, as opposed to basing health protectiveness on the worst-case **maximum one-year annual average ambient air carcinogen concentration** that is the foundation of the

MOS. Using the 70-year basis proposed by DEQ and Perpetua allows Perpetua to emit a lifetime of allowable emissions in 16 years, and undermines the health protectiveness of the rule and increases cancer risk.

30. The origin of DEQ's policy change can be found in the Lewis and Schilling Declarations. The initial Draft PTC offered by DEQ for public review exempted 99% of proposed allowable arsenic emissions from regulation and TAPs compliance because mining fugitive dust was not considered. Following subsequent public hearing testimony, DEQ required that Perpetua consider haul road dust arsenic emission under Section 586 TAPs rule.[13] As Schilling asserts, when subsequently required to consider the massive arsenic emissions, Perpetua informed DEQ that compliance with either the 10^{-6} AACC or the 10^{-5} T-RACT AACC limits were not achievable.[14] Any calculations or analyses to support these conclusions have never been disclosed.

31. According to Schilling, DEQ then suggested the ad hoc SGP 16/70 Project-specific adjustment factor, or dose-averaging approach, to avoid the annual one-year average constraints of the TAPs rule.

> Rather than revise the analytical approach to provide a less conservative assessment of impacts, I proposed that compliance with carcinogenic TAP increments could be based on cumulative cancer risk of the limited-duration project rather than the worst-case annual impact for a project of limited duration.[15]

32. The SGP 16/70 Project-specific Adjustment Factor was introduced in the TAPs Modeling Addendum, Section 4.3 AACC Adjustment for the Operational Life of the Mine.

[13] Lewis Decl. ¶ 18.
[14] Schilling Decl. ¶ 22.
[15] Schilling Decl. ¶ 22.

> [Perpetua] indicated the maximum life-of-mine will be 16 years. Life-time exposures to carcinogenic TAPs were refined by multiplying the maximum modeled annual impact by a ratio of 16/70.[16]

33. In defending this policy change, Schilling asserts that DEQ's position that the short-term factor of 10 applied to the allowable AACC when a project will have a duration of less than 5 years, shows that an adjustment in the exposure concentration is appropriate.[17] He further asserts that:

> . . . DEQ determined it would not be appropriate to subject individuals to a lifetime allowable cancer risk within a duration of less than 5 years. Therefore, the adjustment was capped at 10, rather than using a higher value or values calculated from exposure durations of 5 years of less (e.g., 70 years/5 years = 14 or 70 years/2 years = 35). These short-term projects were most commonly remediation and pilot-scale projects having a duration of up to several years.[18]

34. Schilling refers to IDHW-DOE's explicit 1992 interpretation,[19] also noted by Lopez,[20] that:

> For short term sources (usually less than five years in duration), such as remediation projects, a probability of greater than one in a million risk (over 70 years) will generally be acceptable to account for the decreased term of exposure. It is not acceptable however, for exposed individuals to receive a full 70-year exposure during the life of a short-term project. (Idaho DEQ 1992).[21]

35. In my opinion, nothing in the 1992 IDHW-DOE document suggests that an "adjustment factor" can be applied to any project with a life greater than 5 years, as the Schilling and Lopez Declarations imply is the modified DEQ policy. I am not aware of any quantitative

[16] REC 0698.
[17] Schilling Decl. ¶ 19.
[18] Schilling Decl. ¶ 19.
[19] Schilling Decl. ¶ 19.
[20] Lopez Decl., Memo. in Supp. of Decl. at 11.
[21] REC 3780.

"adjustment factor" connection between the 5-year project lifetime and the 70-year lifetime cancer risk basis. I believe that it is more accurate to describe the short-term factor of 10 as reflecting the order of magnitude increase in allowable risk from 10^{-6} to 10^{-5} criteria. This order-of-magnitude relief in allowable risk levels is commonly justified in cancer risk mitigation protocols throughout State and federal jurisdictions in various programs for various reasons, such as the Washington State protocols.[22]

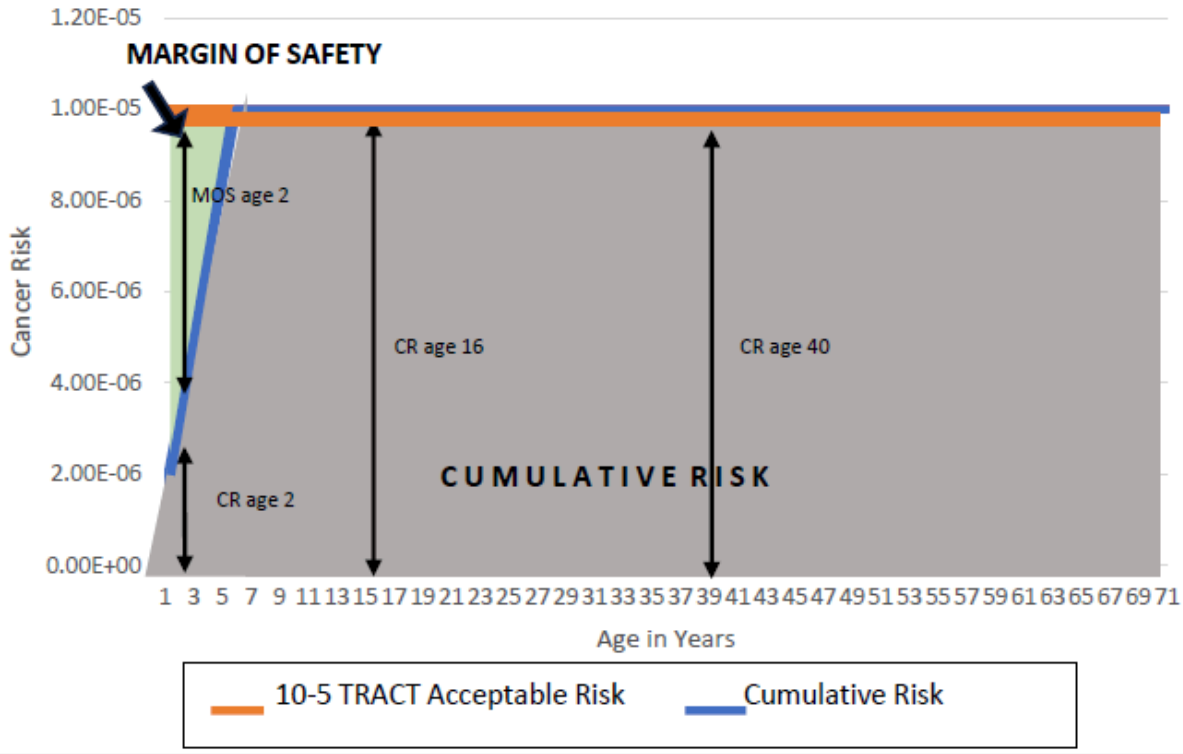
36. According to Schilling and Lopez, DEQ's modified policy implies that the SGP Project-specific adjustment factor can be applied to any carcinogenic source with a duration greater than five years. This shortsighted conclusion is incorrect, unprecedented, and not supported by EPA guidelines. The new policy is poor science and undermines the health protective strategy of regulating TAPs that has successfully been applied for the last thirty years.

37. Consider the extreme case of DEQ permitting a six-year (>5 yr.) life facility to emit sufficient carcinogens to expose individuals to the full 70-year lifetime acceptable risk in six years. The alleged allowable maximum annual ambient concentration would be 70/6 = 11.7 times the AACC, (or 117 times the AACC if T-RACT applied, (i.e. 1.17×10^{-4} cancer risk if applied for 70 years). DEQ's misinterpretation would allow emissions and consequent exposures of more than two orders of magnitude greater risk than the AACC (1.2×10^{-4} equivalent risk) for six years. At year 7 (or 10% of the receptor's assumed lifetime), the six-year-old child will have accumulated, and carry the lifetime burden, of a one-in-one hundred thousand cancer risk (10^{-5}). This risk burden will accompany the individual for the following six decades (> 90%) of the receptor's expected lifetime.

[22] Exhibit C. Washington State Department of Ecology, *Guidance Document First, Second, and Third Tier Review of Toxic Air Pollution Sources (Chapter 173-460 WAC)* (2010).

38. The effect of this dangerous scenario is illustrated in Figure 2. The MOS afforded this childhood receptor occurs briefly in the first six years of life. For the remainder of the receptor's lifetime, any additional arsenic exposure, from any source at any time, would immediately cause the cumulative lifetime exposure to exceed the unacceptable $>10^{-5}$ risk. The receptor would be challenged to avoid any additional arsenic exposures for the remainder of life.

Figure 2. Cumulative Risk (CR) and Margin of Safety (MOS) using the Project-specific (6/70) Adjustment Factor for a 6-year project



39. The ad hoc introduction of risk averaging by DEQ through a 6/70 adjustment factor, as depicted in Figure 2, would allow a six-year project to concentrate 70 years of emissions and lifetime cancer risk into both the 6-year life of the project and receptor child's first

six years of life. This scenario undermines the health protectiveness originally incorporated in Section 586, particularly with respect to neo-natal, pediatric, and adolescent cancers.

40. In justifying the use of the 16/70 Project-specific adjustment factor, the Respondents continually assert that the Unit Risk Factor (URF) is an average based on a 70-year lifetime. However, carcinogenic potency and cancer risk accumulation differ for various stages of life. The cancer dose varies based on contaminant intake and absorption rates and physiological factors such as body weight and organ development. Considering early life exposures, warrants additional examples of the inappropriateness of introducing the SGP 16/70 Project-specific adjustment factor. Pregnant women, the fetus, and pre-school children accumulate dose and risk at the highest rates and are especially vulnerable to disease due to age and developmental factors. Body weight, absorption, and hormonal considerations can make older children and adolescents more susceptible to childhood cancers.

41. DEQ's assertion that the SGP 16/70 Project-specific adjustment factor is health protective implies that it is permissible to subject these sensitive subpopulations to the equivalent $>10^{-4}$ risk levels from conceptus to school age because it will average out over the remainder of the child's life.

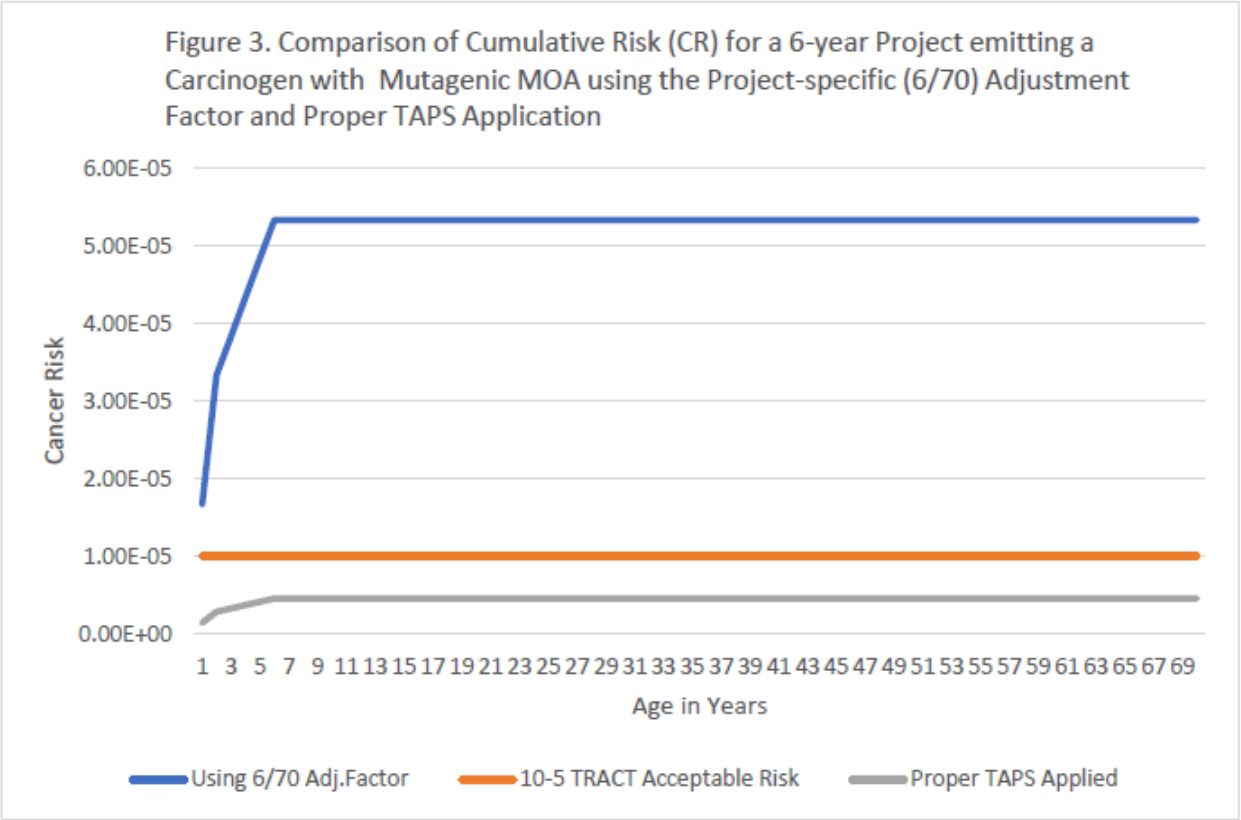
42. The SGP 16/70 Project-specific adjustment factor is a classic example of dose-averaging. The practice of averaging cancer risk over a receptor's lifetime progressively developed as an issue in the risk analyses applied to contaminated hazardous waste sites during the 1990s, and early 2000s. The EPA comprehensively considered the application of

dose-averaging or risk amortization in the Science Advisory Board (SAB) review *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens.*[23]

43. The excessive risk associated with early life-stage carcinogenic dose accumulation has long been recognized by most health authorities and specific protections were incorporated in EPA Risk Assessment Guidance for Superfund (RAGS) policy in 2009. The EPA recommends a quantitative adjustment of the toxicity value to account for early life susceptibility. This guidance recommends a 10-fold adjustment for exposures during the first 2 years of life; 3-fold adjustment for exposures from ages 2 to <16 years of age for carcinogens exhibiting mutagenic mode of action (MOA).[24]

44. Figure 3 shows lifetime cumulative risk were DEQ to apply the ad hoc 6/70 adjustment factor to a carcinogen exhibiting mutagenic MOA for the 6-year project life scenario (blue line). Applying the recommended age-specific adjustment factor shows that DEQs interpretation allowing dose-averaging over the 70-year lifetime would result in the allowable full lifetime exposure occurring by age 2 years, and the child's lifetime cumulative exposure will be $5.3x10^{-5}$ by age 6 (i.e., 53 times the one-in-one million criteria). These lifetime cumulative risks acquired by infants and toddlers, prior to adolescence far exceed EPA acceptable carcinogenic risk policy.

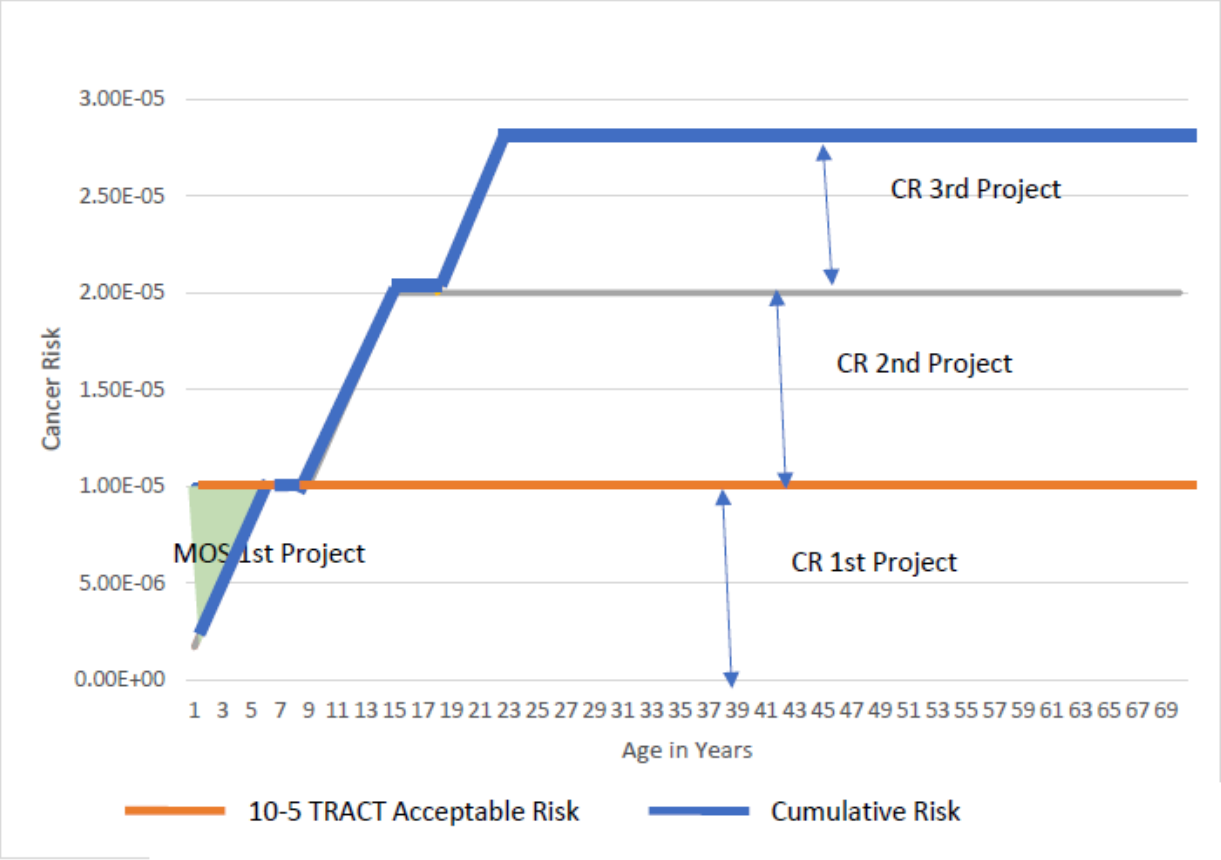
[23] Exhibit D. U.S. EPA, *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (2005).
[24] Exhibit E. U.S. EPA, *Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment* (Jan. 2009).



45. Conversely, proper application of the TAPs rule using the **maximum one-year annual average ambient air carcinogen concentration** is shown by the lower cumulative risk line (gray line). Proper implementation of the TAPs rule would result in 4.6×10^{-6} cumulative cancer risk at age six years, as shown in Figure 3. These results demonstrate that application of a 6/70 adjustment factor for a six-year facility increases a six-year-old child's cancer risk by 12 times over that were the TAPs rules applied under the past policy.

46. As another example, consider the case of two additional 6-year projects being implemented near the source represented in Figure 2 at years 9 and18 in this child's life. Figure 4 shows the child already exposed to the full lifetime allowable cancer $1x10^{-5}$ risk by age 6, will have double ($2x10^{-5}$) the acceptable risk level by adolescence, and will carry three times the allowable lifetime cumulative risk burden ($3x10^{-5}$) through the reproductive stage of life.

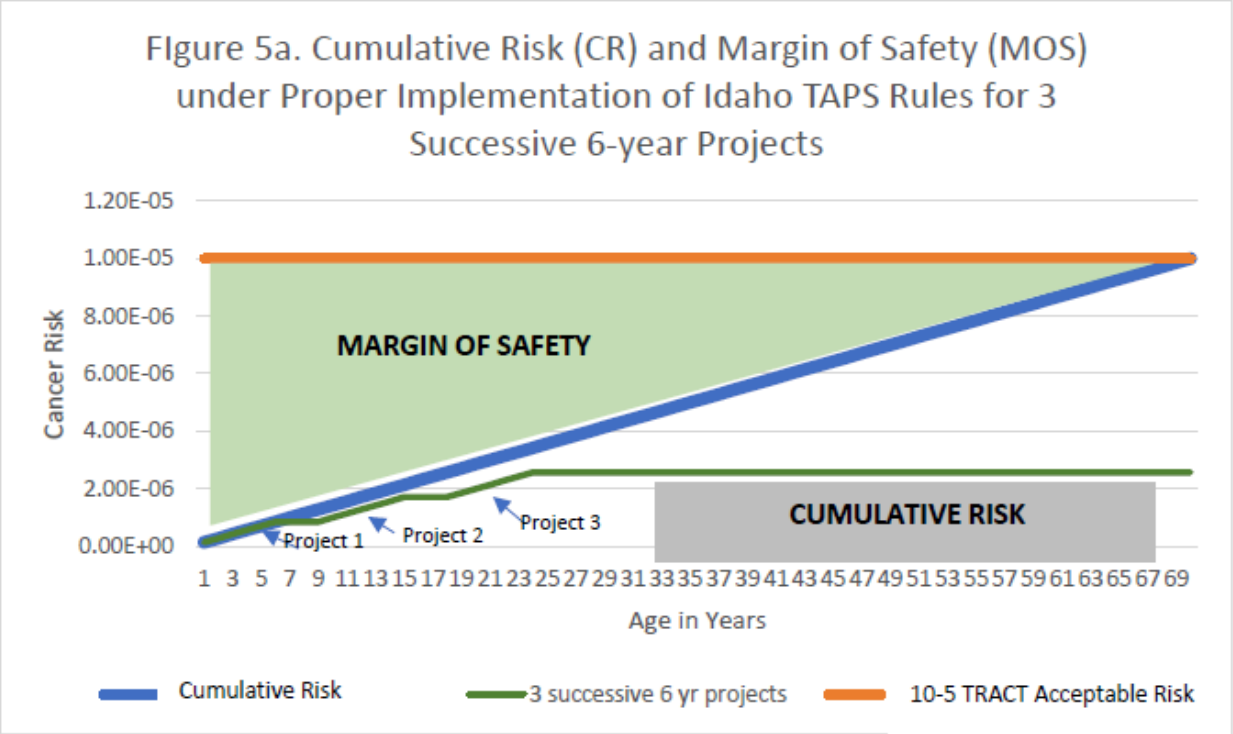
Figure 4. Cumulative Risk using the Project-specific (6/70) Adjustment Factors for 3 Successive 6-year Projects



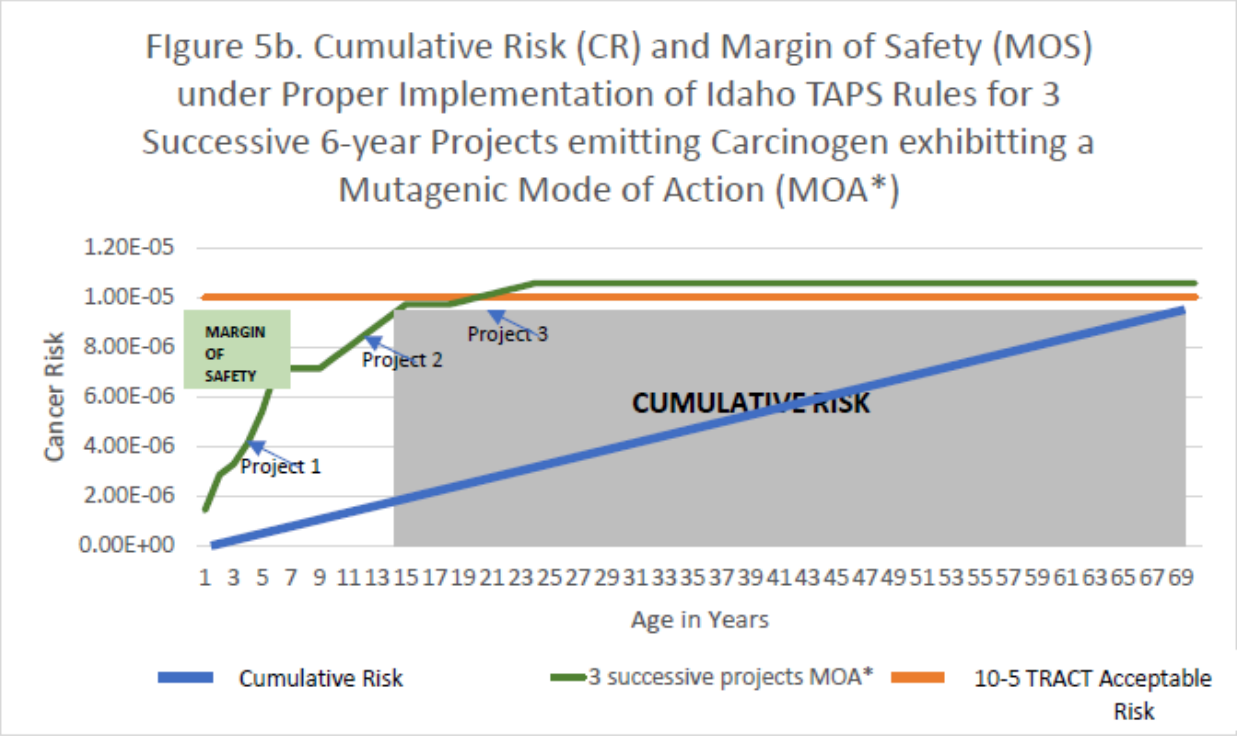
47. Consider the three sequential 6-year projects implemented under the new (6/16) adjustment factor emitting a carcinogen exhibiting mutagenic MOA. In this scenario, the three projects would increase individual cancer risk to $>1x10^{-5}$ lifetime allowable risk by age 2, to $5.3x10^{-5}$ for a 6-year-old child, $8.3x10^{-5}$ for a 16- year old adolescent, and $9.3x10^{-5}$ for a 24-year old adult. These are dangerous and unacceptable risks at vulnerable life stages.

48. Under Section 586, DEQ must consider these new projects incrementally. Thus, it would not account for the cumulative lifetime exposures associated with the earlier projects in a new source PTC application, and are not allowed to consider risk associated with those earlier projects. At Stibnite, for example, should SGP apply to open another pit at the mine, DEQ would be required to ignore the cumulative lifetime risk and cancer burden imposed by the proposed SGP 16-year LOM scenario.

49. Figures 5a and 5b demonstrate the same three sequential project scenarios under the proper implementation of the current TAPs rules using the **maximum one-year annual average ambient air carcinogen concentration** that incorporates the MOS to accommodate additional sources. Figure 5a shows the cumulative risk from all three projects for a carcinogen not exhibiting mutagenic MOA. In this case, a child growing up in the community would be protected from excess cancer risk through all life stages even though DEQ would not consider the earlier exposure in applying Section 586. The lifetime risk accrued by the individual is $2.6x10^{-6}$ as opposed to $3.0x10^{-5}$ in the earlier example. Allowing use of the 6/70 adjustment factor increases lifetime cancer risk by 12 times..



50. Figure 5b shows the cumulative risk for proper implementation of the current TAPs rule for three sequential 6-year projects emitting a carcinogen exhibiting mutagenic MOA. In this example, the MOS is successfully protective throughout childhood and adolescence, with the cumulative risk exceeding the 10^{-5} risk level at age 21. These examples illustrate the effectiveness of the MOS in accommodating additional sources and risk cofactors. The TAPs rule is health protective if properly implemented. Applying risk averaging through the use of the 16/70 Project-specific adjustment factors eliminates the MOS and substantially increases cancer risk, especially considering the incremental nature of the rule.



51. Figures 5a and 5b also demonstrate DEQ's shortsightedness in applying unprecedented cancer dose-averaging methods through the SGP 16/70 Project-specific adjustment factor. The inappropriate averaging is allegedly justified by ad hoc risk assessment calculations and risk management protocols that undermine both the simplicity and the health protectiveness of the TAPs rule. The MOS is compromised, the public is no longer secure, and the regulated industry is now obliged to include cancer risk and health impact assessments in TAPs PTC applications to support the assertions of health protectiveness.

52. There are no provisions in the Air Rules to allow manipulation of the required **maximum one-year annual average ambient air carcinogen concentration** or the **AACC,** or to submit risk calculations. The Respondents assert that because there are no specific prohibitions, using the SGP 16/70 Project-specific adjustment factor is permissible. DEQ did not

require any risk assessment justification during the PTC process, but only provided extremely limited risk analyses in post hoc declarations following the Special Board Hearing.[25]

53. In justifying the SGP Project-specific 16/70 adjustment factor, both the DEQ and Perpetua refer to the EPA Risk Assessment Guidance for Superfund (RAGS) risk assessment protocols eschewed by the agency for the last thirty years to support the ad hoc exposure averaging calculations. As noted in the Tiedeman Declaration, IDHW-DOE specifically avoided RAGS waste site remediation short-term risk protocols in developing the TAPS.[26]

54. The Board of DEQ Vice Chairman McMillan explicitly expressed concerns with this issue, indicating his belief that DEQ's creation and application of a Project-specific adjustment factor cannot be supported by Idaho's Air Rules and that DEQ has misinterpreted how the AACC must be applied if it is to comply with the those rules.

55. Vice Chairman McMillan further indicated that DEQ's application of what he called the "short-sighted" Project-specific adjustment factor to the Stibnite Gold Project created a misleading risk analysis that greatly underestimates the actual cancer risk. In his view:

> The Idaho rules are not ambiguous. There is an acceptable risk associated with the AACC standard. There is an acceptable risk associated with DEQ-approved T-RACT projects, and there is an acceptable risk associated with the short-term project that is five years or less. There are no other acceptable risks identified in Idaho's air quality rules.[27]

I agree with Dr. McMillan's statement.

[25] *See* Schilling Decl.; Paden Decl.; Lewis Decl.; Lopez Decl.
[26] Tiedemann Decl. ¶¶ 26-27.
[27] TR 0160.

B. Ambient air arsenic concentrations and cancer risk are underestimated for the SGP by using a 5-year rolling average in the air quality modeling input factors.

56. Another ad hoc SGP Project-specific adjustment factor DEQ applied to the exposure estimates (prior to implementing the 16/70 Project-specific adjustment factor) was a 5-year rolling average adjustment factor to the emissions rates used as input to the refined modeling. This disguised risk averaging technique results in the models predicting a five-year average ambient air carcinogen concentration rather than the **maximum one-year annual average ambient air carcinogen concentration** required under Section 586 and T-RACT, further undermining the health protectiveness of the TAPs rule.

57. The 5-year rolling average adjustment factor was introduced in the TAPS Modeling Addendum Section 4.2 -TAP Emission Averaging Period. In Section 4.2, DEQ asserts:

> Annual average emissions of carcinogenic TAPs are typically used in the dispersion model to estimate maximum annual impacts. PRI refined the analyses by using source-specific emission rates that are representative of a 5-year averaging period. This approach is appropriate because carcinogenic impacts are of concern from a long-term exposure basis.[28]

58. DEQ erroneously substitutes the 5-year rolling average emissions for the maximum one-year potential emissions required under Section 586 and T-RACT. Section 586 requires the prescribed maximum one-year annual average to be estimated by refined modeling of ambient concentrations based on maximum one-year potential emission rates, or PTE. The PTE should reflect the source configuration and operational scenario that would yield the maximum annual one-year ambient air arsenic concentration. This concentration is then

[28] REC 0698.

compared to the 10^{-6} AACC. If the 10^{-6} AACC is exceeded, the applicant may apply for 10-fold relief under TRACT.

59. DEQ has never disclosed this comparison. In response to public comments critical of DEQ for not calculating nor presenting the required AACC comparisons, DEQ provided the following rationale:

> The comparison offered, comparing maximum annual impacts to the T-RACT adjusted AACC, is irrelevant. Compliance with TAPs rules was demonstrated through a refined analysis, so there is no utility in focusing on results from a more conservative, less refined analysis.[29]

DEQ misinterprets the purpose the comparison and undermines the health protective strategy of the TAPS Rules as implemented in the past.

60. Instead, DEQ substituted the 5-year rolling average for the required maximum one-year emission rate. There is no provision in the TAPs rule for altering or adjusting the predicted maximum one-year annual average. This erroneous substitution significantly reduces the MOS inherent in proper allocation of the one-year maximum emission rates. To be health protective, the prescriptive Section 586 rule explicitly (not typically) requires predicting the **maximum one-year annual average contaminant concentration** using prescribed emissions estimates, and assuring that concentration is not exceeded during the life of the facility.

61. DEQ has never disclosed the required **maximum one-year ambient annual average arsenic concentration.** It is not possible from the available information provided by DEQ to determine how this 5-year rolling average compares to the maximum one-year emission rate that should have been used. I have estimated the underprediction by examining the ratio of

[29] REC 0693.

peak to mean 5-year rolling average emission rates presented in Figure 3 of Perpetua's TAP Addendum.[30] This figure shows estimated potential 5-year rolling average emissions for an alleged 16-year MODPRO2 operations plan. The estimated mean 5-year rolling average from this figure was calculated to be 0.132 lb/hr. Comparing this value to the maximum 0.232 lb/hr value suggests the peak to mean ratio for the alleged T-RACT PTE is approximately 1.8 (0.232 lb/hr / 0.132 lb/hr).

62. Because this Project-specific 5-year rolling average adjustment factor is inherently applied to the emissions input to the refined models, a 1.8 underprediction factor would translate directly to the estimated receptor point ambient air carcinogen estimates. As a result, the maximum one-year annual concentration in the model output is likely underpredicted by a factor of 1.8. The best estimate of the **maximum one-year annual ambient air arsenic concentration** for the modeled scenarios is 0.0125 $\mu g/m^3$ (1.8 x 0.00698 $\mu g/m^3$) for the WEP2.[31]

63. DEQ's application of the 5-year rolling average adjustment factor reduces the **maximum one-year annual ambient air arsenic concentration** and the associated cancer risk by 45%.

C. Ambient air arsenic concentrations and cancer risk are underestimated for the SGP by improper application of the non-WEP emissions scenarios.

64. A third SGP Project-specific adjustment, the non-WEP adjustment factor, was applied to model predicted ambient air concentrations. This is a second disguised dose-averaging step combining eight different 5-year rolling average scenarios, reducing the alleged WEP2

[30] Exhibit L. at 26.
[31] Exhibit L at PDF 224.

maximum annual average an additional 41%. DEQ averaged the maximum WEP2 scenario 5-year average arsenic concentration predicted by the model (i.e. 0.00698 μg/m^3) with the average of the seven model predicted non-WEP 5-year average concentrations (0.00134 μg/m^3). These alleged annual averages are actually an average of 5-year averages as these were predicted by the already diluted 5-year rolling average emissions input to the refined modeling. This non-WEP multi-averaging adjustment factor dilutes the ambient air carcinogenic concentration by an additional 41%, yielding the 0.00416 μg/m^3 alleged incremental annual ambient arsenic concentration. Paden and Lopez use this value to assert compliance with EPA cancer risk policies in subsequent risk calculations.[32]

65. DEQ and Perpetua assert this additional dose-averaging step is justified because no one scenario will apply throughout the 16-year LOM operation. In the context of properly applying the TAPs rule, the non-WEP adjustment factor is irrelevant. DEQ's obligation is to identify the emission scenario that produces the **maximum one-year annual average ambient air carcinogen concentration**. That value is the maximum WEP2 scenario, and would not consider non-WEP scenarios unless the non-WEP emissions sources were operating contemporaneously during the WEP2 emission maximum year. In that case, any non-WEP scenario operating in the same year as the WEP2 maximum configuration would add to, not dilute, the critical receptor maximum ambient air concentration.

66. DEQs applying the SGP Project-specific non-WEP adjustment factor effectively converts the 5-year alleged annual average value (0.00698 μg/m^3) to an arbitrary 0.00416 μg/m^3 16-year LOM average carcinogenic concentration. A variety of combinations of the different

[32] *See* Paden Decl. XXX; Lopez Decl. XXX.

modeling scenarios, based on alleged operations plans could have been combined to manipulate this multi-averaged hybrid LOM ambient air carcinogenic exposure estimate (e.g. 3-year rolling average and 70% non-WEP contribution).

67. The final effect of DEQ's application of an arbitrary multi-averaging non-WEP adjustment factor can be estimated by comparing the WEP2 and non-WEP average ambient air carcinogen estimates (i.e., (0.00698 $\mu g/m^3$ / 0.00416 $\mu g/m^3$), or by a factor of 1.7. Applying the non-WEP Project specific adjustment factor underpredicts the required **maximum one-year annual average ambient air carcinogen concentration** and associated cancer risk by an additional 41%.

D. The combined application of the SGP 16/70 Project-specific adjustment factor, the 5-year rolling average adjustment factor, and the non-WEP adjustment factor increase cancer risk and negate the health protectiveness of the TAPs rule.

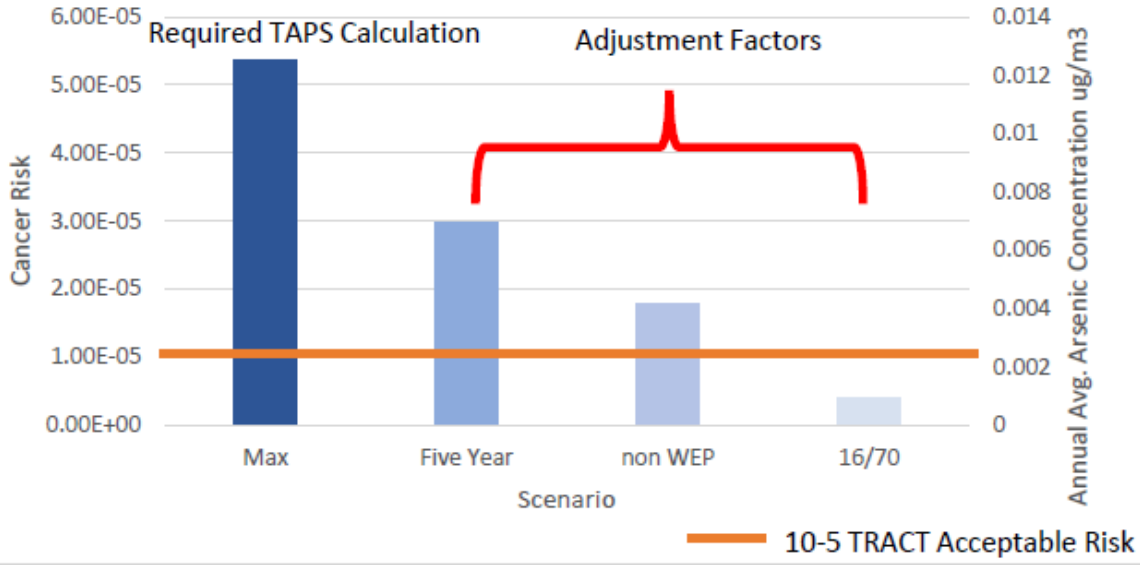
68. The conclusions in the DEQ Board's Final Order correctly identified the three Project-specific adjustment factors that undermine the health protectiveness of the TAPs rule for carcinogenic risk. The Board correctly concluded that application of these adjustment factors underestimates cancer risk. DEQ applied the: 1) 5-year rolling average; 2) non-WEP; and 3) SGP 16/70 LOM adjustment factors sequentially to the input and the output of the predictive air quality model. As a result, the dilution effects are multiplicative, rather than additive.

69. In summary, DEQ diluted the (0.0125 $\mu g/m^3$) maximum one-year annual average ambient air carcinogen concentration by 45% to 0.00698 $\mu g/m^3$ by applying the 5-year rolling average. DEQ further diluted 5-year average concentration by 41% to a value of 0.00416 $\mu g/m^3$ by applying the non-WEP adjustment factor, which is diluted an additional 78% to a value of 0.00095 $\mu g/m^3$ by applying the 16/70 SGP Project-specific adjustment factor. In total, DEQ

diluted the required **maximum one-year annual average ambient air carcinogen concentration** by 93%, or a factor of 13 times before calculating the corresponding cancer risk.

70. The risk levels associated with these exposures were similarly underpredicted as follows: the risk for estimated **maximum one-year annual average ambient air carcinogen concentration** of $5.3X10^{-5}$ was (1) diluted to $3x10^{-5}$ by applying the 5-year rolling average adjustment factor; (2) diluted to $1.8x10^{-5}$ by applying the non-WEP adjustment factor; and (3) to the alleged compliance $4x10^{-6}$ by applying the SGP 16/70 Project-specific adjustment factor. These results are shown in Figure 6. DEQs sequential application of the three SGP Project-specific adjustment factors underpredict cancer risk by 13 times, as these carcinogenic risk levels are employed in properly implementing the TAPs rule.

Figure 6. Effect of DEQs Application of the Project-specfic Adjustment Factors Compared to Required TAPS Calculation



71. These analyses confirm Vice-chairman McMillan's observation in the Special Hearing:

> The PTC proposes to allow 16 years higher daily carcinogen doses and disguises such doses using a non-rules-based mathematics.[33]

E. DEQ's SGP Project-specific adjustment factors represent a significant change in the regulation of carcinogenic risk in Idaho that increases both cancer risk and regulatory burden.

72. As DEQ admits,[34] cancer dose-averaging has seldom, if ever, been used in TAPs carcinogenic risk compliance evaluations for a stationary source under the Clean Air Act in Idaho. Although there is a history of using cancer dose-averaging in risk assessment and risk management protocols for short-term remediation projects at contaminated sites, applying it to the SGP PTC is unprecedented. In implementing the SGP 16/70 Project-specific adjustment factor, DEQ has deviated from the long-held prescribed TAPs rule protocol of guaranteeing the **maximum one-year annual average carcinogen concentration** will not exceed the AACC or T-RACT AACC for each year of the Project. This thirty-year health protective strategy has provided the public comfort that cancer risk exposures are within acceptable limits both near the source and Statewide.

73. Should application of risk averaging become precedent through acceptance of the SGP Project-specific adjustment factors, the conservative MOS inherent in the TAPs rule is significantly reduced. This major change in health protective strategy should simultaneously require PTC applications to include a comprehensive health risk assessment to consider other

[33] TR 0160.
[34] REC 1201.

potential sources otherwise inherently addressed in the MOS. Providing such evidence would be incumbent upon both the PTC applicants and DEQ.

74. These health and risk assessments would require new applicants to consider other past, present, and future sources that did, or may, expend significant portions of the critical receptor's lifetime allowable risk. A simple review of Washington State's required Health Impact Assessment (HIA) points out the numerous shortcomings in the ad hoc alleged risk analyses offered by the Respondents. The HIA requires specified emissions calculations, approved air dispersion modeling, AACC screening, risk assessment, hazard identification, exposure estimates considering other sources and exposure routes, dose-response criteria, non-carcinogenic risk characterization, uncertainty analysis, discussion of acceptability of risk, and a risk management analysis employing modified emission control strategies.[35]

75. DEQ has no history utilizing risk assessment to support TAPs rule applications, nor do the Idaho TAPs regulations offer any guidance for conducting health risk analyses. No comprehensive analyses, nor discussion related to risk and health assessment, are found in the Statement of Basis for the SGP PTC.[36] No comprehensive assessment of health and risk issues associated with application of the SGP Project-specific adjustment factors were required in Perpetua's application.

76. Additionally, from a regulatory standpoint, other Idaho air permit applicants may seek similar preferential relief. No facility plans for a 70-year life. The 70-year basis is an artifact of cancer risk analyses protocols, not a facility design criterion. Every facility ever to apply for a

[35] Exhibit C at 26.
[36] *See* REC 0410.

PTC that did not opt for short-term relief (less than 5 years) likely anticipated a project life of less than 70 years of operation. Will DEQ offer SGP-equivalent project-specific adjustment factor relief and require comprehensive Health Impact Analyses for 6/70, 10/70, 16/70, 20/70, 25/70, 30/70-year alleged project life, as Schilling Declaration suggests?[37] Will DEQ approve incremental emissions from a new source impacting the same critical receptor location that has already expended its lifetime allowable risk, as demonstrated in Figures 4 and 5, above? Will DEQ approve additional emissions from the same location after the original permit has exhausted the critical receptor lifetime allowable risk? Will DEQ require, and provide guidelines, for risk and health assessments to support the preferential relief?

77. These questions demonstrate the short-sightedness of DEQ's acquiescence to Perpetua in allowing dose-averaging concepts to be applied to the Section 586 TAPs rule. Proper application of the rule inherently precludes risk averaging to maintain health protectiveness, without requiring applicants to address the issues without guidance. The regulatory burden placed on future applicants by this modified policy is potentially immense.

78. Allowing Perpetua and the SGP to concentrate a lifetime of carcinogenic emissions and allowable risk in a shorter exposure period defined by the LOM introduces numerous issues and uncertainties that can appropriately be considered only in comprehensive risk assessment analyses.

79. There are numerous examples of inadequacies of the risk calculations offered by the Respondents. Among the more important are those related to the SGP Project-specific adjustment factors concentrating emissions and carcinogenic risk in childhood and adolescent

[37] *See* Schilling Decl. ¶ 19.

life stages. Environment Canada conducted an extensive review of the development and incorporation of life stage cumulative risk assessment, and particularly dose-averaging.[38]

80. This document provides an understandable and concise review of the several issues surrounding dose-averaging, and risk amortization in applying cumulative risk assessment to short-term exposure scenarios. The report also evaluates and describes how various U.S. and Canadian health agencies had implemented risk amortization policy in the preceding decade. Environment Canada's conclusions reflect earlier EPA's determinations that dose averaging generally underestimates risk for fetus, infant, toddler, school children and adolescents; can be appropriate for healthy adults; and overstates risk late in life.[39] Idaho's current TAPs rule MOS appropriately accommodates both these conclusions if properly implemented as illustrated in Figure 1, above.

81. Environment Canada's conclusion with regard to threshold carcinogens is most pertinent to consideration of the SGP 16/70 Project-specific adjustment factor. Environment Canada states:

> Without a sound basis for doing so (i.e. it cannot be a default assumption), **the human health risk assessor should not simply mathematically spread out a short-term dose over a long period and conclude that the short-term dose is toxicologically equivalent to a lower dose over the long period. In short, CSD recommends that the exposure be averaged over the total actual exposure period and compared with the appropriate TRV.** A scientific rationale is required to support any proposed amortization (dose averaging beyond actual exposure period) to ensure that short-term risks are not underestimated. This analysis needs to be done on a chemical-specific basis.[40] (emphasis added)

[38] Exhibit F. Environment Canada, *Interim Guidance on Human Health Risk Assessment for Short-Term Exposure to Carcinogens at Contaminated Sites* (2015).
[39] Exhibit F; Exhibit E.
[40] Exhibit F at 18.

82. TRV is the equivalent of the Idaho AACC. For the past 30 years Idaho has implemented the TAPs rule as Environment Canada recommends, providing a health-protective MOS that appropriately protects children, adolescents, and pregnancies. DEQ now proposes to endorse dose averaging through the three SGP Project-specific adjustment factors, increasing both cancer risk for these vulnerable populations and regulatory burden for PTC applicants.

83. Two examples of relevance to the SGP Project-specific adjustment factors demonstrate the inadequacy of the risk calculations offered by Paden and Lopez. A comprehensive HIA addressing arsenic at mining sites would address 1) Mode of Action (MOA); and 2) non-carcinogenic risk as these relate to critical life stages.

84. **MOA Considerations**: As the Lopez Declaration notes, arsenic is not considered a carcinogen exhibiting mutagenic MOA by the EPA at this time. Current EPA guidance does not specifically recommend applying the age-dependent adjustment factors to the arsenic inhalation URF. Current EPA policy requires life-stage adjustment for known mutagenic MOA carcinogens but leaves it to the risk assessment and risk managers' discretion whether to apply age-adjustments for carcinogens with unclear MOAs.[41] Some jurisdictions recommend applying age dependent adjustment factors to carcinogens for which the MOA is not definitive.[42] A comprehensive risk assessment would inform the risk management decision-makers that there is evidence suggesting arsenic, in combination with other co-stressors, has shown mutagenic

[41] Exhibit D.
[42] Exhibit G, California EPA, OEHHA, *Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures* (May 2009) at 3.

MOA.[43,44] A comprehensive risk assessment would inform the risk management decision-makers that there is evidence suggesting arsenic, in combination with other co-stressors, has shown mutagenic MOA.

85. **Non-carcinogenic Risk.** Environment Canada notes specific examples of non-carcinogenic arsenic health effects that can become the risk driver after applying age-specific exposure, absorption, and dose accumulation adjustments at contaminated sites where children may ingest, in addition to inhaling, arsenic laden dusts.[45]

86. Allocating a lifetime of allowable arsenic intake to children in 6 or 16 years, raises numerous non-carcinogenic concerns not mentioned in the Respondents' limited risk analyses.

87. The largest source of arsenic at the SGP are haul road fugitive dusts. Application of the SGP Project-specific adjustment factor allows the SGP to increase annual emission rates from haul roads by four to ten times more than that allowed under proper implementation of the TAPs rule.

88. This concentration of emissions in early childhood, not only increases ambient air arsenic concentrations, but more than quadruples the rate of arsenic laden dust deposition. It is well-known, in Idaho, nationally and internationally, that incidental ingestion of mining-related fugitive dusts is the major childhood exposure route for heavy metals in mining communities. Numerous DEQ risk assessments for abandoned mine sites in Idaho, including several at the

[43] Exhibit H, Environmental Health Perspectives, *Low-dose Arsenic: In Search of a Risk Threshold*, 122:5 (May 2014).
[44] Exhibit I. Speer, R.M., *et. al.*, *Arsenic and cancer: evidence and mechanisms*, Adv. Pharmacol. 96:151-202 (2023).
[45] Exhibit F at 18.

Bunker Hill and Coeur d'Alene Basin Superfund Site, have historically involved fugitive dusts from mining sites.[46, 47]

89. The EPA and DEQ Superfund regulators routinely apply age-dependent adjustment factors similar to those required for carcinogens that exhibit mutagenic MOAs.[48] There has been no consideration of non-carcinogenic risk for the SGP. Figures 3 and 5, above, demonstrate there is no need to assess other potential sources or non-carcinogenic risk if the TAPs rule is implemented properly using the **maximum one-year annual average carcinogen concentration**. Dust deposition would occur at rates anticipated under proper application of the TAPs rule. As a result, properly complying with the cancer risk criteria is also protective of non-carcinogenic risk.

90. The Paden and Lopez Declarations contain extremely limited risk calculations. Both Respondents use the inappropriately derived dose-averaged ambient concentration of 0.00095 $\mu g/m^3$ to calculate an alleged $4x10^{-6}$ cumulative cancer risk and assert compliance with EPA risk assessment policy. Both Respondents refer to the same EPA formulae found in Superfund guidance and simply compare the same long-term 70-year average value to the same range of alleged EPA allowable risk levels. Neither considers pertinent risk co-factors, vulnerable life stages, other potential sources, or a variety of other considerations inherent in the Idaho TAPs compliance strategy or MOS noted above. Neither mentions nor indicates understanding of the incremental nature of the TAPs Rule.

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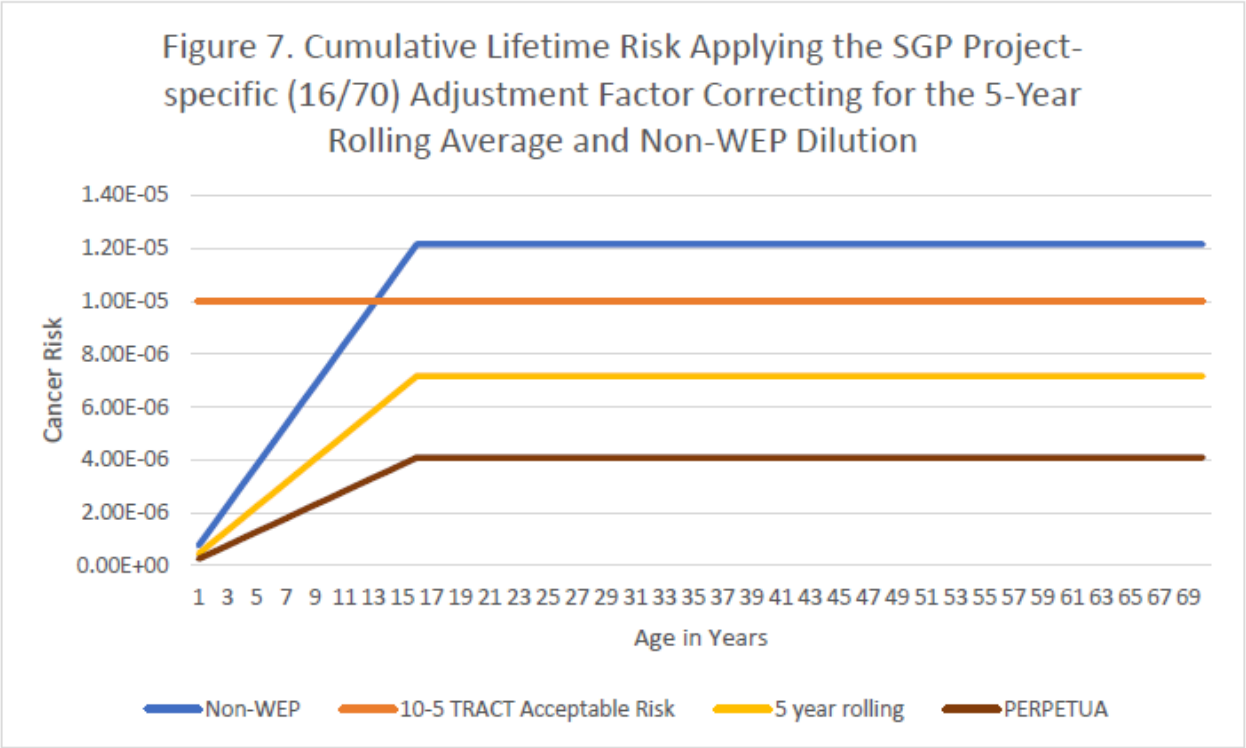
[46] Exhibit J. von Linder, I.H., *et. al.*, *Estimating Children's Soil/Dust Ingestion Rates through Retrospective Analyses of Blood Lead Biomonitoring from the Bunker Hill Superfund Site in Idaho*, Envtl. Health Perspectives, 124:9, 1462-1470 (2016).
[47] Exhibit K. U.S. EPA, *Estimation of Age-specific Soil and Dust Ingestion Rates for U.S. Children: Update to the Default Values for the Integrated Exposure Uptake Biokinetic Model for Lead in U.S. Children* (2021).
[48] Exhibit K.

91. Were the proper TAPs analysis conducted, the cumulative risk for long-term operations would be 5.1 $x10^{-5}$, as noted above. Figure 6, above, illustrated the sequential application of the three SGP Project-specific adjustment factors applied by DEQ (i.e., 5-year rolling average,, non-WEP sources, and 16/70 lifetime adjustment). The final 16/70 exposure dilution yields a cancer risk of $4.1x10^{-6}$. DEQ and the Respondents allege that 40% of the full lifetime allowable exposure is expended by the 16 years of SGP operations.

92. The $5.1x10^{-5}$ carcinogenic risk calculated for the SGP as TAPs requires does assume a 70-year basis. Figure 7 shows the application of the proper **maximum one-year annual average ambient air carcinogen concentration** (0.0125 $\mu g/m^3$) applied to the same 16-year LOM formulae used by the Respondents. After correcting for the 5-year rolling average and non-WEP adjustment factors disguised risk averaging steps, the cumulative risk after the16-year LOM is 1.2 x 10^{-5}.



93. This cumulative risk exceeds the allowable risk criteria by 20% using DEQ and Perpetua's calculation. Figure 7 also illustrates the effect of the serial application of SGP Project-specific 5-year rolling average and non-WEP Project-specific adjustment factors on cumulative cancer risk from the critical receptor viewpoint. Removing these dilution adjustments shows the individual receptor will experience a full lifetime allowable carcinogenic $1x10^{-5}$ equivalent exposure by year 13.

94. This opinion concludes that DEQs use of the ad hoc SGP Project-specific adjustment factors undermines the health protectiveness of the TAPs rule. The TAPs rule was specifically developed to avoid requiring risk assessment analyses by providing an inherent margin of safety (MOS). These SGP Project-specific adjustment factors facilitate cancer dose-averaging risk calculations that allow the SGP to significantly increase arsenic emissions

based on short-term Life of Mine (LOM) assumptions, but to nevertheless average the risk associated with those increased emission over 70-years.

95. This transfer of risk from the mine to the receptor's lifetime significantly reduces the MOS and negates the health protectiveness of the TAPs rule. The TAPs rule simply offers 10-fold increases in allowable risk, or emissions, for either 1) short-term projects of less than 5 years, or 2) T-RACT based relief based on available technology.

96. There is neither a provision, nor a need, for risk assessment if the TAPs Rules are properly implemented based on annual compliance with **maximum one-year annual average ambient air carcinogen concentration**. This application of the TAPs rule has served Idaho well for three decades. This policy change allowing risk averaging through the SGP Project-specific adjustment factors not only undermines the health protectiveness of the individual applicant source, but also the Statewide strategy that keeps all Idahoans safe with minimal regulatory burden.

DATED: October 4, 2024

Ian H. Von Lindern, P.E., Ph.D