CENTER for SCIENCE in PUBLIC PARTICIPATION

224 North Church Avenue, Bozeman, MT 59715

Phone (406) 585-9854 / Fax (406) 585-2260 / web: www.csp2.org / e-mail: csp2@csp2.org

"Technical Support for Grassroots Public Interest Groups"

December 29, 2022

To: Linda Jackson, Payette Forest Supervisor
500 N. Mission Street, Building 2
McCall, Idaho 83638
Email: linda.jackson@usda.gov
https://www.fs.usda.gov/project/?project=50516

Re: Stibnite Gold Project Supplemental Draft Environmental Impact Statement

General Comments

The Stibnite Gold Project Supplemental Draft Environmental Impact Statement (SDEIS) analyzes one open pit mining project proposal, with two access road alternatives. There are no mining alternatives analyzed. Underground mining had been eliminated from evaluation in the DEIS on the basis that underground mining in not economic, but this rationale is supported only by innuendo, not by technically defensible information. Because the potential for underground mining is heavily promoted by Perpetua in its feasibility studies, this mining alternative should have been included for more detailed analysis.

There are two very serious flaws with the technical analysis in the SDEIS. The first is the failure to include an analysis of the financial surety associated with reclamation and closure. The public is ultimately liable for this cost if the company cannot pay it, and it is liable for any difference between the amount eventually established by the Forest Service and the actual cost of reclamation and closure.

In the 2019 Prefeasibility Study, the cost estimate for the financial surety was $66.5 million. In the 2021 Feasibility Study that cost estimate increased to $100 million. These cost calculations are not included in the EIS analysis, only in the feasibility analyses, but they have potential significant financial impact on taxpayers and the public. There is no technical justification for delaying the analysis of these calculations, since the mining alternative has been determined, and the financial assurance calculations have already been done. The public deserves to be able to comment on these calculations as a part of the EIS.

The second serious flaw in the technical analysis is failure to include technical reference documents containing preliminary technical specifications and analysis of the tailings dam. The SDEIS refers to calculated factors of safety for both static and seismic considerations, provides the updated seismic risk analysis necessary to make these calculations, but is still lacking the basic engineering specifications for the dam itself. For example, there is no discussion of the fundamental type of dam construction (downstream or centerline?), the specifications for the fill for the different sections of the dam, and how the quality assurance for dam construction will be performed. Developing this information is standard procedure for an EIS, and since the fundamental dam design does not appear to have changed since at least 2017, there should have been more than sufficient time to develop this information.

Section-Specific Comments

2.2 Development of Alternatives

From a mining perspective, there is only one alternative analyzed in the SDEIS – the 2021MMP as proposed by Perpetua. The alternatives consist of two different access road options to the mine. As discussed further in Section 2.6.1.1 below, there are several good reasons for an underground mine alternative to be analyzed, and the EIS analysis has not conclusively demonstrated that underground mining is not economically viable. Hand waving arguments about a lack of economic viability do not provide sufficient justification to eliminate an alternative that could provide a significant reduction in environmental effects.

As now presented, there is no real alternative to the mining project proposed by Perpetua, in spite of the fact that the company proposes an extensive underground drilling prospect as a part of this project proposal, and has promoted several possible underground prospects to potential investors as a part of its most recent Feasibility Study (M3 2021).

The potential for underground mining should be viewed first in the light of a choice as an environmentally preferable SDEIS alternative. Underground mining would mean less waste disposal on the surface, and less disruption of existing surface water flows, while still allowing removal of the existing source of contamination proposed for the open pit mining alternative. In the haste to eliminate underground mining as a consideration, a potential environmentally preferable option is not being properly analyzed.

2.4.5.7 Ore Processing – Oxidation and Neutralization

The autoclave is a major component of the ore processing system, yet doesn't rate even a subtitled paragraph in the SDEIS, just a line here and there under other headings. An autoclave is very expensive to operate, requires pure oxygen from an oxygen plant, and because of the high operating temperature at which it operates, can be a major source of mercury in the exhaust. There is no discussion in the SDEIS about where the oxygen for the autoclave will be sourced. It must either be produced onsite in a local oxygen plant, which has potential hazards of its own, or it must be trucked in from an outside plant, with potential transportation liabilities. More information on the source and risks with oxygen must be provided.

The potential for mercury air emissions is acknowledged in the SDEIS, and a short description of the mercury collection system that would be employed is briefly discussed in another section. There is probably potential for other contaminants to be present in the autoclave air emissions, for example particulate arsenic, but there is no discussion of other potential autoclave air emission contaminants.

Any mercury in the ore processed in the autoclave is typically vaporized, and must be collected by an exhaust collection system. This collection system must be very efficient, because even at 99% efficiency enough mercury can escape to cause an air emission violation. Mercury was inadvertently discovered by the EPA in the early 2000s to be a major source of mercury emissions in autoclaves and roasters at mines in Nevada. These mines were emitting amounts of mercury equivalent to that from coal fired power plants, and at that time mercury emission controls for mines were not required and were not being utilized, even though the mines knew they were volatilizing significant amounts of mercury.

Because the mercury emission control systems must operate at a very high efficiency in order to conform to air quality requirements, monitoring their performance is very important. There is no discussion of the efficiency at which these control systems must operate, or how and when they will be monitored.

Autoclave operation needs to be given more importance than it presently receives in the SDEIS, and a thorough discussion of the monitoring for air emissions from the autoclave, mercury and any other potential contaminants, needs to be provided.

2.4.5.8 Tailings Storage Facility

The design, construction, operation, and closure of a tailings facility, primarily the tailings dam itself, is the most important mine-related structure to be analyzed in an EIS because of the potential environmental, economic, and public safety liabilities associated with a structure that must function properly for millennia. In a worst-case accident, tailings would be released causing environmental harm, the loss of property, and the loss of life.

Normally the references for an EIS would include a technical report from an engineering company experienced in the design, construction, operation, and closure of tailings dams. The SDEIS references do not include such a report. The SDEIS refers to the Feasibility Study (M3 2021) for many of its technically related comments on the tailings storage facility, but the feasibility study[1] itself does not contain technical information on the tailings dam.

The figures presented in the SDEIS, Figures 2.4-10 and 2.4-11, suggest that at least some preliminary engineering work has been performed, but there is no reference given for the source of these figures, which by themselves are wholly inadequate to permit the construction of a tailings dam. These figures also appear in the Feasibility Study (M3 2021), which contains a figure not included in the SDEIS, Figure 18-11 (M3 2021). Figure 18-11 is a cross section of the dam showing Zone B Fill and Zone C Fill, which constitute the major structural zones of the dam – but there is no explanation of how these zones will be constructed.

We do not know whether this dam would be classified as a downstream or centerline construction type. We do not know what type of stability analysis has been done on the dam, if any. Golder (2021) provides some of the information needed to perform this stability analysis, but does not discuss the stability analysis itself. This is critically important information, and should be included in the SEIS.

2.4.6.2 Underground Exploration

In the SDEIS, it is noted:

> *"Underground exploration activities could occur for the SGP throughout the life of the mine, such as the newly-discovered Scout Prospect, a 1-mile, downward-sloping tunnel … Approximately 100,000 tons of rock would be excavated from the decline."*

Underground exploration could potentially impact water quality and quantity, and involve the surface disposal of rock with as-yet defined geochemical properties, which could affect the type and level of contaminants that leach from this rock. Information on the predicted water quality and quantity impacts, the geochemistry of the waste that require surface disposal, and the closure plans for the underground workings should be presented in the SDEIS.

If an exploration project that included a 1-mile tunnel producing 100,000 tons of waste rock were proposed as an independent project, it would warrant an EIS. Yet the only information provided about this project is limited to the 10 sentences that constitute Section 2.4.6.2. The lack of information, data, and analysis in the SDEIS is insufficient to authorize an activity of this scope.

In addition, the Feasibility Study (M3 2021) contains an entire Section, *9.8 Potential High-Grade Underground Mining Prospects*, that discusses 5 separate underground prospects in the immediate vicinity of the Stibnite Gold Project (including Scout), consisting of 14 pages of information.

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[1] A feasibility study is fundamentally an economic analysis, not a technical analysis, of a proposed mining project. The M3 Feasibility Study (2021) is focused on the economic viability of the Stibnite Gold Project. It is not a design report for the tailings dam.

The two pages of information on the Scout Prospect in the Feasibility Study is devoted mostly to the mineral resource potential, but it is noted that Scout lies in the Scout Valley Fault Zone, and that the potential underground target is in the range of 2-5 million tons.

2.4.7.13 Post Closure Water Treatment

Post-closure water treatment, if required, typically doubles the amount of financial assurance required for a mine. For the Stibnite Project, the requirement for post-closure water treatment depend on two potential sources of contaminated water; (1) pit lake water in the West End Pit could exceed discharge water quality standards (SDEIS 2022, Section 2.4.7.5); and, (2) consolidation water from the tailings, and any ongoing seepage from the waste rock buttress (SDEIS 2022, Section 2.4.7.6).

According to the SDEIS, water treatment will no longer be required after Mine Year 40 (SDEIS 2022, Section 2.4.7.6). In order for this to occur, water treatment would no longer be required for the West End Pit, and the seepage from the tailings consolidation and from any buttress seepage would need to be de minimis.

The estimate for consolidation of the tailings, along with the cessation of seepage, at Mine Year 40 appears to come from the Tierra Group (2020).[2] This reviewer is familiar with one lined mine waste impoundment, the New World waste facility in Montana, where waste consolidation water has continued to accumulate since the impoundment was sealed, necessitating the annual pumping and disposal of accumulating water. This is probably due to liner leakage, but a definitive source of the accumulating water at New World has not been identified. All liners leak – it's just a matter of how much.

The Stibnite TSF Buttress contains a large amount of non-potentially acid generating material, and some potentially acid generating material (SDEIS 2022, p. 4-191). All of this material can leach antimony, arsenic, cadmium, chromium, copper, fluoride, manganese, mercury, nickel, lead, selenium, silver, sulfate, thallium, zinc, and total dissolved solids above surface water quality standards (SDEIS 2022, Table 4.9-3). The predictions are that the seepage will exceed groundwater quality standards for antimony and arsenic (SDEIS 2022, Table 4.9-4).

Low Grade Ore stockpiles could be left at mine closure. The seepage from any residual log grade ore would be worse than from the other waste in the buttress. Water quality modeling assumed the Low-Grade Ore would be processed prior to mine closure, but there is no guarantee this will happen.

The waste rock in the tailings dam buttress will have a liner on top, but no liner on the sides or bottom. A top liner is a good idea, but it does not guarantee de minimis seepage after the initial drain down of the waste. It is quite likely that seepage from the waste rock could exceed the 5% infiltration of incident water assumed in the SDEIS. Any seepage will contain high contaminant levels of antimony and arsenic. The actual infiltration rate and contamination loads can only be established by actually measuring seepage rate and contaminant levels post-closure, once all reclamation activities are complete.

The assumption for the SDEIS appears to be that there will be no seepage from the tailings after initial seepage drain down. In the SDEIS, it is noted;

> *"From Mine Year 41 onwards, it is expected that consolidation would be complete and pore water drainage from the tailings would cease (Brown and Caldwell 2021b)." (p. 4-207)*

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[2] In the *Tailings Consolidation Technical Memorandum, Tierra Group International, September 8, 2020*. This reference is not cited in the SDEIS, but it was provided as a part of the SDEIS reference package provided by the Forest Service. It is noted in Tierra 2020, "*The analyses were run for a total of 40 years, 14.25 years of deposition and 25.75 years of post-deposition when settlement is complete*." This is not the same as predicting that there will be significant seepage after Mine Year 40, but it is the only reference noted.

The interpretation of little to no post-closure seepage is supported by the data presented in Figure 4.9-3 Tailings Storage Facility Buttress Seepage Volume (SDEIS 2022), which shows the pop-out seepage and toe seepage going to zero after the liner is installed. In Figure 4.9-6 Tailings Storage Facility Seepage Volume (SDEIS 2022), cover infiltration and consolidation water are essentially zero after Mine Year 40.

Until an actual post-closure seepage rate can be established for both tailings drain down and buttress seepage, it is not reasonable from a public-liability perspective to assume seepage from the waste rock in the buttress will be low enough, and/or contain only low levels of contaminants, that there is no possibility that long-term treatment might be required. Provision for water treatment in perpetuity should be assumed until it can be demonstrated by post closure monitoring that water treatment will not be required beyond Mine Year 40.

If water treatment is needed for the West End Pit water, neither the need for, or the length of time required, has been established in the SDEIS. However, since the potential for Wend End water treatment has been identified, financial provision for West End Pit water treatment should be provided in the post-closure financial assurance.

The point to take from these concerns for the need for potential long-term water treatment is that there is significant uncertainty in the potential requirement for water treatment. Only empirical data collected post closure will confirm or deny this assumption. Geochemical and hydrological predictions covering post closure are not accurate enough on which to base major decisions.

2.4.7.14 Closure and Reclamation Financial Assurance

It is noted in this section,

> "*Perpetua would be required to post financial assurance to … provide adequate funding to allow the Forest Service to complete reclamation and post-closure operation, including continuation of any post-closure water treatment, maintenance activities, and necessary monitoring for as long as required to return the site to a stable and acceptable condition in the event Perpetua was unable to do so*."

When mines are developed on their lands, a financial assurance is required by federal land managers and many state regulatory agencies. The financial assurance is to cover the cost of reclaiming the disturbed surfaces of the mine, and to pay for all post-closure requirements. In this case, a significant part of the financial assurance will be for the cost of water treatment.

It is also important to note that the financial assurance does not cover the cost of a potential mine accident. The financial assurance only covers planned closure.

The financial assurance requirement is important for several reasons.

First, there have been numerous instances in virtually every state of mining companies going bankrupt and not having the financial resources to complete their closure obligations– for example, the Illinois Creek mine in Alaska, and the Zortman-Landusky mine in Montana. In these instances, the government regulatory agencies did not require enough financial assurance to cover the actual costs of mine closure. In British Columbia, it is estimated that the Province holds over $1 billion less than the full value for financial assurance required to reclaim BC mines. If the mining company cannot clean up and close the mine, then the public becomes liable either for the cost of cleanup, or for the environmental consequences of the damaged minesite.

There is significant political pressure to keep the costs of these financial assurances as low as possible in order to enhance the economic viability of the mine. In the past, this has led to significant underestimations of the amount of financial assurance required to close a mine after a bankruptcy.

Alaska, Montana, Nevada, South Dakota, and other states have been victims of this problem. In each instance, taxpayer dollars were required to augment inadequate financial sureties.

Second, the amount of money required to close the mine and to perform post-closure water treatment can be enormous. The present financial assurance for closure of the Red Dog mine in Alaska is $563 million, most of which is related to water treatment in perpetuity. At closure, the Red Dog mine is projecting to treat approximately 1.8 billion gallon/year, which drives the majority of the financial assurance requirement. Perpetual water treatment at Stibnite would add hundreds of millions of dollars to the closure cost, which must be covered by the financial assurance.

How the agency responsible for calculating the financial assurance to insure that public will not be saddled with these costs is an important issue that is being avoided in the EIS. Public disclosure, and an opportunity to review the cost calculations, is not only appropriate, but the potential financial and/or environmental impact on the public is also significant.

The National Environmental Policy Act requires federal agencies to undertake a pre-action analysis in the form of an Environmental Impact Statement (EIS) of potential environmental impacts for "major Federal actions" that may "significantly affect" the quality of the human environment. 42 U.S.C. § 4332(2)(C).

The Code of Federal Regulations, Title 40: Protection of Environment defines "human environment" as:

> ***§1508.14 Human environment.***
>
> *<u>Human</u> <u>environment</u> shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. (See the definition of "effects" (§1508.8).) This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment. (<u>emphasis</u> <u>in</u> <u>original</u>)*

If a financial guarantee is required to protect environmental values, like clean water and fish, then 40 CFR 1508.14 clearly suggests that the significant financial assurance required by agency regulations should be evaluated in an EIS. When a federal agency intentionally decides to ignore analyzing the requirement for a financial assurance to protect the environment, the message it clearly sends is that it is not confident in its ability to defend its financial assurance calculations to the public. Deferring the analysis of the financial assurance requirement until later in the permitting process expedites the permitting process, as well as make it more difficult, if not impossible, for the public to review and comment on the adequacy of the financial assurance requirement.

Reclamation and Closure costs are not only a significant factor for calculating the capital costs of a mine, but are also a potential major liability to the public if they are not properly calculated and managed. This means Reclamation and Closure costs could have a major potential impact on the economic environment of both the community hosting the mine, and the taxpayers who would be liable to pay the costs of reclamation and closure if the mining company becomes financially insolvent. Under the NEPA definition of "significant environmental impact", the potential impacts of an inadequately calculated financial assurance for the reclamation and closure of this mining project could have significant economic, social, and environmental impacts. The financial assurance should be analyzed as a part of this SDEIS.

In the SDEIS, it is important to disclose and analyze the assumptions that will be made in establishing the financial assurance the amount of post-closure financial assurance needed to protect the public if water treatment is required beyond Mine Year 40. At a minimum, tens of millions of dollars are at issue.

However, in the SDEIS it is noted:

> *"Calculation of the initial bond amount would be completed following the Record of Decision (ROD) when enough information is available to adequately and accurately perform the calculation." (SDEIS 2022).*

The information available at this stage of the mine design, and for the SDEIS analysis, is more than sufficient to analyze the Reclamation and Closure costs. In fact, those calculations have already been made in the Feasibility Study (M3 2021). The Forest Service has decided not to include them in the SDEIS. By doing so, the Forest Service is playing a classic game of "hide the ball".

In its 2021 Feasibility Study, M3 notes:

> *"Anticipated costs for closure and reclamation of the Stibnite Gold Project were developed utilizing the Standardized Reclamation Cost Estimator (SRCE) model currently used and developed in Nevada for mining specific projects, supplemented by site-specific costs and quantity estimates from the FS designs. This model has been utilized for mining projects on public and private land in Nevada and other western states for many years and is publicly available online through the Nevada Division of Environmental Protection." (M3 2021)*

As M3 notes, the Nevada Standardized Reclamation Cost Estimator is probably the most widely used spreadsheet model used to calculate the costs of reclamation and closure. I have used this model, and it contains of all of the sections necessary to calculate cost estimates for reclamation, closure, and post-closure activities, including perpetual water treatment, and the additional costs that would be incurred should a regulator be forced to conduct reclamation and closure activities if the mining company were to become financially insolvent.

M3 included the calculation of these costs in the Prefeasibility Study (2019) because they constitute a significant line item in the capital requirements for the proposed project. In its 2019 Prefeasibility Study, M3 calculated this cost at $66.5 million (M3 2019). This estimate included the cost of the financial surety/bond from a `financial institution.

For the 2021 Feasibility Study, as noted above, M3 stated the reclamation and closure cost calculation would be finalized after the Forest Service issued a record of decision. However, M3 did calculate a reclamation and closure cost, but listed it only as cost per ounce of gold produced. That cost was $24/oz produced. Using $24/oz produced, and the total life of mine production is 4,819,000 ounces of gold, I can calculate the total reclamation and closure cost of $100 million.[3] This is almost double the 2019 cost estimate of $66.5 million (M3 2019). The public is ultimately liable for this cost if the company cannot pay it, and it is liable for any difference between this amount and the actual cost of reclamation and closure, it the actual cost should be greater than the $100 million.

Why is there such a significant difference between the 2019 cost of $66.5 million and the 2021 cost of $100 million? Did the cost calculation assume water treatment for 40 years, or for treatment in perpetuity, which would be protective of the taxpayers? What assumptions were made for the Indirect Costs associated with a government agency assuming the responsibility for reclamation and closure? Indirect Costs typically vary between 25% and 45% of the direct reclamation and closure costs. What assumptions were used for the present value calculations to pay for post-closure water treatment, and for

[3] Based on the information available in M3 2021, the total cost can be calculated in two ways. First, the total ore milled is 104.6 Mt (Table 1-5) times the reclamation and closure cost of 0.95 $/t (Table 1-9), yielding a total cost of $99,370,000. The second way is to use the total gold produced of 4,217,000 oz (Table 1-9) times reclamation cost of $24/oz (Table 1-9) yielding a cost of $101,208,000. These figures are in close agreement, and I have rounded this to $100 million.

monitoring and maintenance? Who will manage the post-closure fund? What rate of return for the investment was assumed?

These are all questions that can be answered now, and those answers will not change between the present time and the issuance of the record of decision and permits for the mine. The financial assurance calculation is an issue that can, and should, be discussed now. The public deserves to know these answers, and deserves to be able to comment on them, as a part of the EIS. There is no reason to hide the ball.

2.6 Alternatives Considered but Eliminated from Further Detailed Study - 2.6.1.1 Underground Mining

The SDEIS does not provide adequate justification for eliminating underground mining as an alternative to be considered in the SDEIS. In explaining why underground mining was eliminated as a consideration in the SDEIS, the rationale presented begins by asserting:

> *"In aggregate, grades for these three deposits above a 0.48 grams per ton (g/t) gold cut-off grade averaged 1.43 g/t gold, 1.91 g/t silver, and 0.064 percent antimony (M3 2021).* ***Typical economic cutoff grades for underground mine operations are approximately 5 g/t gold****." (SDEIS 2022,* ***emphasis added****)*

The basic consideration for potential economic viability must begin by considering how much gold greater than the cutoff grade that has been identified, and whether this amount would justify underground mining. This is not addressed in the SDEIS analysis.

In addition, if underground mining were to take place, the cutoff grade would likely be less than the 5 g/t proposed in the SDEIS. The reference cited in the SDEIS, the Stibnite Gold Project Feasibility Study (M3 2021), has an entire section devoted to the discussion of "*Potential high-grade underground exploration prospects*" (M3 2021, Section 9.8). In that section M3 using "gold cutoff" values of 2.4 g/t and 3 g/t, both of which are well below the 5 g/t cited in the SDEIS. The SDEIS does not give a citation for its choice of 5 g/t as "T*ypical economic cutoff grades for underground mining …*". The 5 g/t cutoff grade is not mentioned in the Feasibility Study. The choice of a typical cutoff grade for underground mining in the SDEIS should at least be consistent with the information being presented to the company's potential inverters in its technical reports.

Unlike the Feasibility Study, which aggressively addressed the possibility for underground mining to potential investors, the SDEIS appears to avoid serious discussion of underground mining as a possibility by proposing underground mining is economically unfeasible, then failing to defend that premise with any quantitative analyses.

The potential for underground mining should also be viewed in the light of a potential choice as an environmentally preferable SDEIS alternative. Underground mining would mean less waste disposal on the surface, and less disruption of existing surface water flows, while still allowing removal of much of the existing waste sources of contamination proposed for the open pit mining alternative. In the haste to eliminate underground mining as a consideration, a potential environmentally preferable option is not being properly analyzed.

4.2.2.2 2021 MMP – Tailings Storage Facility and TSF Buttress

The stability analysis of the tailings dam is discussed in this section. The analysis is summarized in *Table 4.2-1 Calculated Factors of Safety for the TSF Embankment and TSF Buttress*. The analysis is based on a study performed for the original project as proposed by Midas Gold (Tierra Group 2017). The Tierra Group study uses the Site-Specific Seismic Hazard Analysis performed by URS (2013) as the basis for its seismic stability calculations. That study has been superseded by the Site Specific Seismic Hazard

Assessment (Golder (2021). Even though the Golder study reduces the calculated peak ground acceleration that it predicts could be experienced at the site, it is not clear that the spectral accelerations associated with the lower peak ground acceleration are less than those associated with the 2017 Tierra Group peak ground acceleration. The issue of spectral acceleration differences from the Tierra Group is not addressed by Golder. In addition, Golder notes that the only bedrock conditions were used for the ground motion conditions in the pseudostatic modeling (Golder 2021, p. 7). The center portion of the dam will be constructed on alluvial/glacio-fluvial valley sediments, with the left and right abutments bedrock (Golder 2021). It is not clear from the Golder-Tierra discussions why pseudostatic modeling is appropriate for a dam with several different foundation conditions, and whether two-dimensional modeling might better reflect the different dam foundation conditions.

In addition, the Tierra 2017 analysis, where the current static and seismic factors of safety were developed, did not cite an actual tailings dam design report as the basis for developing the model it used to conduct the pseudostatic analysis. As with the information provided for tailings dam design in the SDEIS, we do not know where the engineering specifications for the dam design come from. It appears that some actual engineering design work has been done, but there is no reference to it. We do not know what specifications have been required, for example the type of fill, and the quality assurance requirements that will be enforced. We do not know what assumptions were assumed in the factor of safety calculations. The level of design information presented for the tailings dam is insufficient to adequately review the dam design information used to calculate the factors of safety.

The use of pseudostatic analysis for dam of this size is questionable, even though pseudostatic analysis is often used for tailings dams. One of reasons for its wide acceptance is that it is less expensive to run than a two dimensional model. Although widely accepted, there are a number of long-recommended cautions about using pseudostatic modeling.

In 2005, the Federal Energy Management Agency published a report titled "*Federal Guidelines for Dam Safety Earthquake Analyses and Design of Dams*" (FEMA 2005). These guidelines, which are still current, contain a thorough discussion of dam modeling techniques. It has this to say about pseudostatic models:

> *"A pseudostatic analysis (sometimes called seismic coefficient analysis) should only be considered as an index of the seismic resistance available in a structure not subject to build-up of pore pressure from shaking. It is not possible to predict failure by pseudostatic analysis, and other types of analysis are generally required to provide a more reliable basis for evaluating field performance." (FEMA 2005, p. 35)*

and;

> *"Pseudostatic methods are generally discouraged and should only be used for screening from further consideration those dams where a seismic stability failure is highly improbable. … Dynamic time-history analyses are used to determine the displacements and stresses experienced by the dam and foundation. Evaluation of the results is used to determine if there is a risk of a stability failure." (FEMA 2005, p. 38)*

Cost is a paramount consideration for a tailings dam. A tailings dam does not produce revenue for a mine, it is an operational cost. Mines are always looking for ways to minimize the cost of waste disposal. The only reason for using upstream-type and centerline-type dam construction is to lower the cost of dam construction. Tailings dams are designed by engineering consulting companies, not by the mining companies themselves. As consultants, engineering consulting companies want to minimize cost to their clients. It is in their economic interest to do so. While this does not mean they would adopt dangerous practices, it does mean that lacking clear guidance to utilize the safest practices in the design, construction, operation, and closure of tailings dams, "site-specific" considerations do often lead to the employment of what would otherwise be considered suboptimal practices. Examples of these suboptimal practices include upstream-type dam construction, the use of saturated tailings impoundment closures to minimize cost, and pseudostatic analysis.

4.5.2.2 2021 MMP – Reclamation Cover Materials

The discussion in this section notes that the amount of cover/ growth material available for reclamation is only 48% of the amount of material that will be needed (p. 4-87). It is then noted that;

> *"Options being considered by Perpetua for developing additional GM for the SGP include: utilizing materials from off-site borrow areas and supplementing additional salvage of GM through composting."*

At this point, a commitment to supply the additional planned/required growth material is required. There is a danger is delaying this commitment until a later time, when there will obviously economic pressure to just say the amount of growth material available will be utilized to the "maximum extent possible", a commitment seen by this reviewer in other EISs. If the plan/promise in the EIS is to provide the remaining cover/growth material, then the commitment to do so should be clear.

4.7.2.2 2021 MMP – Mercury and Mercury Containing Materials

There will a significant amount of mercury produced by the mercury emission controls, presumably as elemental mercury, but the details on the mercury emission controls are not provided in adequate detail in the SDEIS. It is noted:

> *"… total mercury content in flasks and other waste streams to be disposed offsite is 10.9 tons per year with 10.7 tons consisting of metallic mercury in flasks."*

This is a significant amount of mercury, which will require disposal. In the SDEIS it is not stated where mercury emission control residue will be disposed. The responsible way to dispose of this mercury would be ship it to a designated mercury disposal facility. The other option would be to dispose of the mercury in the TSF. Although this is probably a legal option, it also this mercury potentially more available than it would be if disposed of in a designated mercury disposal facility.

In the following subsection (4.7.2.2 2021 MMP – Water Treatment Plant (WTP) Residuals), it is noted;

> *"The WTP would produce a residuals slurry that would be disposed in the TSF."*

It is clear from the statement that the TSF will be for the disposal of water treatment plant sludges, but it is not clear what will be done with the mercury emission control waste.

The disposition of the mercury from the emission controls is an important issue, and needs further disclosure and discussion in the SDEIS.

Reviewer's Background

David Chambers has 40 years of experience in mineral exploration and development – 15 years of technical and management experience in the mineral exploration industry, and for the past 25+ years he has served as an advisor on the environmental effects of mining projects both nationally and internationally. He has Professional Engineering Degree in physics from the Colorado School of Mines, a Master of Science Degree in geophysics from the University of California at Berkeley, and is a registered professional geophysicist in California (# GP 972). Dr. Chambers received his Ph.D. in environmental planning from Berkeley. His recent research focuses on tailings dam failures, and the intersection of science and technology with public policy and natural resource management.

This review was conducted at the request, and with the financial support, of the Idaho Conservation League and American Rivers.

Thank you for the opportunity to comment on this Supplemental Draft EIS.

Sincerely;

David M. Chambers, Ph.D., P.Geop.

References Cited:

FEMA 2005. Federal Guidelines for Dam Safety Earthquake Analyses and Design of Dams, Federal Emergency Management Agency, May 2005

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