

January 10, 2023

Ms. Linda Jackson
Payette National Forest Supervisor
500 N. Mission Street, Building 2
McCall, Idaho 83638

Dear Forest Supervisor Jackson,

I am submitting the following comments regarding the Supplemental Draft Environmental Statement for the Stibnite Gold Project (SGP). Unfortunately, the whole NEPA process for this project has been fraught with political meddling from both the proponent and the Forest Service from the beginning. The mine site operational plan proposed by Perpetua Resources (now referred to as the 2021 MMP) has changed constantly throughout the NEPA process rendering significant parts of the original DEIS analysis obsolete. This has left the Forest Service scrambling to keep up with the changes and consequently producing another hasty and incomplete analysis in the SDEIS. And the changes continue. The SDEIS identifies many parts of the plan that have not yet been described in sufficient detail to be analyzed.

This constantly moving target should leave the Forest Service with two choices at this point: 1) finalize the EIS choosing the No Action alternative, or 2) produce yet another supplemental DEIS that addresses all the new (and old) points raised in the substantive comments. I recommend the former, but if the FS still maintains (erroneously) that its decision options are curtailed by and subordinate to the Mining Law of 1872, then they had best prepare to up their game with a much more thorough analysis than the current woefully inadequate SDEIS.

I suppose I should at least mention my professional background with regard to this project just in case that has any bearing on the degree to which my comments are seriously considered. I am a retired geologist, hydrologist, minerals administrator, and reclamation specialist. I worked for the Payette National Forest from 1990 to 2015. I have spent quite a bit of time at Stibnite involved in reclamation projects in the early 2000s and later monitoring the activities of Midas Gold during the Golden Meadows Exploration Project. In late 2014 a draft copy of the original Stibnite Plan of Operations landed on my desk for my review, and I have been following this project closely ever since. I have worked and played in the South Fork Salmon River basin for the past thirty years and after much scrutiny of the SGP as it stands now, I am convinced that the project poses an unacceptable risk of permanent damage to multiple resources.

Where to start? How about the end game – “restoration”. A key slogan of the proponent, Perpetua Resources, is “Restore the Site”. I haven’t heard that much lately. Perhaps they read the SDEIS and the accompanying Soil and Reclamation Specialist Report which make it abundantly clear that post-mining reclamation (much less anything approaching true ecological restoration) success will be extremely difficult if not impossible to achieve. Having thought a fair bit about restoration options out at Stibnite during my tenure with the Payette NF, this comes as no surprise to me. Basically, there is very little soil to work with out there to begin with and what is there is of poor quality. To make matters worse, the Forest Service proposes to amend the Forest Plan to allow the total destruction of 17% of the project area soil (measured by TSRC). Aldo Leopold had this to say about that: “The destruction of soil is the most fundamental kind of economic loss which the human race can suffer.”

Soils & Reclamation

With regard to soil impacts and reclamation success, the following two issues are identified under the heading of Soils and Reclamation Cover Material (SDEIS p. 4-74).

Issue: The SGP may result in long-term adverse impacts to soil resources.

The definitive answer to the first issue is “yes it will”. Section 4.5.2.2 indicates that Total Soil Resource Commitment (TSRC) guidelines in the PNF Forest Plan to limit TSRC to 5% of activity area would be violated with the project leading to a TSRC of 17%. Reclamation activities would not reduce this amount as noted on p. 4-78:

“As a general rule, the processes responsible for restoration of soil productivity occur over a very long timeframe (centuries to millennia) and do not directly correlate to successful reclamation, which is mainly oriented to short-term objectives.”

And,

“Thus, the recovery of greater than 40 percent soil productivity within a 50-year timeframe is unlikely (Forest Service 2022c).”

This unavoidable conclusion led to the Forest Service proposing a Forest Plan Amendment (FPA) which would waive the TSRC guidelines. This action may have been avoided if an underground mining alternative had been seriously considered rather than being summarily dismissed early in the analysis. Such an alternative combined with paste tailings backfill would have a drastically smaller surface disturbance footprint than the 2021 MMP alternative. The Forest Service should at least consider whether such an alternative could avoid having to make this FPA.

As an aside, one wonders whether by giving the project a free pass on TSRC, can revegetation simply be foregone under the rationale that since the soil resource is irretrievably destroyed, what's the point in trying to accelerate soil development by a decade or two when it will take centuries or millennia to regain productivity? One would hope not.

Issue: Available RCM may not be of sufficient quantity or quality to achieve reclamation objectives of returning disturbed areas to productive conditions that sustain long-term wildlife, fisheries, land, and water resources, as defined in the Reclamation and Closure Plan (Tetra Tech 2021a).

This answer to this second issue is uncertain and raises a plethora of questions that are not encouraging. A host of negative factors suggest the ultimate success of reclamation (particularly revegetation efforts) at the site is very much in doubt.

Page 4-85 identifies the primary factors:

There are three primary challenges associated with the quality and suitability of available RCM for the SGP: (1) the overall relatively poor existing quality of the upland soils (unit mixed typic cryorthents) that make up approximately 62 percent of the salvageable volume at the SGP and Burntlog Route; (2) the long-term stockpiling of material; and (3) the high background concentrations of metals in the soil.

The deficit of salvageable soil is proposed to be addressed by a number of measures to improve both quantity and quality. These measures come up short on both counts. The quantity issue is addressed by bulking up the salvaged soils with wood chips to create what is termed “Growth Media” (GM). Depending upon a multitude of factors, the incorporation of wood chips into soil (particularly in the

volumes proposed) can deplete plant-available nitrogen. The effects of anaerobic conditions expected in stockpiled GM (SDEIS, p. 46) on nitrogen cycling, microbial activity, and overall soil health should be evaluated in the context of wood chip addition. Even after addition of wood chips a GM deficit of roughly 800,000 cubic yards remains.

The Reclamation Closure Plan (TetraTech, 2021a) proposes to use glacial till and colluvium/alluvium from the Yellow Pine pit to make up the deficit. This solution does not appear to be analysed in either the SDEIS or the Soils and Reclamation Cover Materials Specialist Report (U.S. Forest Service (Forest Service), 2022c). The Reclamation Closure Plan asserts that this material will be non-PAG/ML, but only provides average concentrations for arsenic, neglecting to mention antimony or mercury. Although the chemical suitability of this material is partially addressed, there is no mention of the other suitability criteria which likely rate it as fair to poor. This material would be stored separately from the other GM, but it is unclear how it will be used. If it is blended with the other GM when applied, this is likely to result in further decline in the suitability of already questionable quality GM. There is no explanation why 1.5 million BCY would be stored in the Fiddle GM stockpile when only 797,000 BCY are needed.

Stockpiling of the GM is another problem. Two primary factors are at play here. The depth of burial and the time in stockpiles. Both have deleterious effects on soil productivity. The proposed stockpiles are up to 200 feet high with residence times of up to 42 years. Despite a handful of mitigation measures proposed, the SDEIS at p. 4-87 concludes:

“Despite these measures the storage of GM within deep stockpiles for years would still result in the loss of soil productivity, which would affect the overall quality of this material at the time of placement.”

The quality of the usable GM leaves much to be desired from a physical, biological, and chemical standpoint. There is simply no getting around the fact that soils in the area are generally thin and of poor quality. Perpetua proposes to increase the organic matter content of the GM by adding alfalfa hay or compost to the GM (TetraTech, 2021a, p. 3-52). Both would be sourced out of southern Idaho, incurring significant transportation costs and GHG emissions. The Soils and Reclamation Cover Materials Specialist Report (p. 74) throws cold water on this idea, stating:

“The RCP identifies 10 tons per acre of compost would be incorporated into the top 3 to 6 inches of GM; however, the volume specified is minimal, translating to less than 0.25 inch of compost to be mixed into 6 inches of GM. This small amount of compost is not expected to provide sufficient long-term benefits to the GM that would be important for revegetation.”

Fertilizer is considered as another possible means of improving GM quality, however there is disagreement as to how the addition of phosphate fertilizer might affect plant uptake of phytotoxic arsenic. The Reclamation Closure Plan (p. 3-57) suggests bioavailable arsenic could be reduced, while the Soils and Reclamation Cover Materials Specialist Report (p. 77) states that arsenic solubility could be increased. Statistically robust greenhouse testing of the performance of the main reclamation plant species in phosphate amended GM should be required prior to field application of these fertilizers.

One consequence of the shortfall in GM and SBM volume is that the reclaimed areas have much less depth of GM spread over them than the depth of native material that is salvaged. For example, comparing numbers in Tables 3-5 and 3-7 in the Reclamation Closure Plan one can note that although salvageable SBM in wetlands extends to depths of up to two feet with another foot of suitable GM below that, the proposed application depth in all but one constructed wetland is a mere 2 inches of SBM

over 4 inches of GM. It seems likely that the productivity and functionality of these thinly veneered wetlands would be significantly reduced from the existing areas, yet no analysis of the influence of soil depth on wetlands function is included.

The Soils and Reclamation Cover Materials Specialist Report (p. 74) states that coarse woody debris would be scattered over reclaimed land but offers no estimate of the total volume required or where it would be sourced.

Climate change presents yet another challenge to successful reestablishment of vegetation and is only addressed in passing in the Climate Change Specialist Report (U.S. Forest Service (Forest Service), 2022b). Soil moisture and carbon content are expected to decline (p. 19). More frequent rain-on-snow events would increase erosion. Changes in precipitation, evaporation, and streamflow will affect vegetation growth. There is no discussion concerning the choice of revegetation species that could be more resilient to climate change.

Soils throughout the project area contain elevated levels of arsenic, antimony, and mercury which can have phytotoxic effects on plants. Appendix B of the Reclamation Closure Plan (Tetra Tech, 2021) attempts to address this issue and determine element concentration values that would serve to establish chemical suitability guidelines for Root Zone Material (RTZ). Why such guidelines don't appear to be applicable to GM is unclear and should be explained. A statistical analysis of soil samples concludes that:

"It is recommended that the upper-quantile values be used to assess whether on-site soils could support plant growth and development; therefore, the Chebyshev rule of inequality value for As, Hg and Sb of 450, 17 and 68 ppm, respectively, would likely provide a realistic yet conservative estimate of upper confidence limits of the mean concentrations in soil for the concentrations in soil (EPA 2015; ITRC 2012) that would be expected to support plant growth and development on site." (p. B-19)

The average mercury and antimony content of proposed RTZ material falls below these limits, however much of the development rock proposed for use as RTZ material greatly exceeds the 450 ppm limit for arsenic. This inconvenient fact is then immediately discounted by noting that vegetation on a previously reclaimed area with higher arsenic levels appears to be doing well. Section 5 of Appendix B then goes on to present a different approach using vegetation survival to justify a much higher arsenic suitability value of 3000 ppm. This conclusion rests on the data from just three soil pits located in one of the oldest reclamation sites in the project area. Why weren't any of the other previously reclaimed sites such as the Spent Ore Disposal Area, the Garnet Pit, or any of the exploration phase test plots chosen as well? Most of these sites are not doing very well as far as vegetation establishment (Soils and Reclamation Cover Materials Specialist Report, p. 77). Absent any rationale for site choice, this approach suggests a strong bias in site selection and sample number.

Given the numerous adverse factors and uncertainties noted above, the long-term success of the post-mining reclamation of the site is very much in doubt, with the final outcome conceivably being essentially an ecological sacrifice zone.

Then there's reclamation bonding. The Forest Service needs to explicitly state that all financial assurance instruments for the bond meet federal guidelines that preclude the use of corporate

guarantees. Perpetua successfully lobbied to get the State of Idaho to accept corporate guarantees which are expressly forbidden by the Forest Service after the spate of huge defaults in the 1990s. If the State of Idaho ends up setting the bond for the private parcels at Stibnite, the Forest Service needs to increase their bond to account for the potential for contaminated surface water and/or groundwater to travel onto Forest land in the event that Perpetua defaults on their State bond.

Water Quantity and Quality

Increasing lack of access to freshwater resources is a well-documented global trend. In terms of essential benefits to humans, freshwater is far more valuable than any amount of gold. The SDEIS analysis of effects to water resources is somewhat improved over the previous DEIS, but the results are still fraught with such a high degree of uncertainty, that the Forest Service will be hard pressed to base any reasonably defensible decisions on it. Future predictions by their nature contain uncertainty, but more thorough analysis could have been done to reduce that uncertainty, yet that did not happen. The reliance on "industry standard" methods often sets a much lower bar than the "best available science" that NEPA calls for.

Way back when that first draft plan landed on my desk at the Forest Service, I told my boss that the FS had better retain the services of some top-notch geochemists and hydrologists well versed in numerical modeling if they hoped to conduct an adequate analysis of the project. I even suggested a few names. Well, that went nowhere and now eight years later it is apparent that this still hasn't been done. Almost all affected resources are linked to water in some way and the predicted effects to those resources are dependent upon predictions of water quality and quantity. These predictions are all based on computer models produced by contractors hired by the project proponent. The lack of any critical review in the SDEIS of the model data inputs, assumptions, conceptualizations, and process steps suggests that either the Forest Service and its NEPA contractors did not have the experience to conduct an in-depth critique, or that they simply accepted the model results at face value. The Forest Service needs to address the following model-related issues, and to do this they need expertise that is currently lacking.

Two basic problems the public had in conducting a thorough review of this project were the brief comment period which was inappropriate considering the length and complexity of the document, and the lack of supporting information provided by the Forest Service. At the beginning of this comment period the FS website was missing several key documents that were cited in the SDEIS. Some of these documents were eventually added to the site (often too late to review thoroughly) throughout the comment period. Others were flat out refused to be added. A prime example of this is the following reference:

Tierra Group International, Ltd., 2013. Golden Meadows Pre-Feasibility Engineering Climatology Data Review and Recommendations. Issued to Midas Gold 4 December 2013.

This particular document was foundational in determining climatology input parameters for the Meteoric Water Balance (MWB), therefore I am prevented from evaluating whether the choice of dataset was appropriate. The Forest Service needs to obtain this document and review the conclusions. A basic problem with the climatology data is the fact that there are only a few years of site-specific data. The alternative PRISM dataset is based on extrapolated precipitation and temperature data primarily from SNOTEL sites far away from the project site. The following excerpt from the Water Quantity Specialist Report raises some questions.

A long-term climatological record is not available for the SGP. Therefore, Parameter-elevation Regressions on Independent Slope Model (PRISM) data compared with the National Weather Service and Snow Telemetry (SNOTEL) Secesh Summit site is used to develop average precipitation and temperature estimates (Table 6-1). The Secesh Summit site is located 35 miles northwest of the SGP, at a comparable elevation (Brown and Caldwell 2017).

First of all, since the PRISM data is based on SNOTEL data the utility/validity of comparing it with a dependent variable (a single SNOTEL site) is questionable. Then one wonders why the Secesh site was chosen for this comparison. The elevation is only comparable to the valley floor at Stibnite, not the surrounding uplands. The Deadwood Summit SNOTEL site is of similar elevation and much closer to Stibnite than Secesh Summit. Why wasn't this used? It appears that there are many other steps in the MWB model, however the model is proprietary so confirmation of its validity is not possible unless the Forest Service can obtain the program from Brown & Caldwell.

The glaring fundamental flaw in the MWB model is a failure to take climate change into account. The project effects are expected to extend up to 100 years into the future. To rely on a dataset from the present back to 100 years in the past is absurd. Was this a case of overlooking the obvious, or willful ignorance? Having cobbled so many different models together for this analysis, was there some reason why even rudimentary climate projections were not accounted for? All subsequent model outputs rest on this MWB. The term "castles made of sand" comes to mind. The Forest Service needs to demand that climate change considerations are incorporated into all modeling. The latest CEQ guidance (CEQ-2022-0005) on the matter is clear:

As discussed in this guidance, when conducting climate change analyses in NEPA reviews, agencies should consider: (1) the potential effects of a proposed action on climate change, including by assessing both GHG emissions and reductions from the proposed action; and (2) the effects of climate change on a proposed action and its environmental impacts.

The subsequent hydrologic models suffer from a variety of shortcomings. Sensitivity and uncertainty analyses were done for some, but not all models. Output from one model serves as input for another in many cases, greatly compounding uncertainty. Was this accounted for and quantified? Some models (e.g. the SHSM) are created using the MWB and MODFLOW6, but appear to be coupled in only one direction. It is not clear how evapotranspiration (ET) was modeled in the MWB. It appears that potential ET was used (Site Wide Water Balance, p. 38) instead of actual ET. This introduces significant error in the MWB. The ET tool available for MODFLOW6 may do a better job. The use of monthly timesteps in various models is not particularly useful when analyzing effects to fisheries since hydrologic events (e.g. rain-on-snow events that are expected to increase in frequency with climate change (Espinoza, et. al., 2018) that can have significant impacts to fish habitat are averaged out thus failing to account for their out-sized impacts on channel morphology. Previous recommendations to use fully-integrated, physically-based, daily timestep models (of which there are plenty of choices) seem to have been ignored.

The Water Quantity Specialist Report at page 85 makes a blanket excuse for failing to adequately evaluate model uncertainty by selectively paraphrasing Rzepecki (2012), claiming it would be too expensive and time consuming.

Many of the other, more sophisticated approaches listed above for evaluating model uncertainty can be quite involved and, due to limitations of software and hardware, combined with the budgetary and time constraints of most projects, are still not practical outside of the realm of research (Rzepecki 2012).

Rzepecki acknowledges the difficulty of implementing better approaches, but does not consider them impractical and goes on to present a simplified approach that compares favorably with Calibration-Constrained Monte Carlo methods. Why was this approach not subsequently investigated? Rzepecki's paper is ten years old and there are likely significant improvements made in uncertainty analysis since then that should be investigated. The expense excuse doesn't hold much water when one considers that Perpetua has just received a huge Department of Defense grant earmarked to conduct further environmental studies. So do it.

Other model-related issues

The SHSM model boundary is located too close to the YP pit which will produce erroneous groundwater drawdown predictions. The Meadow Creek alluvial aquifer needs further testing. This is the most extensive aquifer in the project area, and expected to supply most of the groundwater for process makeup water, yet it has only received one aquifer test that supports the modeled Gestrin feature. Given the usual heterogeneous properties of glacial outwash deposits, further aquifer testing would seem to be warranted to confirm model predictions.

There are errors in the West End pit lake model. The Meadow Creek Fault Zone was modeled, but the West End Fault Zone (WEFZ) was not. Why? Given the fact that wells drilled into the WEFZ have produced up to 50 gallons per minute of high-concentration arsenic water (Rygh, 2015), and that the fault strikes northeastward under Sugar Creek, the Forest Service should investigate the possibility that it could form a preferential groundwater flow path from the West End pit lake to Sugar Creek.

Other hydrologic issues

Speaking of the West End pit lake, the SDEIS at 2.4.7.5 states that if spillage of surface water from the West End pit lake becomes imminent, a portable system would be brought to the site to treat and discharge pit lake water to maintain levels below the rim of the lake and prevent uncontrolled release of lake water. So would this option be in place forever? Would the Forest Service assume responsibility for this after all reclamation bonding has been refunded to Perpetua?

The protection of springs, seeps, and associated groundwater dependent ecosystems (GDEs) appears to be non-existent. Impacts are discussed on page 4-162 of the SDEIS but only springs within the model-predicted 10-foot groundwater drawdown would be monitored for any changes. To imagine that effects (e.g. reduction/cessation of flow, death of dependent flora & fauna) would not occur with less than 10 feet of drawdown is completely unrealistic. The proposed solution to this potential problem is to monitor select seeps and springs (SDEIS, p. 4-178) and if groundwater drawdown is not behaving as predicted, then maybe do some more monitoring to maybe figure out what to do about it. Seriously. It appears that this mitigation is designed to validate groundwater modeling, not protect GDE resources. Since Perpetua is diverting water left and right out there, perhaps a mitigation measure of supplemental watering of at least the highest priority (in terms of unique GDE components) is warranted if they become dewatered by drawdown.

There does not appear to be any discussion of the effects of using geosynthetic liners in stream reconstructions (during & post-mining). Of particular relevance are the implications of curtailing any surface water / groundwater exchange through the hyporheic zone. Despite the significance of hyporheic zones to aquatic biota, the term is mentioned only in passing in section 3.12.4.1 of the SDEIS where it states:

“...there are diurnal variations and hyporheic conditions that protect the eggs and alevins reducing mortality rates. Therefore, while summer temperature thresholds may show zero miles of suitable habitat, this may not be a true representation of the conditions in the river.

This appears to suggest that hyporheic flow may act to mitigate the poor temperature predictions of the model while simultaneously questioning the real-world validity of the model. Interesting. Oddly enough no synoptic surveys were conducted in the area streams to determine losing and gaining reaches, so little is known about the existing conditions of groundwater flux. If, for example a lined reconstructed stream replaces a natural reach which was gaining during summer base flow conditions, a source of cold flow upwelling into the hyporheic zone would be lost. This would have deleterious effects on the survival of various salmonid eggs and fry. If the proposed stream channel reconstructions incorporate a significant amount of clean non-PAG/non-metal leaching material into the floodplain within the lined volume, that may act as a limited perched water table / hyporheic zone that could drain to base flow in the summer months. Whether this would be enough to replace the natural groundwater contribution to base flow would depend on the storage volume of that material. Have any mitigations addressed the potential loss of hyporheic flow?

To ensure protection of groundwater the State of Idaho would be required to set Points of Compliance. The Forest Service should be involved in this process as much as possible. Three points should be set; one on the East Fork South Fork Salmon River (EFSFSR) just above the confluence with Sugar Creek, one on Sugar Creek just above the confluence with the EFSFSR, and one on Meadow Creek just above the confluence with the EFSFSR. These should utilize paired wells (or isolated sampling intervals within one wellbore) to monitor both alluvial groundwater and bedrock groundwater. Corrective actions should be specified should threshold contaminate concentrations be exceeded.

Water Quality / Geochemistry

Many issues with the geochemical modeling remain in the SDEIS. Unfortunately I have run out of time to address them, and other commenters have done a more thorough job. I will simply reiterate the concerns expressed by D. Kirk Nordstrom (Nordstrom, 2019) in the original DEIS comments. I have attached a copy of his review. Some of the points he raised have since been addressed in the SDEIS and can be ignored, while I have a strong suspicion that other fundamental problems have not been corrected. Please consider his points carefully, as there are a few other geochemists with his level of expertise.

Conclusions

I want to close this letter with a few observations outside the realm of hard science. I came to McCall thirty three years ago specifically to work for the Payette National Forest. I was hired on as a Hydrologist Technician to design and implement the first watershed rehabilitation projects under the newly formed Watershed Improvement Program. I spent the next nine years studying how water flows across and beneath the landscape of West-Central Idaho. When I worked with other scientists on interdisciplinary teams to ensure projects were protective of water resources we felt a certain esprit de

corps because in some way most of us had internalized solid land stewardship ethics. I don't sense that much any more from the Forest Service. Between the Trump administration's war on science, the isolation of the workforce brought about by the pandemic, and the passing of analysis work off to contractors, the ability to holistically comprehend complex projects has diminished. So here I sit grinding through review and critique of this project doing pro bono work that the Forest Service should have been putting a lot more effort into from the get go.

I've hiked countless miles over the mountains and down the rivers of this remarkable country and it's seeped deep into my bones. As William Faulkner opined, we do not own the land, it owns us. This proposal to create a massive industrial complex in our spectacularly wild backcountry is an abomination. The water will suffer as a result, restoration is a pipe dream, antimony will benefit neither security nor sustainability, and the rich will get richer. Executive Summary: Choose the No Action alternative.

References (submitted separately through electronic comment portal)

Council on Environmental Quality, 2023. *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*. Federal Register, Vol. 88, No. 5.

Espinoza, V., D.E. Waliser, B. Guan, D.A. Laers, and F.M. Ralph, 2018. *Global Analysis of Climate Change Projection Effects on Atmospheric Rivers*. Geophysical Research Letters.

Nordstrom, D.K., 2019. *Review of Midas Gold Reports on Site-Wide Water Chemistry and Geochemical Modeling*. Unpublished report in Stibnite Gold Project DEIS comment record.

Rzepecki, P.A., 2012. *"Qualitative Model Predictive Error Analysis" – a Protocol for a Simple Practical Application*. Published in the Proceedings of the Hydrology and Water Resources Symposium 2012, Sydney, Australia, 19-22 November 2012. ISBN 978-1-922107-62-6 Engineers Australia.

Rygh, J.T., 2015. *Analysis of the Potential Effects to Groundwater Resources from the Proposed Golden Meadows Exploration Project (2015 Revision)*. Unpublished report in Golden Meadows Exploration Project Record. Payette National Forest.

Best Regards,



John Rygh
Geologist/Hydrologist, Retired