Memorandum

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RE: Lack of Hydrologic Basis for BLM and USFS Decision to Reject Renewal of Twin Metals Minnesota's Mineral Leases and Potentially Withdraw Federal Minerals in the Rainy River Watershed

Summary and Key Findings

This document reviews the Bureau of Land Management (BLM) and United States Forest Service (USFS) decision to propose withdrawal of federal minerals from within the Rainy River Watershed. The BLM/USFS decision rests on an assumption that there is a hydrologic pathway for constituent migration from the TMM leases to the Rainy River Watershed and Boundary Waters Canoe Area (BWCA Wilderness). The key findings included in this document are as follows:

- The BLM/USFS decision does not rely on any site-specific data for hydrologic characterization that meets scientific, industry, or regulatory standards for site characterization.

- The BLM/USFS decision does not rely on any site-specific hydrologic model analysis that meets scientific, industry, or regulatory standards for model construction, calibration, sensitivity analysis or predictive analysis as is routinely required by regulatory agencies.

- The BLM/USFS decision disregards what resources will be mined, how they will be mined, where important facilities will be located, how those facilities will be engineered, how those facilities will be monitored and maintained, and how the operation will be closed.

- The only published hydrologic analysis of potential impacts from the TMM leases is from the Journal of Hydrology (Myers, 2016) and does not meet scientific, industry, or regulatory standards. To the degree that this paper influenced BLM/USFS thinking, the work product rests on no site-specific data, does not meet standards for model construction and analysis, does not reflect an engineered mine plan and engineering controls, assumes development of multiple mineral resources, and fails to consider important locational features.

- TMMs hydrologic data collection program is currently underway and the data has been submitted to the BLM. This data indicates that there is no or minimal potential for a hydrologic pathway from the mine to surface waters in the Rainy River Watershed.

- Based on the above, the BLM/USFS decision is deficient in that it ignores TMM's data and is not based on a demonstrable hydrologic pathway for impacting water quality in the Rainy River Watershed.

- The USFS citation of the number of mines impacting waterways on USFS managed land refers to legacy mining operations prior to the advent of modern mining and regulatory programs. Furthermore, the citation that 8,000 to 16,000 kilometers (km) of streams are impaired from these operations is not substantiated. Moreover, both the BLM and USFS ignore the fact that they have permitted, since 1990, over 3,000 new hardrock mines and none of them have been placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List.

- In the absence of site-specific hydrologic characterization data, a hydrologic model developed in accordance with accepted industry standards and the incorporation of an actual mine plan, it is not possible to conclude that there is or is not a pathway for migration of constituents of concern into the BWCA Wilderness and impairment of those waters. Absent these industry-standard and agency-required practices and information, no scientifically defensible conclusions of can be drawn about any aspect of Project impacts, to water resources or any other component of the natural environment or human and socio-economic concerns.

Background

On December 15, 2016, BLM and USFS announced the initiation of steps to withdraw mineral leases in the Rainy River watershed. The announcement referenced concerns presented in the USFS letter denying consent to renewal of the TMM leases. The USFS letter cited "grave concerns" that development of copper sulfide-ore in the Rainy River Watershed risks seriously impairing the water quality and ecosystem of the BWCA Wilderness.

In their December 14, 2016 letter to the BLM, the USFS cited a number of concerns with respect to renewal of the mineral leases. These concerns include acid mine drainage (AMD), leaching of metals, and hydrologic migration of liberated constituents of concern into water resources that flow into the BWCA. In essence, the USFS's concern is that the mining of

sulfide ores will lead to the migration of metals and acid into water resources that flow into the BWCA Wilderness. Specific claims made by the USFS to substantiate their concern include:

- Oxidation of sulfide minerals creating sulfuric acid and leaching of metals.
- Citation of the number of mines that exhibit AMD on lands managed by the USFS and waterways that have been impacted.
- Water from the mine could potentially enter streams and lakes through wastewater treatment plant discharges, uncollected runoff and leakage, spills, accidents, tailings dam failures, water collection and treatment operation failures, and post-closure failures.
- A direct flow of water from lands subject to TMM's leases to the BWCA Wilderness.
- USFS belief that TMM's plan will involve development of four delineated ore bodies, all of which drain into the BWCA Wilderness.
- USFS belief that all of the waste rock and tailings to be managed at the surface will be located in the Rainy River Watershed and that all the materials will exhibit AMD and metal leaching thus creating a source and pathway for constituents of concern to enter the waters flowing into the BWCA Wilderness.

Nowhere in the December 14, 2016 letter to the BLM does the USFS cite specific data or analysis that: 1) demonstrates AMD will occur with the materials that could be mined by TMM, or 2) demonstrates a pathway for migration of metals and constituents of concern from TMM facilities to waters flowing into the BWCA Wilderness. The BLM/USFS decision to propose withdrawal of federal minerals is premised, in part, on assumptions with respect to AMD and migration pathways to waters that flow into the BWCA Wilderness, and on assumptions regarding locations of Project facilities that are not consistent with current Project concepts. This document establishes that with respect to potential migration pathways to waters flowing into the BWCA Wilderness, that the BLM/USFS opinion does not meet standards normally applied by regulatory agencies to affirm their decisions. Typically, regulatory agencies require rigorous hydrologic investigations, analyses, and models to assess important policy decisions associated with the potential for Project impacts. These hydrologic investigations, analyses, and models that properly incorporate potential mining features are not cited by the BLM/USFS and to our knowledge have not been developed. Specifically, this document presents a summary of the following:

- Standard of Care for Hydrologic Investigations, Analyses, and Application/Development of Hydrologic Models to Assess Migration Pathways.
- Use of Hydrologic Models in Support of Regulatory Decision Making in Regard to Migration Pathways and Assessing Risks to Potential Receptors.
- Journal of Hydrology research paper Assessment of Migration Pathways and BLM/USFS Decision on Nonrenewal.

- Failure to Establish Basis for Hydrologic Pathway to Contaminate Waterways.

- Failure to Consider Other Information Related to BLM and USFS Administered Mining Operations.

- Minimal Potential for Water Quality Impacts in Area of Concern.

Standard of Care for Application/Development of Hydrologic Models to Assess Migration Pathways

In the course of carrying out their administrative functions, regulatory agencies tasked with administering the development of natural resources and protecting the environment routinely require and rely upon the development of hydrologic (groundwater and surface water) models to guide their assessments of proposed decisions. This applies to both federal and state agencies, and based on experience, applies to any regulatory decision-related mining. These hydrologic models are required to conform to scientific and industry accepted standards guiding data collection and hydrologic model development and use.

Need for Site-Specific Baseline Hydrologic Data

The development of a hydrologic model begins with the collection of baseline and site-specific data. This data collection process is typically costly, time consuming, and broad based. The norm for hydrologic data collection involves a progression of multiple stages of investigation, analysis, and data collection that conform to accepted standards. A partial list of potentially applicable standards under which hydrologic characterization and data collection are conducted includes:

- ASTM D4043 Guide for Selection of Aquifer Test Method in Determining Hydraulic Properties by Well Techniques.

- ASTM D4044 Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers.

- ASTM D4050 Test Method for (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems.

- ASTM D4106 Test Method for (Analytical Procedure) Determining Transmissivity and Storage Coefficient of Nonleaky Confined Aquifers by the Theis Nonequilibrium Method.

- ASTM D5912 Test Method for (Analytical Procedure) Determining Hydraulic Conductivity of an Unconfined Aquifer by Overdamped Well Response to Instantaneous Change in Head (Slug).

- ASTM D5920 Test Method (Analytical Procedure) for Tests of Anisotropic Unconfined Aquifers by Neuman Method.

- ASTM D4448 Standard Guide for Sampling Ground-Water Monitoring Wells.
- ASTM D6452 Standard Guide for Purging Methods for Wells Used for Groundwater Quality Investigations.
- ASTM D6089 Standard Guide for Documenting a Groundwater Sampling Event.
- ASTM D5903 Guide for Planning and Preparing for a Groundwater Sampling Event.
- ASTM D6911 Guide for Packaging and Shipping Environmental Samples for Laboratory Analysis.
- SW-846 6020 Inductively Coupled Plasma-Mass Spectrometry for the analysis of metals.
- EPA 200.8 Determination of Trace Elements in Waters and Wastes by ICP-MS.
- ASTM D516 Standard Test Method for Sulfate Ion in Water.
- EPA 300.0 Inorganic Anions (e.g., sulfate) by Ion Chromatography.

Accepted standard of care data collection routinely includes:

- Installation of numerous borings to define hydrostratigraphic units.
- Installation of numerous monitoring wells (and subsequent potentiometric and water quality monitoring programs) to map groundwater flow paths, delineate hydrostratigraphic units, and establish baseline groundwater quality.
- Installation of surface water monitoring stations to quantify baseline seasonal flow conditions and surface water quality.
- Analysis and delineation of groundwater and surface water interactions.
- Water budget studies to estimate site-specific recharge, evaporation, and baseflow.
- Characterization of hydraulic conductivity and storage characteristics of the various hydrostratigraphic units through pumping tests, slug tests, single and multi-borehole packer and pumping tests, etc.

Standards for Model Construction

Construction of a hydrologic model to assess potential migration pathways is based on the data derived from the site characterization program. Per accepted practice and standards, model construction progresses through a number of fundamental steps including:

- Selection of the numerical model (modeling code) that will adequately simulate the documented hydrologic conditions at the site.

- Definition and selection of the modeling domain (the area that is going to be modeled).

- Selection of hydrologically defensible boundary conditions to represent the boundaries of the modeled area and important surface water features.

- Horizontal discretization of the model.

- Vertical discretization of the model to appropriately represent hydrostratigraphic features and operational features that could affect migration pathways.

Standards to which model construction should adhere include the following:

- ASTM D6170 Guide for Selecting a Ground-Water Modeling Code.

- ASTM D5447 Guide for Application of a Ground-Water Flow Model to a Site-Specific Problem.

- ASTM D5880 Guide for Subsurface Flow and Transport Modeling.

- ASTM D5609 Guide for Defining Boundary Conditions in Ground-Water Flow Modeling.

- ASTM D5610 Guide for Defining Initial Conditions in Ground-Water Flow Modeling.

Hydrologic Model Calibration

After construction of the numerical model, the next step in model development is model calibration using site-specific data in conformance to accepted industry standards (ASTM D5981 Guide for Calibrating a Ground-Water Flow Model Application, and Anderson, et al., 2015). This generally involves calibrating the model to observed groundwater elevations and surface water flows. Typically, model calibration is carried out so that the model matches average or "steady state" groundwater level and flow conditions based on field measurements that capture seasonal variability. To improve model reliability, practitioners will also calibrate to transient conditions that result from natural or test-induced stresses to the hydrologic system. This can involve calibration to large scale pumping tests or to natural system stresses such as droughts or seasonal baseflow/stage fluctuations involving surface water bodies. The goal is to rigorously calibrate the model to natural conditions so as to gain confidence in the model's ability to adequately assess system behavior under proposed conditions. Standards (ASTM D5981 Guide for Calibrating a Ground-Water Flow Model Application, ASTM D5490 Guide for Comparing Ground-Water Flow Model Simulations to Site-Specific Information, Anderson, et al., 2015) have been developed to define what constitutes acceptable calibration based on comparison of modeled data vs. site-specific data, modeled mass balance errors and other numerical checks and statistical analyses of the modeled output.

The standard of care for groundwater modeling associated with mine planning and permitting commonly includes calibration to site-specific groundwater elevations (potentiometric head elevations). When available and appropriate, calibration using fluxes to/from surface water bodies as calibration targets is also common. At present, the only site-specific data suitable for calibration target use that has been collected and made publically available is stream/lake discharge and stage data gathered in the Project vicinity by the state of Minnesota and the U.S. Geological Survey. The Project has begun collection of groundwater elevation data, however, no groundwater elevation data set suitable for use as a calibration target set is publically available. As such, no meaningful project-specific model development or assessment of groundwater pathways is possible by any non-project entity at this time.

Hydrologic Model Sensitivity Analysis

Upon completion of the calibration, the next step in the development of a hydrologic model is sensitivity analysis. In this phase of model development, the practitioner varies calibrated model parameters such as hydraulic conductivity values, storage coefficients, recharge, and boundary condition values to test the sensitivity of the model to various changes in model inputs. This process is completed in conformance to accepted standards (ASTM D5611 Guide for Conducting Sensitivity Analysis for a Ground-Water Flow Model Application, and Anderson et. al., 2015). In performing this step, the practitioner identifies the model parameters most influential on modeling results. This information informs conclusions and decisions associated with uncertainty in model input parameters and the implications of that uncertainty on model projections. Sensitivity analysis is also used as a basis for guiding subsequent field investigations aimed at reducing model uncertainty and improving the reliability of modeling projections.

Model Predictions and Uncertainty Analysis

After completion of model sensitivity analysis, the model is then used to assess/predict future conditions based on a proposed development scenario. As was the case with the previous steps, model predictions and uncertainty analysis are carried out according to accepted standards (ASTM D5447 Guide for Application of a Ground-Water Flow Model to a Site-Specific Problem, and ASTM D5880 Guide for Subsurface Flow and Transport Modeling). In the case of a mining operation, questions that are typically addressed include:

- How much groundwater will flow into the mine?
- Will mine dewatering negatively affect groundwater levels, stream flows, spring flows, water levels in lakes and other surface water bodies?
- Will mine dewatering adversely impact existing water supply wells?
- Will constituents associated with the ore body, ore processing, or mine waste be released into groundwater or surface water, and if so, at what levels?
- What are the migration pathways, travel times, and receptor impacts associated with constituents that may be released or mobilized as a result of mine operations?

During the predictive phase of modeling, model parameters are typically varied over ranges defined through model sensitivity analysis to evaluate the effect of uncertainty on predicted impacts. This is sometimes carried out through the incorporation of probabilistic models used to derive a statistically-based level of confidence in the range of potential outcomes, or a probability based assessment that the site will or will not meet established water quality criteria.

It is through this process of rigorous field investigations, data collection/analysis, and model development in conformance with accepted standards that hydrologic models are developed to assess important questions related to potential impacts to water quantity and quality from proposed natural resource development projects.

Use of Hydrologic Models in Support of Regulatory Decision Making in Regard to Migration Pathways and Assessing Risks to Potential Receptors

In using hydrologic characterization and modeling to assess mining projects, regulatory agencies not only require that hydrologic characterization and model development/ application be conducted in accordance with established standards as described above; the agencies also require that data collection, testing, and modeling incorporate pertinent features of the proposed Project to provide a quantitative basis for evaluating their potential impact on water resources (groundwater and surface water quantity and quality). Project-specific features for which agencies require detailed hydrologic impact assessment via a synthesis of site characterization, data analysis, model development, and engineering alternatives analysis include:

- A model-based representation of the mine that is being proposed (open pit or underground workings) including a temporal treatment of the pit or workings as a function of time.

- A model-based impact analysis incorporating engineering design properties for major Project facilities, including:
  - Waste rock storage facilities.
  - Tailings storage facilities.
  - Water retention basins.
  - Water treatment and discharge.
  - Project reclamation plans including closure of the mine and tailings storage facilities.

- Geochemical analysis and modeling of the mined materials applied to water resources impact assessments associated with waste products, wall rock in pits or workings, and pits and workings following reclamation and closure.

In assessing potential Project impacts, the hydrologic and related models are expected or required by agencies to reflect the actual locations of the facilities and the engineering designs that reflect actual construction plans. Typical engineering plans that are incorporated into the assessment include plans and designs of lined facilities for storage of tailings and Project wastewaters, mine reclamation plans, including pit or workings backfill if proposed, and post-closure operation and maintenance plans. Other Project features that are typically

incorporated into hydrologic models for proposed mining projects include site monitoring and contingency plans.

In summary, when regulatory agencies administer their obligations with respect to natural resource development projects such as mining projects, they follow a defensible protocol for guiding their decision making which includes:

- Reliance on use of defensible standards that withstand legal challenge.
- Reliance on extensive site-specific data.
- Adherence to established protocol for model construction, calibration, sensitivity analysis, predictions, and uncertainty analysis.
- Incorporation of project-specific engineering controls, monitoring, and contingency plans.
- Incorporation of project-specific geochemical assessments of waste materials.

Regional mine development projects provide an example of regulatory agencies adhering to the standard hydrological modeling process to assess proposed mining projects and, in particular, to assess potential migration pathways for constituents of concern. Over the last 25-plus years there have been approximately six base metal mining projects in the Great Lakes Region that have advanced through the regulatory process. All of these projects have broadly conformed to accepted industry standards with regard to the application of hydrologic models. These projects include:

- The Eagle Mine in Marquette County, Michigan (F&VD, 2006).
- The Humboldt Mill in Marquette County, Michigan (Foth, 2008).
- The PolyMet North Met Project in Hoyt Lakes, Minnesota (MDNR et al., 2015).
- The Flambeau Mine in Ladysmith, Wisconsin (WDNR, 1990).
- The Back Forty Project in Menominee County, Michigan (Foth, 2015).
- The Copperwood Project in Gogebic County, Michigan (Orvana, 2011).

These examples from the region demonstrate that in the normal course of carrying out their regulatory obligations with respect to their decision making authority, both state and federal agencies require the use of scientifically defensible models to assess potential contaminant migration pathways and potential impacts.

Journal of Hydrology Research Paper-Assessment of Migration Pathways and BLM/USFS Decision on Nonrenewal

As noted elsewhere in this memorandum, the BLM/USFS decision to pursue withdrawal does not explicitly cite any site characterization, data analysis, mine planning or engineering, or modeling as a basis for arguing that leases must be withdrawn lest irreparable impacts occur to waters within the BWCA Wilderness and Rainy River Watershed. The lease denial decision does not rest on any such analysis because none has been performed.

However, a groundwater modeling study purporting to address the potential for groundwater and subsequent surface water impacts has been published in the Journal of Hydrology (JoH) in 2016 (Myers, 2016). To our knowledge, this is the only publically available analysis purporting to address the potential impacts associated with a mining operation in the Twin Metals Project area, and as such, this study may have formed a partial basis of perceived support for the BLM/USFS lease denial decision. Therefore, this modeling study is evaluated here.

In the final paragraphs of the introduction, the author states:

"The objective of this study was to use watershed-scale groundwater flow and transport modeling to ***predict which mine sites in a sulfide-rich watershed would be more likely to cause downstream AMD [acid mine drainage] problems if engineering controls fail****. It demonstrates how watershed-scale modeling prior to the actual development of mines can improve mine planning to facilitate future remediation when engineer failures occur…"* (**emphasis added**)

The author continues:

"The model could help to ***optimize mining and waste disposal locations*** *or to decide whether the risks of mining are too high as well as providing information on where more information is needed for decision making."* (**emphasis added**)

The first of the bold portions of the quoted text indicate that the author is seeking to establish a benign objective for the modeling study; namely, to use the model as a screening tool to consider a broad suite of sites and identify locations where a mine, or mine waste management facilities could be located and not pose a threat to water resources in the event of a failure of engineering controls. However, the author does not apply the model to a variety of potential mining sites, but rather develops the model specifically for the location of the Twin Metals ore body south of the Kawishiwi River.

Furthermore, the author states that the analysis will evaluate potential problems that may occur if "engineering controls fail." Later in the paper, the author assigns source terms to the model consisting of 10,000 milligrams per liter (mg/L) sulfate in recharge and in injection water delivered to subsurface bedrock zones. These high contaminant loading rates do not represent an engineering failure of a modern waste management system. Rather, they represent a complete absence of any modern waste management practices combined with extremely reactive mine wastes and the most extreme and unfavorable environmental conditions, as well as an absence of natural attenuation capabilities found in many natural systems. Additionally, the engineering controls failure incorporated in the model does not represent a realistic failure of a liner or overtopping of a storage pond; rather it represents something akin to the complete dissolution of a liner combined with enormous localized increases in bedrock recharge that are not physically realistic. These elements of the model indicate a lack of objectivity needed for a meaningful analysis and a predetermined agenda under which the model was developed with the intent to show a worst possible case result.

Development of a model to identify locations where such careless mining practices could be applied without negatively impacting the environment is a pointless exercise as there are no locations in the U.S. or on the planet where such practices would be deemed acceptable. A complete failure, or, more consistent with the modeled conditions in the paper, a complete absence of engineering controls will cause unacceptable impacts to water resources no matter where the mine or mining facilities are located. The author notes as much in the second paragraph of the paper:

"Mining-caused contamination is a global problem and few sites are isolated or sufficiently under-used that potential contamination can be ignored."

Furthermore, while the author states that the objective of the study is to "*…predict which mine sites in a sulfide-rich watershed would be more likely to cause downstream AMD [acid mine drainage] problems if engineering controls fail,"* the results presented in the paper do not attempt to identify mine leases that are prone to causing environmental problems and those that are not prone to such damage. Rather, the paper considers a single site only–the Twin Metals site. Nor does the paper determine zones suitable for waste management as distinguished from those that are not. Instead, the paper steers from the beginning to a blanket conclusion that the Twin Metals site is not safe from environmental damage if poor mine practices are accompanied by a complete failure of engineering controls or a complete absence of engineering controls. The same can be said of virtually any location in the U.S. or in the world, which renders the findings of the paper of little practical value.

The nature of the study, in which complete failure of engineering controls, or an absence of such controls, and the subsequent assessment of environmental impacts under the worst possible combination of conditions attempts to impose a standard on mine planning that does not exist and is not embodied in any state or federal regulations. There are no locations in the U.S. where a mining operation could be shown to have acceptably limited water resources impact under conditions of complete failure or absence of engineering best management practices. The imposition of the standard implied in the paper would preclude all mining at any and all locations worldwide.

The value of the study in assessing potential environmental impacts is further limited by several broad features of the modeling effort. These include:

- The modeling effort included no site-specific data. Rather, it relied upon limited data published in regional studies. The ability of such a modeling effort to account for actual conditions in the study area is, therefore, severely limited or nonexistent and completely departs from standards cited previously which are expected to be adhered to by agencies when applying models for use in mine planning, permitting, and environmental review. The complete lack of site-specific data renders the result of the JoH modeling useless for inferring any future impacts associated with Twin Metals Project.

- The modeling effort does not incorporate any aspects of any mine plan. Locations of mine workings within the Duluth Complex, locations of mine operations and waste management facilities, mining methods, waste management methods and schedules, and other important variables that affect locations, environmental exposure, and

reactivity of mined materials, are completely excluded from the study. This may be have been a necessity since final mine plans were/are not yet developed. However, this limitation severely constrains the utility of this modeling study for assessing environmental impacts prior to development of Project plans.

- The discussion and presentation of the modeling methods and results is brief, with limited text and tables, and a limited number of figures that are small in scale and not suitable to a careful evaluation of complex modeling methodologies and results. These constraints mean that many aspects of the modeling methodology and results are not presented and cannot be evaluated. As such, the ability to interpret the validity of the study and the results is, at best, limited. In this regard, the JoH paper does not conform to the standards established in ASTM D5718 (Guide for Documenting a Ground-Water Flow Model Application) for the presentation of modeling results.

The three broad constraints noted above severely limit the usefulness of the model and the paper for assessing environmental impacts. A modeling study and report similarly constrained would be considered unacceptable as a basis for water resources impact evaluation under any element of the environmental review process (such as the Environmental Impact Statement or Permit to Mine Application) through which a mining project must proceed.

In addition to these general and broad limitations on the utility of the study as a decision-making tool, there are several specific aspects of the paper and study that render it unsuitable for use as a policy-making or decision-making tool:

- The labeling of sub-units of the Duluth Complex (Pma and Pmt) on Figure 2 is such that one cannot distinguish one unit from the other. Because these sub-units are associated with parameterization of the model (hydraulic conductivity, porosity, etc.), one is unable to interpret or evaluate this important aspect of the model construction.

- The paper notes that well water levels were used as calibration targets. Figures in the paper indicate all well calibration targets are highly clustered in a few locations within the model domain and limited to data obtained from a state of Minnesota database. No information is provided regarding the types of wells included as calibration targets, manner in which the data was collected, the time at which the measurements were made, the geologic units represented, or other important details. No contour map of groundwater potentiometric surfaces is presented. These omissions preclude development of a conceptual understanding of groundwater flow and prevent an evaluation of the quality and applicability of the water level data used to calibrate the model.

- On page 283, the author states that sulfate transport was assumed to be conservative (no attenuation) "…*to estimate the sources which could have the most significant impacts without relying on estimates of reactivity to attenuate the risk*." Treating sulfate as conservative does not aid in determining which sources present more risk than others because this approach effectively treats all sources, all geologic units, and any/all source control practices the same, assuming worst case conditions for all.

Treating sulfate as a conservative constituent simply produces conservative or worst-case projections of impact as opposed to projections that properly reflect site conditions and Project-specific practices associated with potentially reactive mined materials.

- Layer 1 for the numerical model is defined to represent overburden/glacial till that overlies bedrock in the study area. The model assigns a constant and uniform thickness of 15 meters (m) to this unit. Fifteen meters is substantially thicker than actual Quaternary deposits in much of the study area. Outcrops are common in the study area, as are zones with unconsolidated deposits of 1 to 2 m thickness. The actual limited thickness and the variability in thickness of Quaternary deposits in the area will exert a significant influence on groundwater flow paths and rates. In much of the study area, there is no aquifer or groundwater flow system in which to transport any constituent. These components of flow system variability are excluded from the model and limit the usefulness of the results as a basis for predictions.

- The second layer of the model was defined as having a thickness of 125 m. This layer is defined in the paper as that which represents the upper weathered or fractured portion of the bedrock. No data is presented to document that the upper portion of the bedrock is more fractured or weathered than deeper rock. No data is presented to document the depth or thickness of this more weathered or fractured zone. Hydraulic conductivity data collected by the Project to date via depth-specific packer testing indicates the vertical reach of bedrock that may exhibit higher hydraulic conductivity is limited to the upper 75 m. As such, the layer thickness/parameterization for the uppermost bedrock in the JoH study departs substantively from actual site conditions.

- The use of a uniform thickness for Layer 1 representing unconsolidated deposits precludes representing the actual topography of the bedrock surface. Because of the high contrast in hydraulic conductivity of the unconsolidated Quaternary deposits relative to the bedrock, the bedrock topography exerts strong controls on groundwater flow paths and rates within the Quaternary deposits. Excluding this information from the model limits the model's ability to accurately account for these processes. The transport simulation of the Quaternary groundwater system is therefore severely constrained as well.

- Calibrated hydraulic conductivities for the Duluth Complex presented in Table 1 are extremely large in comparison to literature values, preliminary results from hydraulic tests performed within the Duluth Complex, and the author's own qualitative description of this formation. For example, the author assigns a value of 0.12 for the specific yield of some zones of the Duluth Complex. Much of the Duluth Complex rocks have specific yields or porosities that are essentially zero. Hydraulic conductivity is commonly the most influential parameter in terms of flow directions and rates obtained from a flow model. The multiple-order of magnitude over-estimation of this parameter in the JoH study render the results unrepresentative of the actual hydrogeologic system and of no value for drawing conclusions regarding potential Project impacts.

- The calibration of the model includes multiple zones for estimation of hydraulic conductivity and related parameters for each hydrogeologic unit. Yet there is no discussion of the rationale for distinguishing different zones within these units. This suggests that the zones were determined not on the basis of observed features of these units and formations, but rather were selected merely to allow some degree of calibration success. This is not consistent with common modeling practice. And the absence of a discussion of the rationale behind the zonation makes it impossible to assess the success or lack thereof of the calibration.

- The presentation of the calibration results is very limited, with only a single calibration statistic discussed and no presentation of graphical calibration results or spatial distribution of calibration statistics. This presentation departs widely from standard practice as documented in ASTM D5718 (Guide for Documenting a Ground-Water Flow Model Application). Again, this limitation precludes drawing any conclusions regarding the degree to which the model represents actual hydrogeologic conditions in the study area.

- No mass balance results are presented for the model as a whole or for individual model layers. This precludes evaluating the internal consistency of the numerical solution. The model mass balance (for the overall model and for individual model layers and units) is one of the most fundamental and important measures used in the assessment of a model's performance. Without knowledge of these model mass balance results, the validity of the model is completely unsubstantiated.

- River and lake boundary conditions are incorporated in the model using the drain feature of MODFLOW. This is not a common practice. Rather, the river package in MODFLOW is normally used to model rivers and lakes. Furthermore, the head value assigned to the drain boundary conditions was defined as an elevation 5 m below ground level. This is substantially different than actual physical conditions within the study area and will substantially increase hydraulic gradients above actual values. The effect of such an increase or distortion in hydraulic gradients is to overestimate groundwater velocities and underestimate constituent travel times. Rivers and lakes are assumed to be gaining water from the groundwater system at all times, a condition that the author acknowledges is not consistent with actual system behavior. These features of the JoH modeling study constitute serious errors in the models fidelity to the actual physical system it purports to represent.

- To represent constituent release from underground workings, the author modeled injection wells delivering 10,000 mg/L sulfate water to Layers 2 and 3 of the model. The author injected such water for a one year duration and noted that total sulfate load per model cell under this configuration was approximately 3,000 tons per year. Such a loading is considered extreme, if not impossible to achieve, even if it was one's objective. Furthermore, the use of an injection well to create a source term in the model causes an over-representation of hydraulic gradients (presumably an enormous overestimate; actual gradients associated with these predictive simulations are not reported) that does not reflect conditions that would naturally exist in the presence of underground workings or backfilling of mine waste. Again, the

overestimation of hydraulic gradients results in overestimation of constituent transport rates and subsequent impacts.

The above represents a partial summary of the limitations and problems associated with the modeling study, the presentation of the work, and the use of both as a basis for making meaningful decisions regarding environmental impacts. They indicate that the JoH modeling study provides a poor representation of the hydrologic system at the Twin Metals site, that it does not conform to standard practice, and that it provides no meaningful representation of Project impacts.

Project Investigations Indicate No Substantive Groundwater Flow Pathway from Ore Body to Surface Waters

Although site characterization activities and analysis of hydrologic systems are yet to be completed, data collected to date overwhelmingly indicates an absence of a groundwater migration pathway from the ore body where mining will take place to surface waters. In the absence of such a pathway, there is no route for constituents released from the ore body, either during operations or following reclamation and closure, to reach surface water features and flow into the BWCA Wilderness lakes or rivers.

Early site characterization activities have included the geologic logging of exploration, monitoring well, and piezometer borings, mapping of geologic units, hydraulic testing of bedrock to estimate hydraulic conductivity, geophysical surveys and testing, and installation of and potentiometric monitoring in wells and piezometers.

Geologic logging of exploration borings, core collection and analysis, and geophysical surveys indicate that Duluth Complex rocks (and footwall rocks of the Giants Range Batholith) are predominantly composed of highly indurated, competent, unfractured rock (commonly referred to as "stick rock" or "gun-barrel core" due to the nature of the core which resembles a steel rod in general appearance) of near zero porosity. Fractures are present in the rock but are infrequent and display minimal or zero aperture. Porosity approaches zero. Such rocks have minimal capacity to transmit groundwater.

Hydraulic testing of exploration borings has included numerous packer tests at discrete intervals as well as full-length slug and pumping tests. Analysis of test data obtained shows that rocks in the vicinity of the ore body are predominantly characterized by very low hydraulic conductivities. Hydraulic conductivity values for rocks deeper than 200 feet are generally between 10^{-8} and 10^{-11} centimeters per second (cm/s). Conductivities in this range correspond to published ranges for unfractured igneous rocks which represent some of the lowest permeability rock formations on the planet. A small number of higher conductivity test results (maximum of 10^{-4} cm/s) were observed, but even these higher estimates are considered "low conductivity" and unconducive to groundwater flow. Additionally, the higher conductivity test results are predominantly isolated to shallow bedrock where weathering has occurred and which will not be exposed to underground workings, meaning they offer no pathway for groundwater migration from the proposed mine to surface waters.

Another set of important data that has been collected is vertical profile potentiometric data which quantify groundwater elevation or hydraulic head as a function of depth. This data, collected via nested piezometers and monitoring wells, reveals that hydraulic gradients within the bedrock above the ore body are generally directed downward. Downward hydraulic gradients mean that groundwater is moving within the bedrock in a downward direction under natural conditions. Downward flow rates are very low due to the low hydraulic conductivities of the rocks in and surrounding the ore body described in the preceding paragraph. Mine operations which will involve dewatering of the underground workings will maintain downward gradients, with mine inflow rates projected to be low as a result of the low porosity and permeability of ore and host rocks. Upon mine reclamation and closure, vertical gradients will generally return to their natural state, maintaining a downward flow direction within the bedrock. Under these conditions, it would be physically impossible for constituents to migrate from the ore zone to surface water, whether it be under pre-mining conditions, operating conditions, or closure conditions. As such, contamination of BWCA Wilderness surface waters from underground operations or closure is of minimal likelihood.

Comparison of groundwater elevations in shallow unconsolidated deposits with those in deeper bedrock zones indicates groundwater levels are generally higher in the unconsolidated deposits than in bedrock. Additionally, groundwater elevations in shallow unconsolidated deposits display relatively rapid response to precipitation and snowmelt events, whereas bedrock water levels display little or no response to the same events. These observations suggest that bedrock is recharged by near-surface hydrologic features (shallow groundwater and surface water) and that this recharge is slow and involves minimal flux rates. They also suggest a poor hydraulic connection between near-surface features that would limit or minimize impacts to near-surface hydrologic systems (such as induced seepage from shallow groundwater, lakes, streams, or wetlands) in response to development of underground workings. Such conditions will further mitigate against substantive movement of constituents from workings in the ore zone to shallow groundwater or surface water both during operations and following reclamation and closure.

Failure to Establish Basis for Hydrologic Pathway to Contaminate Waterways

The BLM/USFS decision to pursue withdrawal fails to meet the standards that agencies apply to mine operators when seeking to permit a project in numerous important regards:

- The decision presents no characterization of hydrologic or hydrogeologic conditions in the Project area. Site-specific data is completely absent in the BLM/USFS denials of renewal for the subject mineral leases.

- The decision is not supported by any quantitative or even qualitative analysis of hydrologic systems in the Project area.

- The decision implicitly assumes that groundwater in the vicinity of the planned ore body and underground workings is hydrologically connected to and flowing to surface water bodies. This assumption is presented with no scientific or engineering data to support it. This assumption is also contrary to data collected by the Project to

date which overwhelmingly indicates an absence of any substantive hydrologic pathway moving water from the ore body to surface water features.

- Development of a TMM mine plan is in progress but no final plan has been completed or published. Given the absence of a final plan, the BLM/USFS assumed, in promulgating their lease termination decisions, that all Project features are located in the Rainy River Watershed. This assumption appears, in part, to have been based on an outdated Pre-feasibility Study (prepared for Duluth Metals in 2014) that does not reflect current Project conceptual planning. While the final Project plan is still undergoing development, several important Project components have been established and are summarized on the Project web page: http://www.twin-metals.com/about-the-project/project-facts/. Important Project elements summarized here and relevant to the lease withdrawal include:
  - Storage of waste rock in underground workings.
  - Storage of approximately half of the generated tailings in underground workings using cemented backfill process.
  - Storage of remaining tailings in engineered and lined tailings impoundment near Babbitt (outside of the Rainy River Watershed).

  These Project features alone eliminate or dramatically reduce the potential for surface waste storage facilities contributing to degradation of surface waters in the Rainy River Watershed. The storage of waste rock in underground workings and the use of low-permeability cemented backfill disposal of tailings in the workings will isolate these underground storage facilities in bedrock of very low permeability. Field data collected to date indicate minimal or very poor hydraulic connectivity between these waste disposal zones and both shallow groundwater and surface water. Failure to consider these Project features in the lease denial decision indicates that the decision was based on perceived or assumed Project features and risks that will not exist.

- As with any modern infrastructure project, the Twin Metals Mining operation will be designed and constructed using modern, state of the practice technologies; both for the design of engineering controls, the selection of products used in the construction of designed controls, and the monitoring of the performance of these systems. These designs, product selections, and monitoring/maintenance practices have not yet been designed. In lieu of knowledge and analysis of these Project features, the BLM/USFS decision implicitly assumed that all systems would be designed and constructed using practices and materials equivalent to those used over the last century. The single published study purporting to evaluate impacts of the Twin Metals Project goes further and assumes that all waste management will be mismanaged to such an extent that mine waters equal or exceed the worst levels observed at any historic mining site, that all engineering controls will fail completely. These assumptions are equivalent to making decisions about the current utility and merit of solar-generated electricity based on photo cell technology from 1950 or earlier.

- Any attempt to permit a mine with the lack of site characterization, data analysis, modeling, quantitative analysis of engineered systems, and similar, conventional, state-of-the practice analysis would be summarily rejected without review by agencies responsible for such permitting.

In the absence of site-specific hydrologic characterization data, a hydrologic model developed in accordance with accepted industry standards, and the incorporation of an actual mine plan, it is not possible to conclude that there is or is not a pathway for migration of constituents of concern into the BWCA Wilderness and impairment of those waters. Absent these industry-standard and agency-required practices and information, no scientifically defensible conclusions of can be drawn about any aspect of Project impacts, to water resources or any other component of the natural environment or human and socio-economic concerns.

Failure to Consider Other Information Related to BLM and USFS Administered Mining Operations

In the USFS letter to the BLM denying USFS consent to renew the Twin Metals leases that the agencies cite as a basis for pursuing withdrawal, the USFS states on page 11: *"FS data indicates between 20,000 and 50,000 mines currently generate acid on lands managed by the agency. Negative impacts from these mines affect 8,000 to 16,000 km of streams."* Note that 8,000 and 16,000 km correspond to 4,971 and 9,942 miles, respectively.

Although the USFS fails to cite a source for the purported claims noted in the preceding paragraph, the source of these claims is easily identified as a report that the USFS produced themselves in 1993. An internet search for any of the number combinations in the preceding paragraph quickly reveals dozens to hundreds of instances wherein these numbers are cited to characterize the extent of mining impacts on waters of the U.S. All such instances that cite a source for the estimates refer to a 1993 report prepared by the USFS itself. The report is:

Acid Drainage from Mines on National Forests, A Management Crisis. U.S. Department of Agriculture, Forest Service, In Cooperation with the U.S. Department of Interior's Bureau of Land Management, Program Aid 1505, March 1993.

Page 3 of the report (USFS, 1993) states:

*"**Currently, reliable data on the total number of mines producing acid drainage and on the number of miles of streams affected by acid and metal drainage are not available for the Western United States**. However, various estimates have placed the number these mines in the range of 20,000-50,000, seriously affecting 5,000-10,000 miles of streams. The cumulative effect of these mines, whatever their actual number, is significant."* (**emphasis added**)

No data or source is cited in support of this claim, even in the original report (USFS, 1993).

Although the USFS letter presents these estimates of AMD-generating mines and impacted stream lengths as facts supported by data, the original USFS report from which the numbers are taken (USFS, 1993) plainly states that no reliable data exist, which suggests that the estimates are mere conjecture. Furthermore, while the USFS letter states that 20,000 to 50,000 acid generating mines are leaking into 8,000 to 16,000 km of streams on *"…lands managed by the agency…,"* the original report makes no statement regarding the ownership, stewardship, or status of the lands on which these impacts are supposedly located. This

indicates another distortion embodied in the USFS claims on page 11 of the lease denial decision.

The original USFS report (USFS, 1993) contradicts these numbers on the exact same page which presents the language quoted above. Namely, paragraph 2 on page 3 reads:

"Over 1,500 western mining sites with significant acid drainage problems have been identified on National Forest System lands."

This begs the questions: "Which is it—1,500 impacted mine sites or 50,000? The discrepancy constitutes an error of 3300%." And, "Are the impacted mine sites on USFS-administered lands or not?"

Given the date of the report (1993) upon which the USFS relies for its claims of dramatic impacts associated with mining operations, USFS (1993) is clearly focused on legacy (pre-1990) mining operations and conditions, and not conditions associated with modern mining practices and regulations. The importance of this distinction is made clear in a letter written by the U.S. Department of Agriculture to Senator Lisa Murkowski in response to inquiries made by Senator Murkowski regarding financial assurance requirements imposed on mining operations. This letter is included herein as Attachment 1. A similar letter on the same topic from the BLM to Senator Murkowski is included as Attachment 2.

Page 3 of the USFS response to Senator Murkowski presents the Senators 7th question and the USFS response:

Senator's Question:
7. How many hardrock mining and beneficiation plans of operation has your agency approved since 1990?

- *a. How many of those sites are, or have been, placed on the CERCLA NPL?*
- *b. How many of those sites placed on the CERCLA NPL involved (a) a responsible party that pays (paid) for the cost of short-term removals or long-term remediation, either in part or in whole?...*

USFS Response:
The total number of hardrock mines permitted since 1990 is 2,685; no sites have been placed on the CERCLA NPL list.

In summary, the USFS states in USFS (1993) that pre-1990 mining operations have resulted in 1,500 mine sites with environmental impairment. And in their response to Senator Murkowski, they state that since 1990, 2,685 mine operations have been permitted on federally administrated lands and not a single site has resulted in contamination problems resulting in CERCLA listing.

This demonstrates that the BLM/USFS decision to pursue withdrawal is based on selective use of unsupported conjecture surrounding mining practices no longer in use while simultaneously ignoring information indicating a record of safe, modern mining practices.

References

Anderson, M.P., W.W. Woessner, and R.J. Hunt, 2015. Applied Groundwater Modeling, Simulation of Flow and Advective Transport. Academic Press, Elsevier Inc., 564 pp.

Foth & Van Dyke and Associates, Inc. (F&VD), 2006. Eagle Project Mining Permit Application Volume II, Environmental Impact Assessment. February 2006.

Foth Infrastructure & Environment, LLC (Foth), 2008. Humboldt Mill Mining Permit Application Volume II, Environmental Impact Assessment. April 2008.

Foth Infrastructure & Environment, LLC (Foth), 2015. Environmental Impact Assessment, Back Forty Project. October 2015.

Minnesota Department of Natural Resources, United States Army Corps of Engineers, United States Forest Service, 2015. NorthMet Mining Project and Land Exchange, Final Environmental Impact Statement. November 2015.

Myers, T., 2016. Acid mine drainage risks–*A modeling approach to siting mine facilities in Northern Minnesota USA*. Journal of Hydrology, 533 (2016) pp. 277 – 290.

Orvana Resources US Corp, 2011. Copperwood Mine, Mine Permit Application. September 22, 2011.

USFS, 1993. *Acid Drainage From Mines on National Forests, A Management Crisis*. U.S. Department of Agriculture, Forest Service, In Cooperation with the U.S. Department of Interior's Bureau of Land Management, Program Aid 1505. March 1993.

Wisconsin Department of Natural Resources, 1990. Final Environmental Impact Statement, Flambeau Mining Co. – Copper Mine, Ladysmith, Wisconsin. March 1990.

Attachment 1

USDA Letter to U.S. Senator Lisa Murkowski
July 20, 2011
(See Response to Question 7)

United States Department of Agriculture

Office of the Secretary
Washington, D.C. 20250

JUL 20 2011

The Honorable Lisa Murkowski
Committee on Energy and Natural Resources
United States Senate
304 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator Murkowski:

Thank you for your letter of March 8, 2011, regarding actions being taken by the United States Environmental Protection Agency (EPA) related to financial assurance requirements, including bonds, for hardrock mines in the United States. I apologize for the delayed response.

On July 28, 2009, EPA published a priority notice identifying classes of facilities in the hard rock mining industry as those for which EPA would first develop financial responsibility requirements under section 108(b) of CERCLA (*see* 74 Federal Register 37,213 (July 28, 2009)). This notice followed a February 25, 2009, U.S. District Court order (later amended) to identify and publish the notice (*see Sierra Club v. Johnson*, No. C 08-01409 WHA, 2009 U.S. Dist. LEXIS 14819 (N.D. Cal. February 25, 2009)).

USDA's Forest Service has existing requirements that provide for financial assurances on hardrock mining operations on National Forest System lands. The EPA has been working with the Forest Service as it develops the rule in order to ensure that both agencies appropriately implement their statutory authorities. This includes protecting the public interest in ensuring that taxpayers do not bear the cost of addressing releases of hazardous substances and that the Federal government provides a streamlined set of requirements for those developing hardrock mineral resources. The Forest Service is continuing to work with the EPA towards this end.

To the extent several of your questions are directed at the content of deliberative interagency communications in an ongoing rulemaking, they raise important confidentiality concerns for the Executive Branch. Enclosed are answers to your questions as they pertain to the Forest Service. I defer further questions on the timing and content of the rule to the EPA.

Again, thank you for writing.

Sincerely,

Thomas J. Vilsack
Secretary

Enclosure

Enclosure

Responses to Questions regarding Actions being taken by the Environmental Protection Agency (EPA) related to financial assurance requirements, including bonds, for hardrock mines in the United States.

1. **Has your agency received any information from EPA indicating that it intends to pursue a "one-size-fits-all" approach under CERCLA Sec. 108(b) for hardrock mining? If so, what information has been provided and has your agency expressed any concerns with this approach?**

The Forest Service understands that the EPA is working to develop regulatory requirements under CERCLA § 108(b). The Forest Service and EPA have discussed approaches to establishing financial assurances during meetings and follow-up teleconferences. The Forest Service has provided expertise based on its experience regulating hardrock mining operations on the public lands. The Forest Service has also provided EPA with information associated with the current Forest Service regulations.

2. **Has your agency received any information from EPA regarding how legacy (pre-1990) hardrock mining (or processing) sites listed on the CERCLA National Priorities List (NPL) impacted their identification of the industry as posing a high risk under CERCLA Sec. 108(b)? If so, what information has been provided and has your agency expressed any concerns with this approach?**

EPA's priority notice of action published in the Federal Register on July 28, 2009, 74 Fed. Reg. 37,213 (July 28, 2009), described eight factors it considered in identifying hardrock mining under CERCLA § 108(b). One of the eight factors considered by EPA was the number of mine sites on the CERCLA site inventory (including both National Priority List (NPL) sites as well as non-NPL sites). The Forest Service has provided EPA with information on the way mining and reclamation practices have evolved from past practices.

3. **Has your agency received any information from EPA indicating that it intends to link the cost of remediating legacy (pre-1990) hardrock mining (or processing) sites to the calculation of future financial assurance requirements that may be imposed under CERCLA Sec. 108(b)? If so, what information has been provided and has your agency expressed any concerns with this approach?**

The EPA has indicated that it has not yet determined the methodology by which the proposed rule will identify the amount of financial assurance required. The Forest Service has provided EPA with information regarding modern mining practices and Forest Service methodology for establishing financial assurances.

4. **Please provide a description of how your agency currently calculates financial assurance requirements applicable to hardrock mines on federal lands.**

The Forest Service process for calculating financial assurance for hardrock mines is described in its Training Guide for Reclamation Bond Estimation and Administration For Mineral Plans of Operation authorized and administered under 36 CFR 228A; USDA – Forest Service, April 2004. The aforementioned Training Guide emphasizes the following for financial assurance estimation:

- Estimates should be made by experienced personnel;
- Estimates should assume that all equipment, supplies and work will be provided under federal contract;
- Unit costs for labor, equipment or materials should be made or verified on a site by site basis;
- Estimates should include direct and indirect costs;
- Direct costs should include interim operation and maintenance, hazmat testing and removal, water treatment, demolition and disposal of facilities, earthwork, erosion control, revegetation, cost of required mitigation, and long-term operation, maintenance and monitoring;
- Indirect costs should include redesign, mobilization/demobilization, contractor costs, agency project management, contingencies and inflation; and
- Estimates should be reviewed periodically to ensure they are adequate.

5. **Can your agency approve a plan of operations that poses a high risk of unnecessary or undue degradation of public lands? How would your agency typically respond to a plan of operations that it believed posed a high risk of unnecessary or undue degradation of public lands?**

The term "unnecessary and undue degradation" of public lands is derived from the Federal Land Policy and Management Act. The term "unnecessary and undue degradation" is also defined in the Bureau of Land Management's (BLM) hardrock regulations and, therefore, only applicable to BLM-managed lands. Regulations at 36 CFR 228A direct the Forest Service to require and approve plans of operation (Plans) for activities that may result in "significant disturbance of surface resources" in order to "minimize adverse environmental impacts" and reclaim surface disturbance.

The Forest Service works with proponents at the project design stage to develop any changes or additions deemed necessary to comply with our regulatory requirements for environmental protection and to mitigate adverse environmental effects. Additionally, we incorporate appropriate monitoring and inspection into plan approvals to ensure mitigation is achieving the intended result and/or provide information to develop an adaptive management strategy.

6. **Does your agency have the authority to impose financial assurance requirements for post-mining, long-term monitoring, maintenance and treatment operations?**

Although not explicitly stated in our hardrock bonding regulation at 36 CFR 228.13, the Forest Service interprets our role as having the authority to impose financial assurance requirements for post-mining long-term monitoring, maintenance and treatment operations. We are working to clarify our internal guidance to apply an appropriate discount to long-term/perpetual financial assurance calculations; the consideration of uncertainty and risk in both water modeling and financial assurance calculations; and the types of financial instruments the Forest Service may accept for long-term reclamation obligations.

7. **How many hardrock mining and beneficiation plans of operation has your agency approved since 1990?**
    a. **How many of those sites are, or have been, placed on the CERCLA NPL?**
    b. **How many of those sites placed on the CERCLA NPL involve(d) a responsible party that pays (paid) for the cost of short-term removals or long-term remediation, either in part or in whole? What is the aggregate dollar amount spent by these responsible parties? What is the aggregate dollar amount spent by the federal (or state) government?**

The total number of hardrock mines permitted since 1990 is 2,685; no sites have been placed on the CERCLA NPL list.

8. **Does your agency coordinate – or has it coordinated in the past – with states to develop financial assurance requirements for hardrock mines on non-federal lands? If so, please describe this coordination.**

The Forest Service has and continues to coordinate with States to develop financial assurance requirements when dealing with individual sites involving both National Forest System lands and non-federal lands expressly for the purpose of avoiding duplicate bonding of operators. This coordination typically takes the form of agreements describing how financial assurance will be estimated, what financial assurance (bond) instruments are acceptable, who holds the instruments, and how the penal sum of these instruments are to be allocated in the event of operator default.

9. **Please provide all documents, records, papers, reports, agreements, notes, correspondence, presentation, analyses, comments, and any other materials generated by your agency as part of an inter- or intra-agency process associated with the EPA's CERCLA Sec. 108(b) rulemaking.**

This request for documents prepared as part of an ongoing rulemaking process for which no draft rule has yet been proposed implicates important confidentiality interests for the Executive Branch. We are happy to provide a briefing or additional material on the Forest Service's program as well as to participate in a multi-agency briefing with the EPA and the BLM if that is preferred.

Attachment 2

BLM Letter to U.S. Senator Lisa Murkowski
June 21, 2011
(See Response to Question 7)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Washington, D.C. 20240
http://www.blm.gov

JUN 2 1 2011

The Honorable Lisa Murkowski
Ranking Member, Committee on
Energy and Natural Resources
United States Senate
Washington, DC 20510

Dear Senator Murkowski:

Thank you for your letter of March 8, 2011, and your interest in the important issue of financial assurance requirements for hardrock mines in the United States.

As you point out, the Bureau of Land Management (BLM) has statutory responsibilities and existing regulatory requirements that provide for financial assurances on hardrock mining operations on public lands. The BLM promulgated regulations in 2001 that broadened bonding protections by requiring full reclamation bonding for all mining activity above casual use. These changes, coupled with changes in mining practices, have alleviated the problems related to remediation that occurred under earlier authorities and requirements for mining activity subject to BLM's bonding requirements.

On July 28, 2009, the Environmental Protection Agency (EPA) published a priority notice identifying classes of facilities in the hard rock mining industry as those for which EPA would first develop financial responsibility requirements under section 108(b) of CERCLA (*see* 74 Fed. Reg. 37,213 (July 28, 2009)). This notice followed a February 25, 2009 U.S. District Court order (later amended) to identify and publish the notice (*see Sierra Club v. Johnson*, No. C 08-01409 WHA, 2009 U.S. Dist. LEXIS 14819 (N.D. Cal. Feb. 25, 2009). The EPA has been coordinating with the BLM as it develops the rule in order to ensure that both agencies appropriately implement their statutory authorities while demonstrating good government. This includes protecting the public interest in ensuring that taxpayers do not bear the cost of addressing releases of hazardous substances and that the Federal government provides a streamlined set of requirements for those developing hardrock mineral resources. We are continuing to work with the EPA toward this end.

To the extent several of your questions are directed at the content of deliberative interagency communications in an ongoing rulemaking, they raise important confidentiality concerns for the Executive Branch. Enclosed are answers to your questions as they pertain to the BLM. We defer further questions on the timing and content of the rule to the EPA.

Please do not hesitate to share any thoughts you have on this issue with me.

Sincerely,

Robert V. Abbey
Director

Enclosure

Responses to Questions:

1. **Has your agency received any information from EPA indicating that it intends to pursue a 'one size-fits-all' approach under CERCLA Sec. 108(b) for hardrock mining? If so, what information has been provided and has your agency expressed any concerns with this approach?**

   The BLM understands that the EPA is working to develop regulatory requirements under section 108(b) of CERCLA. The BLM and the EPA have discussed approaches to establishing financial assurances during meetings and follow-up teleconferences.

   The BLM has provided expertise based on its experience over the past 30 years regulating hardrock mining operations on the public lands. The BLM has also provided EPA with information associated with the current BLM regulations.

2. **Has your agency received any information from EPA regarding how legacy (pre-1990) hardrock mining (or processing) sites listed on the CERCLA National Priorities List (NPL) impacted their identification of the industry as posing a high risk under CERCLA Sec.108(b)? If so, what information has been provided and has your agency expressed any concerns with this approach?**

   EPA's priority notice of action published in the Federal Register on July 28, 2009, 74 Fed. Reg. 37,213 (July 28, 2009), described eight factors it considered in identifying hardrock mining under section 108(b) of CERCLA. One of the eight factors considered by EPA was the number of mine sites on the CERCLA site inventory (including both National Priority List sites as well as non-NPL sites). The BLM has provided EPA with information on the way mining and reclamation practices have evolved from past practices.

3. **Has your agency received any information from EPA indicating that it intends to link the cost of remediating legacy (pre-1990) hardrock mining (or processing) sites to the calculation of future financial assurance requirements that may be imposed under CERCLA Sec.108(b)? If so, what information has been provided and has your agency expressed any concerns with this approach?**

   The EPA has indicated that it has not yet determined the methodology by which the proposed rule will identify the amount of financial assurance required. The BLM has provided EPA with information regarding modern mining practices.

4. **Please provide a description of how your agency currently calculates financial assurance requirements applicable to hardrock mines on federal lands.**

   In 2001, the BLM made substantial changes to its surface management regulations that strengthened bonding requirements. Currently, the BLM requires financial assurances for all surface disturbance above casual use in an amount sufficient to cover the costs of hiring a third-party contractor to fully reclaim the disturbance authorized under the Notice or Plan of Operations. Operators are not allowed to begin any surface disturbance guaranteed by the financial guarantee until the BLM has accepted and obligated the bond.

   The BLM reviews reclamation cost estimates every three years (every year if the operation is bonded incrementally) and requires the operator to increase bond coverage, if necessary.

The BLM holds $1.7 billion in financial assurances.

The BLM considers the following costs when calculating the amount of the required financial assurance:

- All costs of complying with the reclamation performance standards in 43 C.F.R. § 3809.420, including compliance with Federal and State environmental protection laws, and any additional reclamation and closure requirements identified in the accepted Notice or approved Plan of Operations;
- All relevant operation, maintenance, and administrative costs for reclamation;
- Costs associated with using offsite equipment as if the project area was vacated, as well as associated mobilization and demobilization costs;
- When applicable, all interim maintenance costs required to keep the area of operation in compliance with applicable safety and environmental requirements while reclamation contracts are developed and executed;
- Construction and maintenance costs of any long-term treatment facilities or post-closure structures and/or activities required;
- Labor costs, based on federal regulations; and
- Costs of complying with all other performance standards in 43 CFR §3809.420.

5. Can your agency approve a plan of operations that poses a high risk of unnecessary or undue degradation of public lands? How would your agency typically respond to a plan of operations that it believed posed a high risk of unnecessary or undue degradation of public lands?

The Federal Land Policy and Management Act requires the BLM to prevent unnecessary or undue degradation (UUD) of the public lands. 43 U.S.C. § 1732(b). Under the BLM's surface management regulations, the BLM will disapprove a Plan of Operations if the proposed operations would result in UUD. 43 C.F.R. § §3809.411(d)(3)(iii). If the BLM receives a proposed Plan of Operations that would likely result in UUD, then BLM would require the operator to modify its proposed plan. Should the operator fail to make the required modifications, the BLM would not approve the plan.

6. Does your agency have the authority to impose financial assurance requirements for post-mining, long-term monitoring, maintenance and treatment operations?

The regulations at 43 C.F.R. § 3809.552(c) allow BLM to require an operator to establish a trust fund or other funding mechanism to ensure the continuation of any long-term, post-mining treatment or maintenance requirements. When the BLM District or Field Manager determines a need for a long-term funding mechanism, based on specific long-term corrective actions, the operator must establish an acceptable trust fund or other funding mechanism that is adequate to provide for construction, long-term operation, maintenance, or replacement of any treatment facilities and infrastructure, for as long as the treatment and facilities are projected to be needed

after mine closure. As with other financial guarantees, the long-term trust fund assures the performance of the operator's obligations, and is only used if the operator defaults.

7. **How many hardrock mining and beneficiation plans of operation has your agency approved since 1990?**

   There have been 659 plans of operations authorized by BLM's Mining Law Administration Program since 1990.

   a. **How many of those sites are, or have been, placed on the CERCLA NPL?**

   There have been no sites on which a mining plan of operations was approved since 1990 that have been placed on the CERCLA NPL.

   b. **How many of those sites placed on the CERCLA NPL involve(d) a responsible party that pays (paid) for the cost of short-term removals or long-term remediation, either in part or in whole? What is the aggregate dollar amount spent by these responsible parties? What is the aggregate dollar amount spent by the federal (or state) government?**

   There are no such sites.

8. **Does your agency coordinate – or has it coordinated in the past – with states to develop financial assurance requirements for hardrock mines on non-federal lands? If so, please describe this coordination.**

   Requiring financial assurances for hardrock mines on non-federal lands is generally outside of the BLM's authority. Exceptions to this general rule include: operations on certain split-estate lands where the surface estate is patented, but the locatable mineral estate remains under Federal ownership (such as lands patented under the Stock Raising Homestead Act), and lands that remain subject to Federal regulation even after patenting (such as lands patented in the California Desert Conservation Area).

   In these instances, as with the regulation of hardrock mining on Federal lands, the BLM has authority to enter into agreements with states to allow for joint Federal and State administration and enforcement of mining operations, including financial guarantees. 43 C.F.R. § 3809.200. Alternatively, the Federal-State agreement may provide for deferral of BLM's surface management responsibilities to the State, rather than administering the operation jointly.

   If the Federal-State agreement covers financial guarantees, an operator may use a single financial instrument to meet both Federal and State financial guarantee requirements. The BLM and the State must concur on the amount of the financial guarantee, which must be

calculated based on completion of all applicable Federal and State reclamation requirements for the entire operation. To be held as a single financial guarantee, any financial instrument(s) used for the financial guarantee must be acceptable to the BLM under 43 C.F.R. § 3809.555 or § 3809.571.

9. **Please provide all documents, records, papers, reports, agreements, notes, correspondence, presentations, analyses, comments, and any other materials generated by your agency as part of an inter- or intra-agency process associated with the EPA's CERCLA Sec.108(b) rulemaking.**

   This request for documents prepared as part of an ongoing rulemaking process for which no draft rule has yet been proposed implicates important confidentiality interests for the Executive Branch. In order to provide information, we have attached a copy of Instruction Memorandum 2006-135, detailing the BLM's latest requirements for the review and acceptance of reclamation cost estimates. We are happy to provide a briefing or additional material on the BLM's program as well as to participate in a multi-agency briefing with the EPA and the Forest Service if that is preferred.

Index of documents responsive to the March 8, 2011, request from Senator Murkowski for documents related to the actions being taken by the Environmental Protection Agency related to financial assurance requirements, including bonds, for hardrock mines in the United States

Volume: 00026366_Murkowski_001

	Document Name	Pages	Document Date	Document Type	Document Title
1	BLM-WDC-B03-00001-000001	14	20060410	OTH	Instruction Memorandum (IM) 2006-135, Reclamation Cost Estimates for Notices and Plans of Operations
	Total Pages:	**14**			

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

June 17, 2011

Technical Instructions/Information

This production CD is labeled "00026366_Murkowski_001" and contains 1 document consisting of 14 pages.

All images on the CD are in a multi-page PDF format. PDF files can be opened with Adobe Reader.

On the CD-ROM there is a copy of the index for the volume. The following fields are included on the index: document name, page count, document date, document type, document title, and request number.

The format of the date field is the four-digit year, two-digit month and two-digit date (YYYYMMDD). If any part of the date is illegible or unknown, there is an X as a placeholder for the digit.

The index lists the abbreviations for the document types. A list of the abbreviations is as follows:

AGN = Agenda
ANL = Analysis
APR = Appraisal
ART = Article - News
AUD = Audit
BRF = Briefing Paper
CAL = Calendar
CON = Contract
COO = Court Decision/Opinion/Order
COR = Correspondence (Memo)
DEC = Declaration
EML = E-mail
GRT = Grant
LEA = Lease
MAP = Map
MOU = Memorandum of Understanding
MTG = Meeting/Minutes
NTE = Notes
NTI = Notice
OTH = Other
PRO = Proposal
REC = Receipt
REG = Regulation
RPT = Report
STA = Statue
STM = Statement
SUB = Subpoena
TES = Testimony
TRA = Transcript
TVO = Travel Voucher/Order

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Washington, D. C. 20240
http://www.blm.gov

April 10, 2006

In Reply Refer To:
3809 (320) P

EMS TRANSMISSION 04/20/2006
Instruction Memorandum No. 2006-135
Expires: 09/30/2007

To: All Field Officials

From: Assistant Director, Minerals, Realty and Resource Protection

Subject: Reclamation Cost Estimates for Notices and Plans of Operations

Program Area: Mining Law Administration, Surface Management

Purpose: The purpose of this Instruction Memorandum (IM) is to provide policy guidance for the review and acceptance of reclamation cost estimates for Notices and Plans of Operations under the 43 CFR 3809, Surface Management Regulations.

Policy/Action: The operator must provide the responsible Field Office with an acceptable estimate of the reclamation costs for all proposed Notices and Plans of Operations. The operator's estimate of the cost to reclaim the operations must meet the requirements of 43 CFR 3809.552(a) and 3809.554(a), and must be acceptable to BLM as required by 43 CFR 3809.554(b). When the Field Manager requires a trust fund or other funding mechanism under 43 CFR 3809.552(c) to guarantee post-mining obligations, the operator must also provide the Field Office with a cost estimate for the monitoring, construction, operation, maintenance, replacement and other activities for the required facilities, treatment or other needs documented in the Plan of Operations.

Based on a review of the reclamation cost estimate, the Field Manager must provide the operator with a written decision as to the amount of the required financial guarantee. Operations may not commence until the operator has received written notification that BLM accepted and obligated the operator's financial guarantee, and the complete Notice is accepted or Plan of Operations approved by the Field Manager.

Specific policy and procedural guidance for reviewing and accepting an operator's reclamation cost estimate are given in Attachment 1 - *Guidelines for Reviewing Reclamation Cost Estimates* attached hereto.

Time Frame: This IM is effective immediately and will be in effect unless formally modified.

Budget Impacts: There will be a budget impact, but there is no estimate at this time.

Background: The revised Surface Management Regulations became effective on January 20, 2001, with subsequent amendments that took effect through December 31, 2001. The final regulations require all Notices and Plans of Operations to post full-cost financial guarantees in an amount sufficient to allow BLM to contract with a third party to reclaim the operations according to 43 CFR 3809.552(a). The final regulations also require an operator to establish a trust fund or other funding mechanism available to the BLM to ensure the continuation of any long-term, post-reclamation treatment or maintenance requirements identified in the decision document for the operation.

Manual/Handbook Sections Impacted: Bureau Manual Section 3809 - This guidance will be included in the 3809 Surface Management Manual and Handbook that are now being prepared.

Coordination: The policies and procedures found in this IM were developed with input from the Office of the Solicitor, and BLM State and Field Offices.

Contact: If you have any questions concerning this IM, please contact T. Scott Murrellwright at 202-785-6568 or Paul McNutt at 775-861-6604.

Signed by:
Thomas P. Lonnie
Assistant Director
Minerals, Realty and Resource Protection

Authenticated by:
Robert M. Williams
Division of IRM Governance, WO-560

1 Attachment
1 - *Guidelines for Reviewing Reclamation Cost Estimates* (13 pp)

Guidelines for Reviewing Reclamation Cost Estimates

BLM's Review Responsibilities

New or Modified Operation - When submitting a new Notice or Plan of Operations the operator must provide BLM with a reclamation cost estimate that meets the requirements of 43 CFR 3809.552(a) and 3809.554(a), and must be acceptable to BLM as required by 43 CFR 3809.554(b). Where an existing Notice or Plan of Operations is proposed to be modified, the operator must provide the Field Office with an estimate of the reclamation costs for all components of the existing and proposed operation that will be effected by the modification.

BLM will review the operator's reclamation cost estimate to determine if the operator has identified and incorporated all applicable reclamation and administrative costs (identified below). In performing the review of the operator's reclamation cost estimate, the responsible Field Office will notify the operator, in writing, of any deficiencies or additional information needed in order for BLM to complete the review. It is not BLM's responsibility to calculate the reclamation cost for an operator, but the Field Office, at the Field Manager's discretion, may assist the operator in identifying costs to be included in the estimate and in developing the cost estimate.

Reclamation Cost Estimate for Part of an Operation - Where the Field Manager authorizes an operator to provide BLM with a financial guarantee under 43 CFR 3809.553 that covers a part of the operation ("phased financial guarantee") the operator must prepare a reclamation cost estimate for the part of the operation to be covered by the partial financial guarantee. The reclamation cost estimate for part of the operation must conform to the same standards as the reclamation cost estimate for the entire operation. In addition to the reclamation cost estimate for a part of the operation, the operator must also prepare a separate reclamation cost estimate for all operations proposed in the Plan of Operations on public lands. The Field Manager's decision on the amount of the required financial guarantee will identify both the total and partial cost estimates. The amount of the required financial guarantee will be based on the reclamation cost estimate for the part of the operation where the authorized incremental operations are to occur.

Long-Term Funding Mechanisms - When a trust fund or other funding mechanism is required under 43 CFR 3809.552(c), the operator must provide the Field Office with a cost estimate for the monitoring, construction, operation, maintenance, replacement and other activities for the required facilities, treatment or other needs documented in the Plan of Operations. The operator's estimate must project when the cost obligations will occur. For reoccurring costs, such as maintenance of a water treatment facility, the frequency, timing and duration of the obligation should be estimated for each cost component. The operator's cost estimate prepared for long-term obligations to be covered under 43 CFR 3809.552(c) should be documented separate from the reclamation cost estimate [43 CFR 3809.554(a)]. The cost estimates for the long-term post-reclamation obligations must be reviewed by the Field Manager in the same manner and with the same degree of care that is used in estimating traditional financial guarantees for reclamation obligations.

ATTACHMENT 1-1

Periodic Review - It is BLM's responsibility to conduct a periodic review of the reclamation cost estimate. As required by 43 CFR 3809.552(b) and 3809.553(b), BLM must ensure the amount of the required financial guarantee for ongoing operations continues to meet the requirements of the regulations and all reclamation requirements in the accepted Notice or approved Plan of Operations. Unless the operator is proposing a modification to the Notice or Plan, the existing reclamation cost estimate does not reflect authorized operations, or additional information is needed, BLM's review will consist of a complete evaluation and update of the operator's reclamation cost estimate on file. Where additional information is necessary to complete the review or a revised reclamation cost estimate is required, the Field Manager will direct the operator to provide that information.

Reclamation Cost Estimate Assumptions and Conditions

The reclamation cost estimate must be based on the following assumptions and conditions:

- The estimate must cover all relevant operation, maintenance and administrative costs for all reclamation identified in the filed Notice or approved Plan of Operations [43 CFR 3809.301(b), 3809.401(d) and 3809.552(a)].

- Costs must be estimated as if BLM were hiring a third party contractor to perform all required reclamation [43 CFR 3809.552(a)].

- Costs must include the use of off-site equipment as if the project area was vacated, and the estimate must include all associated mobilization and demobilization costs [43 CFR 3809.554(a)].

- The estimate must include, when applicable, all interim maintenance required to keep the area of operation in compliance with applicable safety and environmental requirements while reclamation contracts are developed and executed [43 CFR 3809.552(a)].

- The estimate must cover costs to construct and maintain any long-term treatment facilities or post-closure structures required by the filed Notice or approved Plan of Operations [43 CFR 3809.552(a)].

- Where applicable, labor costs must be based on federally mandated labor rates, as required by the Davis-Bacon Act and the Federal Acquisition Regulations (FAR) for contracts over $2,000. If the reclamation and cost estimate is solely for the dismantling, demolition, or removal of improvements, then contracting is under the Service Contract Act and Davis-Bacon wage rates do not apply. If construction, alteration or repair of the improvements is contemplated, even if it is under a separate contract, then the Davis-Bacon wages apply. (www.access.gpo.gov\davisbacon).

ATTACHMENT 1-2

Maximum Reclamation Cost - The reclamation cost estimate must reflect the maximum cost of reclamation for the proposed disturbance to be covered by the financial guarantee. The point of maximum reclamation costs is often when there is the greatest area of disturbance, greatest volume of materials needing special handling, or some other factor or combination of factors escalating the cost to reclaim. The maximum cost of reclamation is generally not at the end of the project life.

Unless the Field Manager authorizes a phased financial guarantee under 43 CFR 3809.553, the financial guarantee is for the entire life of the mine. In reviewing the operator's estimate, the BLM must make sure the reclamation cost estimate for a life-of-mine financial guarantee reflects the maximum reclamation obligation.

Inflation - Inflation can, over time, become a significant factor in the amount of the required financial guarantee. This is an especially important concern where the potential exists for a substantial time interval between the BLM's review of the reclamation cost estimate and the potential collection and use of a forfeited financial guarantee. To minimize the potential impact inflation can have on the amount of the financial guarantee needed to cover the current reclamation cost the Field Office must review on a periodic basis the reclamation cost estimates for all ongoing operations as addressed in this IM. The maximum allowable time period between reviews is discussed below (Periodic Review).

Reclamation, Closure, Mitigation and Monitoring

The reclamation operating and maintenance (O&M) costs reflect the direct current costs of reclamation based on the reclamation and closure measures in the Notice or approved Plan of Operations. Reclamation and closure tasks typically fall into the following categories:

- Interim Operation and Maintenance – If an operator abruptly ceases operations, immediate site operation and maintenance may be required by a third party to maintain the area of operation in compliance with applicable safety and environmental requirements. There is no preset time period for the care and maintenance of a site prior to the start of reclamation; much depends on BLM's ability to access the financial guarantee, especially in bankruptcy cases. It is a good rule-of-thumb to allow for a minimum of six months of interim O&M by a contractor. Large operations or project areas with limited seasonal access may warrant a longer time period.

- Hazardous Materials – This may include the cost of decontaminating, neutralizing, disposing, treating or isolating hazardous materials used, produced, or stored on the site. The estimated cost for handling hazardous materials should assume, unless otherwise documented, that the material is properly stored and labeled.

If upon site inspection, it is determined the operator is using, producing or storing material on site that could be hazardous, e.g. unlabeled barrels, and the BLM is unsuccessful in getting the operator to properly manage those materials (operator has failed to comply with a noncompliance order), the reclamation cost estimate must be updated to reflect the higher cost of disposing of such material. This distinction is important as the disposal of properly managed hazardous materials may be a fraction of the disposal cost for materials that are not properly stored and identified.

- Water Treatment – All necessary construction and maintenance water treatment costs needed to ensure that mine discharge or drainage will meet relevant standards must be identified in the reclamation cost estimate. The cost of long term, post-reclamation operation, maintenance, and replacement requirements may be addressed in a trust fund established under 43 CFR 3809.552(c).

- Mine Facilities – The demolition, removal and disposal of all mine facilities, immobile equipment and material from the project area must be accounted for in the reclamation cost estimate. Disposal costs for those facilities which have been approved in writing by the BLM for post-reclamation BLM use may be excluded from the reclamation cost estimate. No salvage value for structures, equipment or materials is allowed in the reclamation cost estimate.

  Operable mobile equipment, e.g. trucks, dozers, etc., may be excluded from the cost estimate. If upon site inspection, it is determined the mobile equipment is inoperable and the BLM is unsuccessful in getting the operator to repair or remove the inoperable equipment from the project area (operator has failed to comply with a noncompliance order), the cost of removing and disposing of that equipment must be included in the reclamation cost estimate.

- Earthwork – Earthwork includes, but is not limited to, the cost of hauling, placement, regrading and backfilling to reclaim mine disturbances, including roads that have not been specifically identified and approved to remain open.

- Drill Hole Plugging – The cost of plugging, capping, and isolation of drill holes, including exploration, production and monitoring holes, must be addressed in the reclamation cost estimate. Specifically, care needs to be taken in determining plugging costs based upon whether drill holes encounter water, water under artesian pressure, or dry holes. Proposed plugging must meet all applicable Federal and State requirements.

  Where the operator is proposing drilling, the reclamation cost estimate must include, at a minimum, the estimated cost of plugging the maximum number of drill holes that may be open at one time, or the number of drill holes at a particular phase of the exploration program. The reclamation cost estimate must never be less than the cost of plugging one drill hole for each drill rig that will be working in the project area.

ATTACHMENT 1-4

Where the submitted Notice or approved Plan of Operations calls for drill holes to be plugged, but doesn't specifically require the drill holes be plugged before the drill rig has been moved from the drill pad, the reclamation cost estimate must include the plugging cost for all drill holes identified in the Notice or Plan of Operations. For all drill holes, and water, monitoring and piezometer wells scheduled to be left open, the estimated plugging cost must be included in the reclamation cost estimate. Where the approved Plan of Operations proposes mining through an area where drilling is to occur and the cost of the post-mining reclamation is included in the reclamation cost estimate, the cost estimate for plugging those drill holes is not needed.

If the State Director determines the State's plugging and financial guarantee requirements related to drill hole plugging accomplishes the same level of protection as this policy, the Field Manager may base the estimated plugging costs on the State requirements.

- Revegetation – The reclamation cost estimate must include the cost of obtaining the seed mix specified in the reclamation plan and the cost of soil preparation, such as ripping or harrowing; soil amendments, such as mulching or fertilizer; application of the seed mix; noxious weed control; and placement of tree and shrub seedlings, if required. The cost for hauling and placement of growth medium, if not addressed under earthwork, must be included.

- Mitigation – Mitigation may include avoiding, minimizing, rectifying and reducing or eliminating the impact, or compensating for the impact. The cost of any deferred mitigation the Field Office is requiring the operator to perform must be included in the reclamation cost estimate. For example, if the operator is required to develop five acres of wetlands to compensate for disturbance elsewhere on the project area, until that wetland development is completed the reclamation cost estimate must include the cost of that mitigation.

- Post-Reclamation Costs – The cost of meeting any long-term construction, operation, maintenance, or replacement of any treatment facilities and infrastructure, which are not addressed in a trust fund established by 43 CFR 3809.552(c), must be included in the reclamation cost estimate.

In estimating the cost to perform these reclamation, closure, mitigation and monitoring tasks, the operator's estimate must identify the current O&M costs relating to reclamation including:

ATTACHMENT 1-5

- Equipment rental or acquisition costs,
- Equipment operation costs,
- Equipment maintenance costs,
- Cost of operating supplies,
- Labor costs for operations, maintenance and supervision,
- Site maintenance including roads, infrastructure, power lines, fences and monitoring facilities,
- Reclamation materials acquisition costs, and
- Mobilization and demobilization costs.

All line items contained in an acceptable reclamation cost estimate are not to be considered spending constraints should a financial guarantee be forfeited. The line items listed are solely for the purpose of arriving at a total financial guarantee amount. This total amount may be spent however the BLM deems necessary to implement the reclamation plan. Care should be exercised so that decisions on the amount of the financial guarantee correctly reflect this policy.

Information sources that may be useful in conducting a cost analysis include: applicable parts of the Office of Surface Mining's Handbook for Calculation of Reclamation Bond Amounts (http://www.wrcc.osmre.gov/), BLM's Solid Minerals Reclamation Handbook H-3042-1, the Caterpillar Performance Handbook, Western Mine Engineering, Inc. (use for operator estimates only-does not consider third party contract estimates), R.S. Means Site Work Cost Data, Dataquest (equipment operating and owning costs), Rental Rate Blue Book for Construction Equipment, and Skills & Knowledge of Cost Engineering. The user of these references needs to be cognizant of how the data may be applied. The reclamation cost estimate must reflect BLM's cost to contract to have the work performed; owner/operator cost data does not reflect BLM's contracting cost.

BLM Administrative Costs

The Field Office must ensure the cost of reclamation is estimated as if BLM were hiring a contractor to perform all required reclamation. This will include costs that the operator does not normally encounter. The BLM reviewer needs to pay particular attention to costing standards that are based, in part, on the Federal Acquisition Regulations. The responsible BLM specialist should coordinate with their State Office procurement analyst concerning current labor wages, contracting requirements, and advice on various types of contracts, contract language, and administration.

This guidance contains suggested percentages for some of these administrative costs. Unless otherwise noted, these percentages should be treated as rules-of-thumb and not as precise amounts specified by regulation or law. Figures or percentages, other than those listed below, should be included in a calculation if they are explicitly addressed in a Federal-State agreement regarding the financial guarantee and/or are required by Federal or State law.

ATTACHMENT 1-6

Unless otherwise noted, the administrative cost categories identified below should be included in the reclamation cost estimate.

- Engineering, Design and Construction (ED&C) Plan - An ED&C plan provides the details needed for contracting the reclamation construction work. Where appropriate, the reclamation cost estimate should reflect the costs to prepare such a plan. Should the operator fail to reclaim, the BLM may need to undertake a number of tasks including:
    - Preparation of maps and plans to show the extent of required reclamation.
    - Survey of topsoil and growth medium stockpiles to determine amount of material available.
    - Sampling and analysis of waste rock, tails, heap material, surface and ground water, etc.
    - Sampling and analysis of topsoil, growth medium and waste piles to determine whether special handling or treatment is necessary.
    - Evaluation of structures to determine requirements for demolition and removal.
    - Evaluation of storm water facilities and process solutions or water impoundments to determine if treatment, clean out, or other improvements are necessary.
    - Preparation of a supplemental environmental analysis or site studies before reclamation may commence.

  Reported costs for preparation of this data collection, analysis and planning have ranged from 2 to 20 percent of the estimated reclamation O&M costs. The actual cost will depend to a great extent on the specifics, including reclamation complexities, of the proposed operation. The amount or percentage you apply should be based on available data within your State. Absent specific local or State data, we recommend the ED&C costs be estimated as 4 to 8 percent of the estimated reclamation O&M costs.

  Inclusion of a line item for the development of an ED&C plan may not, however, be necessary for all operations. Specifically, small operations, such as notice-level operations, may not require the inclusion of funds to collect, analyze and develop the detailed engineering information; reclamation contracting and construction may be able to proceed without developing an ED&C plan.

- Contingency – Contingency allowance is for cost overruns that regularly occur but cannot be ascertained when an operation is being reviewed. Contingency costs generally reflect the level of detail and completeness of the cost estimate, as well as the level of uncertainty in the assumptions used for the reclamation cost estimate. With the development of an ED&C plan many of the unforeseen circumstances and costs are identified. Contingency costs do not, however, include changes in the scope or unforeseeable or unanticipated events such as earthquakes, labor strikes or floods.

ATTACHMENT 1-7

Federal and State agencies that routinely prepare construction cost estimates apply contingencies, ranging from 3 to 45 percent of the O&M costs. The amount or percentage required should be based on available reclamation or construction contract information within your State. Absent reliable local or State information, we recommend the inclusion of a contingency of 4 to 10 percent of the estimated reclamation O&M costs. Where State law specifies an amount, use that figure.

Where the proposed operation involves a relatively small, uncomplicated reclamation effort, and development of an ED&C plan is not anticipated, there may not be a need to include a contingency line item. It is advisable to ensure a contingency is included for operations with estimated reclamation O&M costs over $100,000. As with an ED&C plan, reclamation cost estimates for notice-level operations may not require the inclusion of a contingency allowance.

- Contractor Profit – Government contracts generally include a contractor profit over and above the estimated reclamation O&M costs. Reported prime contractor's profits and overheads on existing contracts cover a wide range of values (10 to 35 percent). For financial guarantees we recommend 10 percent of the estimated O&M costs. Where State or local contract information suggests a different amount or where State law specifies an amount, use that figure. Inclusion of a line item for prime contractor's profit may not be required if the operator incorporates the prime contractor's profit into the O&M estimate. In such cases, the operator's reclamation O&M estimate must document the inclusion of the prime contractor's profit.

- Liability Insurance - The contractor's liability insurance premium must be included in the reclamation cost estimate. If the liability insurance is included in the reclamation O&M estimate, this needs to be documented. The contractor's liability insurance premium should be estimated as 1.5 percent of the estimated labor costs for the project and included in the reclamation cost estimate.

- Payment and Performance Bonds - Payment of premiums for both a performance bond and a payment bond as required by the Miller Act, with estimated contract costs over $100,000, must be included in the reclamation cost estimate. A set amount equal to 3 percent of the estimated O&M costs should be used to calculate the payment of premiums for both a performance bond and a payment bond.

- BLM Contract Administration - BLM's labor and operations costs for the Field and State Offices to administer the contract must be included in the financial guarantee. Reported contract administration costs range from 2 to 25 percent. We estimate BLM's contract administration and inspection cost for reclamation contracts as 6 to 10 percent of the estimated O&M costs, depending on the size and complexity of the proposed operation. The actual cost will depend to a great extent on the specifics of the proposed operation, including reclamation complexities.

ATTACHMENT 1-8

Where data is available, the State or Field Office should review their records to determine appropriate costs. Generally the larger the amount of the financial guarantee the lower the percentage needed for contract administration.

- BLM Indirect Costs - BLM's indirect costs for contract administration must be included in the amount of the required financial guarantee. The indirect cost rate is a fixed 21 percent of the estimated BLM contract administration cost; therefore the indirect costs may range from 1.26 to 2.1 percent of O&M costs (21% of the 6 - 10% contract administration costs).

  If BLM is required to administer a reclamation contract under a forfeited financial guarantee, these indirect cost funds are to remain within the State where the reclamation work will be done. The funds will be available to pay for within-State indirect costs (building rental, telephone, etc.) associated with the project and any project support needed from other offices such as the Denver Service Center contract officers or inspectors.

In reviewing the operator's reclamation cost estimate, the Field Office may need to determine what administrative costs the operator has included with their reclamation O&M costs. For example, operator's labor cost estimates may include base pay, payroll loading, overhead and profit. A typical dozer operator rate in Idaho, in 2002, was $37.59 to $40.25 per hour. This rate included the base pay plus 14.6 percent payroll loading, 10 percent overhead, and 6 percent profit. To avoid overlooking or double counting any of the identified administrative costs, e.g. contractor profit, the operator must document what administrative costs are included in their labor costs or other O&M costs. This may be done by itemizing the cost estimates or by providing BLM with a signed statement that identifies the specific administrative costs that are included in their estimated O&M costs.

Reclamation Cost Estimating Tools

Individual BLM State Offices or Field Offices may develop there own tools to support the reclamation cost estimating process. Summary sheets, checklists, and cost models maybe available to assist the operator in developing the reclamation cost estimate.

Standardized reclamation cost estimating processes, that include standardized unit costs, schedules, spreadsheets and models, are useful tools that provide simplified, efficient, defensible and consistent means of estimating reclamation costs for both Notices and Plans of Operations. Where appropriate, BLM State and Field Offices are encouraged to develop processes based on standardized unit costs to facilitate the review and approval of the operator's reclamation cost estimate. A process that uses standardized costs may be developed, based on local and/or regional costs, to reclaim typical activities, features and facilities (roads, drill pads, drill-holes, trenches, pits, structures, site stabilization, revegetation, etc.) for specific kinds of terrain (topography).

ATTACHMENT 1-9

Where a standardized reclamation cost estimating process is used, the amount of a financial guarantee must be sufficient to meet the requirements of 43 CFR 3809.552(a) and 3809.554(a). The assumptions used in developing the cost inputs must be consistent with both State and Federal regulations and laws. Determining consistency with State and Federal regulations and laws goes beyond the applicable environmental requirements. The assumptions used must also be consistent with applicable contracting requirements, such as Federal Acquisition Regulations. For example, under Federal contracting we cannot require an operator to work double shifts. As such, the reclamation cost estimate should not be based on the assumption that the reclamation contractor will conduct the work using a double shift.

Periodic Review

The BLM Field Office must provide a periodic review of reclamation cost estimates for ongoing operations and issue a determination as to the amount of the required financial guarantee. Based on a complete evaluation and update of the reclamation cost estimate, the periodic review must ensure the current amount of the financial guarantee continues to meet the requirements of 43 CFR 3809.552(a), 3809.552(c) and 3809.554(a).

The following establishes the maximum time the BLM may allow to elapse between reviews. The BLM has the authority to require a more frequent review of the reclamation cost estimate at the discretion of the Field Manager.

- Reclamation cost estimates for Notice operations must be reviewed every 2 years at time of the Notice extension under 43 CFR 3809.333.

- Reclamation cost estimates for Plans of Operations must be reviewed at least every 3 years.

- Where the BLM has an agreement under 43 CFR 3809.200 with the State that requires a review more frequent than every 2 years for Notices or every 3 years for Plans of Operations, reviews must be conducted in conformance with that agreement.

- Where the Notice or Plan of Operations is modified, a review must be conducted at the time of modification. The reclamation cost estimate review must focus on how the modification affects the existing cost estimate on file. Unless the proposed modification necessitates a complete review, the entire current reclamation cost estimate does not need to be reviewed. However, a review that covers a portion of the reclamation cost estimate on file for the modified Notice or Plan does not substitute for the required 2-year review for a Notice or 3-year review for a Plan of Operations.

- Where the financial guarantee is for a part of the operation, as provided under 43 CFR 3809.553, BLM must review the reclamation cost estimate annually [43 CFR 3809.553(b)]. The Field Office will evaluate and update the reclamation cost estimate for each increment of the operations. In addition to the annual review requirement for the phased financial guarantee coverage, the Field Office must also review the reclamation cost estimate for the entire Notice every 2 years or entire Plan of Operations every 3 years as required above.

- The Field Office must conduct, at least every 3 years, a thorough review of the cost estimates and other assumptions used in determining the amount of funds needed in the long-term funding mechanism required under 43 CFR 3809.552(c). The Field Office must also monitor the growth of all trust funds. At least once a year the responsible Field Office must review the financial statements to ensure growth of the fund is keeping pace with the assumptions used to determine the amount needed in the fund.

Review Results and Decisions

The Field Manager must issue a decision that establishes the amount of the required financial guarantee. The decision must be provided to the operator following the completion of the review of the reclamation cost estimate with a copy provided to the BLM office responsible for adjudication of the financial guarantee.

Acceptable Review Results - When the Field Office has received an estimate that is acceptable, the Field Manager must provide the operator with a written decision as to the amount of the required financial guarantee. The decision must state: 1) the amount of the financial guarantee to be provided ($0.50 or more rounded up to the nearest whole dollar and less than $0.50 rounded down to the nearest whole dollar), and 2) the types of financial instruments that are acceptable to the BLM. The Field Manager's decision must also state that an operator may not begin operations under a new or modified Notice or Plan of Operations without first providing BLM with an acceptable financial guarantee that meets the requirements of 43 CFR 3809.551 thru 3809.572; no activity greater than casual use is authorized until the BLM has accepted and obligated the operator's financial guarantee.

Following the periodic review for an ongoing operation, the Field Manager will make a determination as to the amount of the required financial guarantee. If there is a change in the required amount of the financial guarantee or the review was conducted at the request of the operator, the Field Manager must issue a decision as to the amount of the required financial guarantee. For ongoing operations under an existing Notice and Plan, the decision must state: 1) the amount of the required financial guarantee, 2) any change (increase or decrease) in the amount of the required financial guarantee, 3) that the operator has 60 days from receipt of the decision to submit an acceptable financial guarantee if the amount has increased, and 4) that failure to provide an acceptable financial guarantee within the specified timeframe will result in an enforcement action against the operator for failure to maintain an acceptable financial guarantee.

ATTACHMENT 1-11

For a Notice extension under 43 CFR 3809.333, where the amount of the required financial guarantee has increased, the decision must also state: 1) that the Notice is conditionally extended subject to meeting the financial guarantee requirements, 2) that failure to provide an acceptable financial guarantee within 60 days will result in the Notice expiring immediately upon conclusion of the timeframe, and 3) that upon expiration of the Notice, all activities, other than reclamation, are unauthorized and must cease.

Unacceptable Review Results - If the Field Office finds the operator has incorrectly calculated operating and maintenance costs, or finds that the estimate is based on out-of-date cost data that does not reflect the actual cost of reclamation, then the estimate will not be accepted. When an estimate is not acceptable, the Field Manager must notify the operator, in writing, of its unacceptability, and identify the deficiencies or errors that led to that conclusion. The BLM must advise the operator to incorporate the administrative costs outlined above if they are not included in the estimate.

Where the reclamation cost estimate for a new Notice is not acceptable to the BLM, the Notice will not be considered complete as required under 43 CFR 3809.301.

Additional Information - For ongoing operations, where the Field Office lacks the information necessary to determine the adequacy of the existing reclamation cost estimate, the Field Manager must notify the operator of the deficiencies or errors and include a due date when the information or revised reclamation cost estimate must be submitted. Failure to provide the required information within the specified timeframe will result in an enforcement action against the operator for failure to maintain an acceptable financial guarantee.

For Notices to be extended under 43 CFR 3809.333, where the Field Office lacks the information necessary to determine the adequacy of the existing reclamation cost estimate, the Field Manager must issue a decision giving the operator 30 days from receipt to provide all of the requested information. The Notice will be conditionally extended pending Field Office receipt of the required information. Failure to provide the required information within the 30-day period will result in the Notice expiring.

Appeal of Review Decisions - Decisions relating to the acceptability or unacceptability of a financial guarantee are subject to appeal under the provisions of 43 CFR 3809.800. Any adversely affected party may elect to seek a State Director Review (SDR) under 43 CFR 3809.800(a) or appeal directly to the Office of Hearings and Appeals (OHA) under 43 CFR 3809.801.

ATTACHMENT 1-12

Appeal to OHA of a Field Manager's decision must be filed in the office that issued the decision. The Field Office then forwards the Notice of Appeal to OHA. Appeals must be filed by the appellant with the office that issued the decision within 30 days of receipt of the decision. Request for an SDR are filed with the office of the State Director within 30 days of the Field Manager's decision. If the review and evaluation of the financial guarantee and/or financial instrument was conducted by the State Office, a request for State Director review under 43 CFR 3809.806 may not be accepted.

Decrease the Amount - Where the existing amount of the financial guarantee exceeds the Field Manager's determination as to the amount of the required financial guarantee, the operator may request BLM decrease the amount of the required financial guarantee. Any request by the operator for a reduction in the amount of the financial guarantee must be made to the BLM office responsible for adjudicating the financial guarantee.

ATTACHMENT 1-13