

# STATE OF ALASKA

FRANK H. MURKOWSKI, GOVERNOR

## DEPARTMENT OF NATURAL RESOURCES

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October 5, 2006

Austin Ahmasuk  
P.O. Box 693  
Nome, Alaska 99762

**RE: APPEAL OF DECISION APPROVING RECLAMATION PLAN F20069578 FOR  
ROCK CREEK MINE**

Dear Mr. Ahmasuk:

By an electronic mail message dated August 29, 2006, you appealed the Division of Mining, Land and Water's August 9, 2006, decision approving Alaska Gold Company's reclamation plan for the Rock Creek & Big Hurrah Mine Project. The Department of Natural Resources (DNR) received your appeal within the time allowed by law (11 AAC 02). Thank you for your interest in the project.

Your appeal to DNR has been given a thorough review. Because many of the issues you raised are technical in nature, I had my staff review the issues and develop the enclosed technical responses. I have reviewed your appeal and my staff's analysis and its responses. After careful consideration of the points raised in your appeal, I have determined that the Division of Mining, Land and Water considered these issues during the permitting process and further that the division appropriately addressed the issues in the terms and conditions of the reclamation plan approval. Accordingly, I am denying your appeal and upholding the division's Reclamation Plan Approval F20069578.

I wish to stress the following points:

1. Alaska Gold Company is required to salvage and stockpile, for later use, soils from lands disturbed by mining. The company will use this soil for reclamation to help revegetation upon mine closure, except on mine dumps that the company plans to use after mining to stockpile materials that it can use for construction purposes. Alaska Gold Company has this right on its private lands and DNR has agreed to this use. This is a fair alternative land use and is proper as long as adjacent state lands are not adversely affected. DNR will use post closure monitoring to ensure that state lands are protected.
2. I do not view solifluction to be a significant issue because the mine dumps are made up of coarse material that is not likely to retain water and be subject to slumping and creep, especially because the underlying soils will be removed before placement. These dumps are to be recontoured to gentler slopes that will reduce erosion and aid in revegetation at closure.
3. Acid rock drainage issues have been very carefully studied. DNR hired a first-rate consultant to assist the department with its review of the company's data and the department required a good deal of additional testing and evaluation. I know that  
*"Develop, Conserve, and Enhance Natural Resources for Present and Future Alaskans."*

DNR has taken a very conservative approach by not allowing some of the neutralizing material to be used in the calculations for net neutralization potential. In addition, I find that not allowing any mining at Big Hurrah to take place until additional test work is completed, and until DNR sees a waste segregation plan that it is happy with, to be a most conservative decision. Furthermore, the requirement for the acid generating rock to be backfilled into the Big Hurrah pit and held under water is an almost unprecedented conservative approach.

4. Monitoring efforts by DNR and the Department of Environmental Conservation will be thorough and protective of state interests. Both departments have a keen interest in seeing to it that the Rock Creek project meets all the stipulations that they put in place in both the Waste Management Permit and the Approval of the Reclamation and Closure Plan. DNR will review the Reclamation and Closure Plan annually to make sure that it remains up to date and that the financial assurance is accurate.
5. DNR's approach to bonding on the Rock Creek Project has been very thorough. DNR did not accept the company's calculation but rather constructed its own independent calculation then worked with the company to make sure that it was fair and yet protective of the state. The bond amount fairly represents the reclamation, closure, and long term monitoring costs and DNR will update it annually.

This is a final administrative order and decision of the department for purposes of an appeal to Superior Court. An appellant affected by this final order and decision may appeal to Superior Court within 30 days in accordance with the rules of the court, and to the extent permitted by applicable law.

Sincerely,

Michael L. Menge  
Commissioner

ENCLOSURE

- cc: Ed Fogels, Acting Deputy Commissioner, Department of Natural Resources  
Tom Crafford, Acting Large Mine Coordinator, Office of Project Management and Permitting  
Dick Mylius, Acting Director, Division of Mining, Land and Water  
Rick Fredrickson, Acting Mining Section Chief, Division of Mining, Land and Water  
Doug Nicholson, Alaska Gold Company [P. O. Box 640, Nome, AK 99762]

**ENCLOSURE**  
**TECHNICAL RESPONSES TO ISSUES RAISED BY AUSTIN AHMASUK IN HIS**  
**AUGUST 29, 2006, APPEAL OF THE AUGUST 9, 2006, DECISION**  
**APPROVING RECLAMATION PLAN F20069578 FOR ROCK CREEK MINE**

**GENERAL:** The permitting of any new hardrock mine is an iterative process. The State Large Mine Permitting Team and Alaska Gold Company (AGC) initiated pre-application meetings on October 30, 2003 to discuss the geochemical characterization of the Rock Creek Project. Site inspections and review of the project geochemistry occurred during 2004. Pre-application discussions and meetings continued and in July of 2005, AGC submitted a Draft Plan of Operations and supporting documents to the Large Mine Permitting Team for review and comment. After several rounds of review, comment and revision, the Department of Natural Resources (DNR or the department) received and reviewed the final Rock Creek Project Reclamation and Closure Plan submitted June 1, 2006. The financial assurance calculation was completed on August 8, 2006 and the reclamation plan was approved (F20069578) with stipulations on August 9, 2006. An appeal of DNR's approval of the Reclamation and Closure Plan was received from Austin Ahmasuk on August 29, 2006.

**SPECIFIC ISSUES RAISED ON APPEAL:** Following are the specific issues raised by Mr. Ahmasuk in his appeal and the department's technical responses.

**Acid Potential.**

**Mr. Ahmasuk:** *That a thorough review of AGC's ABA testing is crucial to understanding the potential harmful impacts from acid mine drainage at the Big Hurrah and Rock Creek Site. That underlying assumptions by AGC indicating that non-acid generating rock prevails is a common thread of the project plan. That there is no detail within the plan as to how unexpected eventualities will be handled. That there are no alternative scenarios developed for possible eventualities and that total reliance upon AGC's project plan documents without detailed analysis is not appropriate for a project of this nature, which is essentially a large chemical facility.*

**DNR Response:** DNR did not rely upon AGC's conclusions regarding the Acid Rock Drainage (ARD) potential of the development rock at the Rock Creek and Big Hurrah Mine Sites. DNR staff conducted extensive review of the underlying Acid Base Accounting (ABA) database and DNR contracted with a third-party geochemical consulting firm (Lorax Environmental Services) to conduct additional review of certain aspects of the project geochemistry. The Reclamation Plan Approval requires the submission of final facility closure plans for the development rock piles and the paste tailings facility. The final facility closure plans must consider water quality monitoring data,

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development rock characterization records, development rock geochemical monitoring records, and the results of the required environmental audit. Further, DNR has committed to conducting an annual review of the geochemical and water quality monitoring data and may require changes to the Project Monitoring Plan and/or the Reclamation Plan if needed to ensure that the facilities can be operated and closed in a manner that prevents exceedances of water quality standards.

**Soil Stabilization.**

**Mr. Ahmasuk:** *That soil type is mischaracterized by AGC as thin or non-existent. That soil may be characterized as any unconsolidated weathered material on top of bedrock that can support plant growth. That AGC may be characterizing soils as only those with organic matter present. That soil type characterization by AGC is likely flawed. That willow and other arctic plants will grow on soils that do not contain organic matter. That soil stockpiling must be applied to all material above bedrock for later re-use.*

**DNR Response:** The Alaska Administrative Code at 11 AAC 97.200(a)(2) (Land reclamation performance standards) requires topsoil from an area disturbed by a mining operation that is not promptly redistributed to an area being reclaimed, to be segregated, protected from erosion and contamination by acidic or toxic materials, and preserved in a condition suitable for later use. "Topsoil" is typically considered the "A" soil horizon of the three major soil horizons. The "A" soil horizon is the upper most mineral layer, often called the surface soil or topsoil, and is the part of the soil where organic matter is most abundant. The Rock Creek Mine Plan of Operations committed to the salvage of organic soils, where present and practicable, within the area of the mill, the tailings dam footprint, the tailings storage facility, the mine pit area, and the waste rock stockpile "sub-cuts." In addition to these areas, the DNR Reclamation Plan Approval required the salvage of organic soils, where practicable, from beneath the entire footprint of the waste rock stockpiles. The Plan of Operations, as modified by the Reclamation Plan Approval, complies with the topsoil salvage requirements contained in Alaska Statutes and Regulations. Nothing in the statutes, regulations or the Reclamation Plan Approval prohibits the salvage of additional soil horizons, but it is not a statutory requirement. However, where these non-organic fine-grained mineral soils have to be removed for construction purposes, AGC is advised that it may want to consider the additional salvage and separate segregation of these, as

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this material may represent a valuable source of capping material should low-permeability caps be required on any waste facilities.

**Mr. Ahmasuk:** *That solifluction lobes are common land forms in this arctic environment likely due to the impermeability of permafrost zones or shallow bedrock. That AGC's proposed backfill grades will become frozen and lend themselves to soil movement or slumping down gradient when soils become water saturated. That DNR should require low grade contouring with engineered placement of soils to resist slumping. That without engineered placement of soils re-vegetation may become slowed. That AGC is proposing grading of top soil cover or backfill on 25-meter benches. That DNR should review some other method of protective capping of backfilled waste rock or development rock.*

**DNR Response:** 11 AAC 97.200(b) allows for “alternate post-mining land use” of private lands, where the normal requirements for recontouring of slopes and replacement of topsoil may be inconsistent with the post-mining land use intended by the landowner. AGC has indicated that the post-mining land use, for the private property it owns, would be for ongoing use as a storage site for materials source sales, including the potential sale of stockpiled placer tailings removed from surrounding streams. Except on the reclaimed tailings facility, AGC has not committed to topsoil replacement, ripping, fertilization, or reseeded as it has indicated that these are inconsistent with the intended post-mining land use on its privately owned lands. DNR has determined that it is unlikely that there will be any undue degradation of the state’s land and water resources due to the post-mining land use intended by the landowner and has not required the replacement of topsoil on the development rock dumps. The Reclamation Plan Approval requires AGC to submit final facility closure plans of the development rock dumps. If seepage or runoff from a non-potentially acid generating development rock dump exceeds water quality standards, DNR may require the reclamation of the facility to minimize infiltration and/or impacts from runoff and may require covers to include a low-permeability layer, topsoil replacement, seed and fertilizer application, and also surface flow diversion ditches.

Solifluction is the slow downward flow of water-saturated soil on an impermeable surface. The impermeable surface can be permafrost that traps rain, snow, and ice melt within the surface layer, causing them to become saturated. AGC proposes to construct development rock dumps in lifts that are approximately 50 feet thick. The crests of these benches will be flattened during final reclamation to achieve a 3 to 1 slope, which is considered a

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moderate slope. Given the high permeability of the recontoured development rock and the moderate final slope angles, it is considered very unlikely that saturated surface layer conditions will exist that would promote significant solifluction. Current facility closure plans do not require the construction of low-permeability covers over the development rock dumps; therefore, the placement of a topsoil layer on top of these dumps is not considered a critical design factor for the geochemical stability of the facilities. If it occurs, limited erosion or solifluction is not anticipated to result in exceedances of water quality standards in down-gradient waters.

**Acid Mine Drainage.**

**Mr. Ahmasuk:** *That the Water Management Consultants Technical Memorandum referenced a 1999 US EPA report titled: EPA and Hardrock Mining: A Source Book for Industry in the Northwest and Alaska. That a more recent version is available and dated January 2003 and would have been available at the time the Rock Creek Project plan was developed. That any antiquated information based upon the 1999 sourcebook may have mischaracterized Net Neutralizing Potential (NNP), Neutralizing Potential (NP) or Acid Potential (AP).*

**DNR Response:** The geochemical assessment of the Rock Creek and Big Hurrah Mine Sites utilized both static and kinetic tests. The specific methods used to assess the geochemical characteristics and potential for generating acidic or metal-rich drainage from the development rock and ore were well described in Rock Creek Mine Plan of Operations VOLUME 8-Geochemistry and Groundwater Reports for Rock Creek and Big Hurrah and were deemed appropriate.

**Mr. Ahmasuk:** *That a key finding of the January 2003 sourcebook is that NP and AP must be analyzed consistent with expected waste rock or development rock. That AGC's acid tests were done on drill core samples that are not the likely character of ore and gangue material. That ore material will be extracted utilizing blasting agents to loosen the rock and then subjected to various landscaping techniques using heavy equipment and then crushed for cyanidation. That AGC's acid testing did not conform to the January 2003 US EPA sourcebook recommendations for Acid Base Accounting (ABA). That the blasted, repositied, crushed, and/or cyanided waste and/or development rock from Big Hurrah and Rock Creek may have different particle sizes and mineralogy from drill samples that were acid tested. That the underlying assumption regarding acid potential may be flawed. That from page 5 of DNR's*

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*response to public comments where DNR indicated that it required an additional round of ABA test work, it is not clear how AGC or DNR analyzed with caution the ABA testing as it is likely that actual waste rock and development rock particle size and mineralogy will be different from what was tested.*

**DNR Response:** The propensity of a material to generate acidic or alkaline conditions, or to leach metals under neutral pH conditions, depends partly on the particle-size characteristics of the material. The interpretation of static test results should consider if the particle size of the sample test materials vary greatly from the expected particle size of the waste in the field. The particle size of standard ABA tests is similar to that of mine tailings. The particle size of waste rock dumps vary from sand-sized and smaller particles to boulders that measure 10+ feet in diameter. It is impractical and impossible to conduct ABA tests on the larger particle size ranges typically found in development rock dumps. The use of crushed samples for ABA static testing is an internationally accepted practice, particularly for projects in the permitting and development phases of mine life, and is considered appropriate for the Rock Creek Project. The ABA tests utilized are standard to the industry and recognized by a number of international mine regulatory agencies.

**Mr. Ahmasuk:** *That the January 2003 US EPA sourcebook indicates that rock with uncertain acid behavior should be re-tested via alternate kinetic tests. That according to AGC's confirmatory ABA testing, it appears that additional alternate tests were done on separate samples to analyze the presence of NP but were not repeated or re-analyzed on rock samples that showed uncertain acid behavior.*

**DNR Response:** Static ABA predictive tests are useful for determining which geologic units or rock types have the potential to generate acidity. Kinetic tests are used to define reaction rates through time under specific environmental conditions. In general, ARD testing programs utilize a two-step approach in which static tests of numerous samples are used to identify potentially acid-generating geologic units and to characterize the variability that occurs within them. Kinetic tests are then run on samples deemed representative of the range of compositions within potentially reactive units to determine whether acid drainage will occur. The recommendation regarding retesting of rock with uncertain acid generating behavior relates to a rock type or lithology and not necessarily a specific rock sample. A third-party expert in low temperature geochemistry and ARD testing procedures reviewed the ARD test work and results.

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**Mr. Ahmasuk:** *That DNR did not address the flaws with AGC's acid testing in regards to the length of time between sample collection and sample testing when first flush occurred.*

**DNR Response:** Geochemical characterization programs for projects are iterative in nature. The 30 ABA tests in the Phase I Test Program were conducted on archived pulp samples from previous drilling and testing programs. This initial program was followed by a Phase II Test Program, which included the systematic testing of all reverse circulation exploration drill holes on 15-foot intervals. As the Phase I and Phase II tests were conducted on samples collected at different times, the time differential between the two test programs is irrelevant. Further, the issue regarding “first flush chemistry” discussed on page 19 of EPA Technical Document 530-R-036 ([Acid Mine Drainage Prediction](#)) relates to kinetic tests rather than ABA test procedures. It describes the standard Humidity Cell Test Procedure and advises that if the sample has been allowed to oxidize in storage, that the readily soluble oxidation products may be present in the first few water rinses. It is relatively common for the sample analysis of these first few water rinses in a specific humidity cell test not to reflect the long-term steady state condition. DNR considers both the static and kinetic test procedures utilized for the geochemical characterization of the Rock Creek Site to be appropriate. A third-party expert, retained by the state, also participated in the state’s review of the procedures and results.

**Mr. Ahmasuk:** *That DNR's interest to verify the presence of NP by requiring an additional round of ABA testing raises reasonable concern because NP material at both sites is limited and generally not effective buffers.*

**DNR Response:** The additional round of ABA test work was required by DNR to determine what percentage of the neutralizing potential (NP) indicated by the Standard Sobek Test Method was due to carbonate minerals and of this, what percentage of the carbonate minerals were iron-carbonates.

At the Rock Creek Site, 88 percent of the neutralization potential of the development rock; as indicated by the Standard Sobek Test Method; was from carbonate minerals and only 8 percent of the carbonate minerals were found to be iron-carbonates. This work confirmed that there is sufficient available carbonate neutralization potential to effectively neutralize the acid generation that is anticipated from the sulfide minerals in the development rock.

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At the Big Hurrah Site, 76 percent of the neutralization potential of the development rock; as indicated by the Standard Sobek Test Method; was from carbonate minerals and 15 percent of the carbonate minerals were found to be iron-carbonates. Based on the confirmatory analyses and the mineralogy performed on the Big Hurrah development rock, there appears to be a substantial fraction of the original Standard Sobek NP determinations that is due to non-carbonate minerals. Further, approximately 15 percent of the carbonate NP is unavailable due to the acid liberation associated with the iron in the iron-carbonate minerals. In other words, the 15 percent of the Standard Sobek NP that is associated with siderite (iron-carbonate) is unavailable whereas the 24 percent of the non-carbonate Standard Sobek NP is of questionable availability. It is likely that some of the non-carbonate NP is available; however, this has yet to be demonstrated in any of the reports thus far and cannot be assumed. Mining has not been approved at the Big Hurrah Site at this time. AGC must do additional geochemical characterization of the development rock and submit a revised development rock characterization and handling plan for DNR approval before it can be authorized to conduct mining at the site.

**Mr. Ahmasuk:** *That tables 2 through 5 are summarized pH saturated paste data from Big Hurrah and Rock Creek ABA testing. That when uncertain and acid generating rock samples are summated a significant portion of the samples comprise rock that deserve special attention and may contradict the assumptions throughout the project plan indicating that Big Hurrah and Rock Creek rocks are not acid generating. That appropriate reclamation must address acid generation. That contrary to AGC's assertions that acid generation is only a potential issue for Big Hurrah and not an issue for Rock Creek, DNR's approval of the mine permits must be adjusted or reversed. That figures 2 through 5 are frequency diagrams of saturated paste pH of Big Hurrah and Rock Creek ore and development rock. That they show a skewed distribution with a majority of measurement between pH 7.8 to pH 8. That the presence of acidic material in all rock samples is of concern and may mobilize elemental components in addition to elements that were shown to release immediately such as As, Sb, & Mo.*

**DNR Response:** In addition to sulfur species and neutralization potential, the measurement of sample pH has traditionally been a fundamental part of acid base accounting. The interpretation of pH data is normally done through the development of "scatter plots" with the "paste pH" on the Y-axis and various parameters on the X-axis, such as Total Sulfur, Sulfide Sulfur, Net Neutralizing Potential, or Neutralizing Potential/Acid Potential (NP/AP). Review of these

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types of plots allows for an evaluation of whether the samples have developed acidic conditions; however, the paste pH typically cannot be used to predict whether samples may generate acid conditions in the future. DNR staff developed scatter plots for both the initial and confirmatory acid base accounting data where the paste pH was compared to Total Sulfur, Sulfide Sulfur, and Neutralizing Potential/Acid Potential. Paste pH was not found to be a good predictor of any of these parameters. The plots showed that very few samples generated acidic conditions.

**Mr. Ahmasuk:** *That merely segregating PAG material at the Big Hurrah Site is not an effective measure to reduce the possibility of oxidation. That leaving the material as proposed is the most likely way to oxidize the PAG material. That depositing the PAG material in water after it may have oxidized is not an appropriate reclamation plan.*

**DNR Response:** The segregation of potentially acid generating (PAG) development rock at the Big Hurrah Site will allow this material to be stored in a temporary stockpile for future backfilling and inundation in the Big Hurrah Mine Pit. Some oxidation of sulfide minerals in this PAG development rock is anticipated to occur before backfilling in the pit. However, given the relatively short period of storage, acid generation will be minimal. As long as there are sufficient neutralizing minerals present in the development rock to neutralize the acid as it is produced, the net pH of any seepage from the temporary stockpile will remain non-acidic. DNR and Department of Environmental Conservation (DEC) authorizations require that all seepage and runoff from the PAG Stockpile be directed to the mine pit for collection and treatment. When the PAG development rock is initially inundated, it is expected that some oxidation products will be dissolved into the pit water. This “first flush” of the backfilled material will be tested to ensure that it meets Alaska Water Quality Standards before allowing discharge from the pit lake. If the first flush fails to meet water quality standards, it will be treated and injected into the ground per the terms of a DEC Permit. The amount of oxidation products anticipated to be produced during the short mine life of the Big Hurrah Pit are not expected to be significant and the inundation of this material will for all practical purposes prevent future oxidation of the sulfide minerals that remain in the backfilled development rock. The submergence of PAG material is a well-accepted and very appropriate industry-wide reclamation practice.

**Mr. Ahmasuk:** *That DNR indicated on page 6 of its authorization that it is has not approved AGC's handling of Big Hurrah PAG material. That it is very*

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*peculiar that DNR would approve the proposed plan without that crucial component.*

**DNR Response:** Mining at the Big Hurrah Site is not planned to start until summer 2007; this allows time for additional geochemical characterization of the neutralization potential for the development rock. Mining at the Big Hurrah Site has not been approved at this time and cannot take place until a specific waste characterization and segregation plan has been developed and approved by DNR.

**Mr. Ahmasuk:** *That tables 6 & 7 are the result Mr. Ahmasuk's efforts to understand the spatial relationship of drill samples tested for acidity and development areas within the Big Hurrah and Rock Creek Sites. That Mr. Ahmasuk utilized the "client id" field identity to categorize drill hole sample depths. That from Tables 6 & 7 it is shown that the samples are shallow and less than 200 feet in depth. That the Rock Creek pit is planned to have pit wall heights that range around 410 feet (Volume 1: pg 10). That none of the samples collected for acidity are within the 400-foot depth range and relatively few are deeper than 300 feet. That a significant and perhaps less well-known mineralogy exists at the depth of pit wall height as planned. That rock has not been tested for acidity at the expected depth of the pit. That drill samples were taken under some sort of sampling scheme that seems systematic but may not have been applied in an appropriate fashion. That DNR should have conducted a power analysis of samples taken and adjusted the permit or reverse its decision on the Rock Creek Mine permits. That without sufficient statistical analysis of rock sample chemistry sufficient to describe AP and NP the public will not know if DNR is acting with caution or properly scrutinized the drill sample data. That the lack of that analysis raises reasonable concern with DNR's decision.*

**DNR Response:** The Rock Creek pit floor has an elevation of -32 feet at its deepest point and the pit high wall has a maximum crest elevation of +492 feet. The Phase II and Confirmatory sample locations for the ABA database were reviewed and found to range from -35 feet to +415 feet.

Sample Elevation (ft)	Number of ABA Samples
-100 ft to 0 ft	4
0 feet to +100 feet	60

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+101 feet to +200 feet	153
+201 feet to +300 feet	193
+301 feet to +400 feet	98
Above +400 feet	3

The ABA database was used by DNR to develop scatter plots where Total S, Sulfide S, NP/AP (Total S), and NP/AP (Sulfide S) were plotted on the Y-axis and Elevation, as a surrogate for Depth Below Ground Surface, was plotted on the X-axis. These plots showed no discernable trends in Total Sulfur, Sulfide Sulfur, NP/AP (Total S), or NP/AP (Sulfide S) with respect to Elevation. The locations of the samples are considered representative of the material expected to be encountered during mining at the Rock Creek Pit. Further, operational development rock characterization will occur during the mining of the Rock Creek Pit to monitor for any changes in the anticipated geochemistry of the development rock.

**Mr. Ahmasuk:** *That figures 6 through 9 come from Volume 4 & 8 and show the spatial orientation of drill samples and pit locations. That the drill sample locations do not cover the entire area of the pit locations at Big Hurrah or Rock Creek. That DNR should address how the drill locations were placed in relation to the pits and adjust the permit or reverse it decision. That like the sample depths, a power analysis should be done to address the relationship of drill locations and pit locations. That pit locations are approximate and that AGC may change or move the pit locations. That without sufficient statistical analysis of the drill locations, the public will not know if DNR is proceeding with caution or appropriately. That spatial orientation of the rock samples is also crucial to understanding the acid potential of the mine. That DNR should address how the samples are spatially oriented.*

**DNR Response:** The locations of all ABA samples were reviewed with respect to the locations of the proposed mine pits. The Phase I & Phase II Test Programs provided reasonable spatial distribution of samples. This was further enhanced during the Confirmatory Test Program. The spatial distribution was adequate for the Big Hurrah Site and again this was further enhanced during the Confirmatory Test Program. Review of the NP/AP scatter plots for each site, based upon rock type, does not suggest trends in the acid generating capacity of the material with respect to the location within the pit. Pit locations are determined by the physical location of the ore. Actual pit outlines may be slightly modified during mining operations due to the discovery of additional

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ore, changes in mining and milling costs, fluctuations in the price of gold, and/or changes in the geotechnical strength of the rock encountered; however, they are not subject to arbitrary relocation by the company. The location and extent of the Rock Creek Mine Pit has been approved in the Reclamation Plan Approval. Significant expansion of the proposed pit would require amendments that would require supporting data to allow evaluation of the “new” development rock that would be mined and approval by DNR.

### **Net Neutralizing Potential.**

**Mr. Ahmasuk:** *That Net Neutralizing Potential (NNP) of Big Hurrah and Rock Creek rock is generally low but has some limited Neutralizing Potential (NP) such as the presence of  $\text{FeCO}_3$ . That  $\text{FeCO}_3$  does not dominate the rock samples. That AGC did NOT confirm the presence of  $\text{CaCO}_3$  and that the lack of that effective buffering compound affects the NP/AP ratios that could be applied for reclamation.*

**DNR Response:** Net Neutralization Potential (NNP) is a traditional part of Acid Base Accounting (ABA). NNP is a calculated parameter and is equal to the Neutralization Potential (NP) minus the Acid Potential (AP). The ABA test data for the development rock at the Rock Creek site was evaluated to determine the potential for this material to generate ARD. There were approximately 400 samples of development rock tested during Phase II and Confirmatory ABA Testing. Based upon Sulfide Sulfur Acid Generation Potential, only 3 percent of the samples would be considered PAG with a NNP less than -20; 16 percent of the samples would be considered to have an “uncertain” potential to generate acidity with a NNP between -20 and +20, and 82 percent of the samples would be considered NAG with a NNP greater than +20. The mineralogy of the development rock was evaluated using x-ray diffraction (XRD), which confirmed the presence of both dolomite and calcite. The XRD data also indicate the presence of siderite (iron-carbonate); however, later confirmatory static testing indicated that siderite only comprised approximately 8 percent of the carbonates at the Rock Creek Site. The low quantity of siderite is important because in the Inorganic Carbonate Test, siderite is included as an acid-neutralizing mineral; in reality, siderite does not contribute to acid neutralization as the consumption of acid by the carbonate is offset by the production of acid through the hydrolysis of the liberated iron. The overall NNP of a blended development rock dump at the Rock Creek Mine is calculated to have sufficient neutralization potential to prevent ARD.

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Mining at the Big Hurrah Site has not been approved at this time. As is specified in the Reclamation Plan Approval, AGC must receive specific written approval to mine at the Big Hurrah Site. The request for approval to mine at the Big Hurrah Site must include adequate geochemical characterization of the development rock to determine the PAG NP/AP cutoff ratio that minimizes the risk that the blended NON-PAG development rock dump will create exceedances in water quality standards. The plan must also state the maximum amount of PAG development rock that can and will be backfilled into the pit at closure and still allow adequate water cover to minimize the potential for acid production.

### **Pit Lake Reclamation.**

**Mr. Ahmasuk:** *That reclamation of the pit lake may not be appropriate until contamination from cyanidation products, acid mine drainage, and non-acidic elemental releases are controlled. That the likelihood of the pit lake being contaminated is a reclamation issue that is not detailed. That reclamation without contaminant control may attract wildlife to a contaminated pit lake, and that it should NOT be expected that the pit lake will be a healthy lake available for aquatic or terrestrial life until toxic materials have been adequately controlled.*

**DNR Response:** Water quality modeling of the Rock Creek Pit Lake indicates that the post-mining pit lake is expected to meet applicable water quality standards for all designated uses with the exception of the drinking water criterion for arsenic. AGC has submitted a petition to DEC to remove the water supply use designation for Rock and Lindblom Creeks based on the naturally occurring high levels of arsenic. Water quality modeling of the Rock Creek Pit Lake indicates that the post-mining pit lake water quality is expected to result in similar concentrations of arsenic that currently occur in Rock Creek.

Mining at the Big Hurrah Mine has not been approved at this time. As specified in the Reclamation Plan Approval, AGC must receive specific written approval to mine at the Big Hurrah Site and must receive approval from DNR and DEC before the placement of PAG development rock in the pit.

### **Rock Creek Reclamation Estimates.**

**Mr. Ahmasuk:** *That Rock Creek and Big Hurrah surety estimates may be underestimated based upon the following factors:*

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*1. Soil misclassification:*

- a. That soils are any unconsolidated material above bedrock and likely are suitable soils for sub-arctic plant communities. That engineered soil placement must be a part of the reclamation plan placing those soils in an appropriate manner will raise surety estimates.*

**DNR Response:** The Rock Creek Project Reclamation Bond includes funds for the placement of topsoil on the tailings facility. AGC has not committed to the placement of topsoil on the development rock dumps due to this being inconsistent with its intended post-mining land use. DNR has determined that it is unlikely that there will be any undue degradation of the state's land and water resources due to the post-mining land use intended by the landowner on its private lands and has not required the replacement of topsoil on the development rock dumps; therefore, the company will not be required to bond for this action. Regulations do not require an operator to replace topsoil on private land for which it has received approval for an alternate post-mining land use.

*2. Neutralizing material not present:*

- a. That AGC may have to place buffering material with waste and development rock because naturally occurring neutralizing material is not sufficiently present. That based upon the uncertainty of Big Hurrah acid tests that it is likely that surety estimates are low and that the reclamation plan must address the lack of buffering material in both locations.*

**DNR Response:** The development rock at the Rock Creek Site has been shown to contain adequate neutralizing potential in the form of dolomite and calcite to offset acid produced by the oxidation of sulfide minerals present in the rock. It is anticipated that the blended development rock dump will not result in ARD. The inclusion of funds within the reclamation bond for the incorporation of additional buffering material in the development rock dumps is therefore considered not necessary.

*3. Pit lake water quality will be lower than applicable standards:*

- a. That pit lake water quality will be degraded and will contain numerous toxic elements and may contain cyanide. That the exposed pit walls at the upstream portion of the lake will readily oxidize along its surface or along the blast fractures. That reclamation estimates must take into consideration metals leaching from the pit walls and acid production from the pit walls.*

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**DNR Response:** Based upon pit lake water quality modeling, active water treatment of the pit lake water is not anticipated to be required at the Rock Creek Site; therefore, funds for the active treatment of pit lake water were not required in the reclamation cost estimate at the Rock Creek Site. The pit lake water quality model did consider the exposed pit walls and the damaged rock zone in the analysis of post-mining pit lake water quality. Mining at the Big Hurrah Site has not been approved at this time. As specified in the Reclamation Plan Approval, DNR may require revision to the financial responsibility cost estimate for the Big Hurrah Mine should the updated geochemical characterization program require changes to the Reclamation Plan.

The use of cyanide has not been proposed, and is not approved, at the Big Hurrah Site. At the Rock Creek Mill, tailings that have been exposed to cyanide will be treated in a cyanide-destruction circuit before being discharged into the paste tailings facility. The paste tailings facility is located down gradient of the pit lake; therefore, there is no expected mechanism for trace levels of cyanide that might be present in any seepage from the tailings facility to enter the waters of the pit lake. The DEC Waste Management Permit does allow for a one-time discharge of excess tailings water to injection wells at mine closure. Some of these wells may be located up gradient of the pit lake; however, all water sent to the injection well system must meet water quality standards for cyanide before injection. These permit limits are designed to protect all uses of the waters that may be influenced by the injection well system.

*4. Reporting:*

- a. That a more rigorous monitoring schedule must be in place. That daily monitoring during operational activities was argued for, and should be reflected for operational activities and if temporary closure is required.*

**DNR Response:** Water quality monitoring during mine operations and any period of temporary closure have been found to be appropriate by DEC as stipulated by the Waste Management Permit.

- b. That rigorous monitoring post closure must be planned for well beyond 2016 when Rock Creek will be placed back into its prior location after mining activities have ceased. That it has taken many centuries for the geologic material in Big Hurrah and Rock Creek to reach homeostasis and*

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*that DNR must determine in an appropriate manner how the financial surety estimate reflects a statistically sufficient model of water quality behavior after mining activities have ceased and monitoring of toxic material.*

**DNR Response:** Post-closure water quality monitoring at the Rock Creek and Big Hurrah Mines are required as part of the DEC Waste Management Permit. DEC has approved the amount included in the Reclamation Bond for post-closure water quality monitoring.

*5. Environmental Audit:*

- a. That yearly environmental audits must be done during operational activities and then may be systematic after closure. That the lack of sufficient statistical analysis has flawed the conceptual ideas posed by AGC and that if sufficient audits were done on acid tests, drill sample locations and depths there would be more information for the public to assess the adequacy of mining plans and may have reduced concerns.*

**DNR Response:** DNR will conduct an annual review of the geochemical characterization data, development rock characterization/segregation records, and water quality data and may require changes to the Project Monitoring Plan and/or Reclamation Plan if needed to ensure that facilities can be operated and/or closed in a manner that prevents exceedances of water quality standards. Periodic third-party environmental audits are typically conducted before mine closure or mine authorization renewals and are normally done on five-year intervals. All project monitoring data and the results of environmental audits are available for public review. The bonding requirement for reclamation and closure will be changed at any time DNR determines that the existing financial surety is insufficient.

*6. Modifications:*

- a. That bond review should be immediate when any condition is encountered that results in an increase in emissions or discharges, not only from a modification to project plans, and should be reflected in the modifications category of the reclamation plan.*

**DNR Response:** DNR may require revision to the financial responsibility cost estimate, at any time, to address modifications required in the Reclamation Plan due to changed site conditions as evidenced in

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development rock characterization/segregation records, monitoring results, or changes in cost structures (such as increases in fuel prices). At a minimum, DNR will review the adequacy of the bonding on an annual basis.

7. *Bench Angles:*

- a. *That the bench angles of 38 to 52 degrees as proposed and approved by DNR on page 32 of Volume 4 will not be stable and will require modification and possibly major overhaul after mine closure. That slumping which occurs at much lower angles is a common landform where permafrost or shallow bedrock allow solifluction lobes to form. That solifluction lobes are evident at both sites and are an erosional component at both sites at lower angles and will be more prevalent after AGC performs its reclamation landscaping of the benches.*

**DNR Response:** The reference to angles from 38 to 52 degrees relates to the final pit slopes for the Rock Creek Pit. 11 AAC 97.200(c), indicates that a mine pit wall is exempt from the requirements for recontouring, topsoil replacement, and revegetation; as contained in 11 AAC 97.200 paragraphs “a” and “b”; if the steepness of the wall makes them impracticable or impossible to accomplish. Alaska Gold Company is not required to recontour the mine pit walls for the purpose of topsoil placement or revegetation requirements; however, it must leave the wall in a condition such that it will not collapse nor allow loose rock that represents a safety hazard to fall from it. Slumping and solifluction are not failure mechanisms associated with mine pit benches in rock.

8. *Land owner review:*

- a. *That landowner review is minimal. That landowner review may become more substantial as leadership within the Native corporations change. That shareholders of both Sitnasuak and Bering Straits Native Corporation are becoming more concerned for their lands and may pressure the Native Corporations for better sensitivity to their lands.*

**DNR Response:** Bering Straits Native Corporation submitted a letter indicating that its Land & Resources Department had reviewed the materials related to the permitting process for the construction and operations of the Rock Creek Mine and that Bering Straits Native Corporation approves the documents prepared for the federal permit application and the draft state decisions as identified in the public notice

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for the Rock Creek Project. The chairman for the Sitnasuak Native Corporation provided oral testimony at the Nome public meeting in support of the project. He indicated that the land department had reviewed the project documents and the board approved them. Further, appropriate representatives of both Bering Straits and Sitnasuak Native Corporations signed the "Land-Owner Review Page" of the Rock Creek Reclamation Plan.

### **Conclusion.**

**Mr. Ahmasuk:** *That DNR must re-consider its reclamation plan approval of the Big Hurrah and Rock Creek Project. That Mr. Ahmasuk has presented new information that may not have been considered.*

**DNR Response:** DNR conducted extensive review of the geochemical characterization of both the waste rock and ore from the Rock Creek and Big Hurrah Project Sites. In addition to the review conducted by DNR staff, the state retained Jay McNee, Ph.D., Senior Environmental Geochemist at Lorax Environmental Services, Ltd. to review the geochemistry and pit lake modeling for the Rock Creek and Big Hurrah Sites, the waste rock segregation plan for the Big Hurrah Site, and the alternate waste management plan for the Big Hurrah Site.

The DNR Reclamation Plan Approval includes requirements for operational waste rock characterization at the Rock Creek Site to confirm the predicted low frequency of acid generating rock. Further, the Reclamation Plan Approval requires an annual review of the geochemical characterization data, operational waste rock characterization records, and water-quality data and DNR may require changes to the Project Monitoring Plan and/or Reclamation Plan if needed to ensure that facilities can be operated and/or closed in a manner that prevents exceedances of water quality standards. A third-party environmental audit will be conducted in 2010 or before final closure of either site. The environmental audit will include all aspects of the project, including the access roads, material sites, development rock dumps, mine pits, tailings facility, and predicted pit lakes—including, but not limited to, the geochemical and water quality monitoring and modeling associated with each of these facilities. The results of the environmental audit will be used in the development of final facility closure plans. Finally, AGC must submit final facility closure plans for development rock dumps and the tailings facility for agency review and approval.

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DNR believes that the requirements contained within the Reclamation Plan Approval including, but not limited to: additional geochemical characterization of Big Hurrah development rock; revision to the Big Hurrah Development Rock Characterization and Handling Plan; monitoring, reporting, and operating at each site; annual review of geochemical characterization and water quality data; third-party environmental audit; and submission of final facility closure plans for development rock dumps and the tailings facility provide appropriate environmental controls on the project and that the reclamation bond amount of \$6,844,700 is adequate.