New Mexico
Environmental Law Center
TM

Jerry Schoeppner, Director
Mining and Minerals Division
NM Energy, Minerals and Natural Resources Department
1220 So. Saint Francis Drive
Santa Fe, New Mexico 87505

VIA ELECTRONIC MAIL

November 18, 2022

Dear Director Schoeppner:

On behalf of Friends of Santa Fe County, please accept the attached comments on the Cunningham Hill Mine Closure/Closeout Plan. As noted in the attached comments and in comments presented in the public hearing on this matter on November 2, 2022, Friends of Santa Fe County is concerned that the Cunningham Hill Mine Closure/Closeout Plan, as currently proposed, does not comply with either the letter or spirit of the New Mexico Mining Act and its implementing regulations.

Specifically, as reflected in its comments, Friends of Santa Fe County is most concerned that MMD has not adequately considered the need for long-term monitoring, maintenance, repair, and replacement of reclaimed areas and attendant financial assurances to insure protection of public health, safety, welfare and the environment. Friends of Santa Fe County has appreciated MMD's willingness to work with us to address our concerns to date and we look forward to working with you and your staff to address our ongoing concerns.

Sincerely,

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November 17, 2022

To: Ross Lockridge, Friends of Santa Fe County

From: Jim Kuipers P.E., Kuipers & Associates LLC

Re: **Comments on Revised October 2021 CCP update for MMD Permit No. SF002RE, LAC Minerals (USA) LLC Cunningham Hill Mine**

At your request I have reviewed the Revised 2021 Closure/Closeout Plan update for Mining and Minerals Division (MMD) Permit No. SF002RE, LAC Minerals (USA) LLC Cunningham Hill Mine ("CHM CCP"). The following comments have been developed to address concerns raised by Friends of Santa Fe County (FOSFC) and are based on more than 40 years of professional experience in addressing mining environmental impacts including 25 years of involvement in the implementation of the New Mexico Mining Act (NMMA) and the New Mexico Water Quality Act (NMWQA) at hardrock mines in NM.

The approach to these comments has been to take a front to back view of the CHM CCP and provide comments in the order in which they occur in the document and any referenced documents or appendices. However, general comments are provided on the CHM CCP as a preface to more specific comments. It should also be noted that in addition to comments specific to the current revised CHM CCP and public review process being undertaken by MMD, comments specific to both Abatement Plan 27 (AP-27) and Discharge Permit 55 (DP-55) are also provided where applicable.

1. General Comments on the CCP

The application of the requirements of the NMMA at mine sites that were operating or otherwise permitted to operate in the 1990s, together with concurrence as to meeting other applicable requirements, in particular with respect to the NM Environment Department (NMED) groundwater discharge permit regulations, in a comprehensive CCP, has been a challenging task. As someone who has participated directly on behalf of numerous public interest organizations in NM it is my opinion that MMD and NMED have in general been progressive in their approach to applying their regulatory authority. However, as the former CHM site demonstrates, hardrock mine reclamation and closure tasks involve recognition of the mine's entire life-cycle, which often goes beyond original expectations of a walk-away scenario 12 years after reclamation is completed. Once Mining Influenced Water (MIW) is recognized, mitigation of impacts typically becomes a complicated matter, and rarely do predictions, both over the short-term and long-term, come out as expected.

Recommendation: In order to ensure that the requirements for long-term monitoring and maintenance are minimized, and where they cannot be eliminated that they are financially assured, the MMD and NMED should take a conservative approach and require that any uncertainty in future outcomes be considered a liability and reflected in both the CCP and in financial assurance. This approach is further reflected in comments specific to the CHM CCP, AP-27 and DP-55.

It is also recommend as reflected further in these comments that the CHM CCP comprehensively recognize and address the requirements of AP-27 and DP-55. To a large extent, questions as to the completeness of the CHM CCP and adequacy of financial assurance are contingent on these critical permits under NMED's purview, particularly with respect to post-closure. We have consistently recommended to NMED that the CCPs originally required by the NMMA include and address all abatement plans as well as discharge permits under NMED's purview as a means of providing documentation of the comprehensive approach being taken to address the complicated issue of mine reclamation, closure, and long-term post-closure.

2. Section 1.1 Purpose of Plan

According to the CHM CCP "The updated CCP describes closure, remediation, and reclamation actions which LAC will take for those areas not yet fully reclaimed" and the CHM CCP "…will be completed to the standards set forth in 19.10.5 NMAC as well as New Mexico Water Quality Control Commission (NMWQCC) regulations as specified in Discharge Plan DP-55 and Abatement Plan AP-27."

Recommendation: As discussed in more detail in subsequent comments, the CCP should also describe post-closure monitoring, maintenance and operations which LAC will take for both areas that have already been or yet to be "fully reclaimed." This is also necessary for the CCP to be consistent with the requirements of DP-55 and AP-27.

3. Section 2.0 PERMITS AND REGULATORY REQUIREMENTS

According to the CHM CCP "The CCP presents all of the information required by NMMA Rule 5.6 and, if followed, will achieve the requirements of Section 69-36-11B (3)."

NMMA Section 69-36-11B (3) requires that "the closeout plan specifies incremental work to be done within specific time frames that, if followed, will reclaim the physical environment of the permit area to a condition that allows for the reestablishment of a self-sustaining ecosystem on the permit area following closure, appropriate for the life zone of the surrounding areas unless conflicting with the approved post-mining land use; provided that for purposes of this section, upon a showing that achieving a post-mining land use or self-sustaining ecosystem is not technically or economically feasible or is environmentally unsound, the director may waive the requirement to achieve a self-sustaining ecosystem or post-mining land use for an open pit or waste unit if measures will be taken to ensure that the open pit or waste unit will meet all applicable federal and state laws, regulations and standards for air, surface water and ground water protection following closure and will not pose a current or future hazard to public health or safety." (underline added)

Recommendation: NMMA Rule 5.6 should be cited as 19.10.5.6 NMAC. The CCP should clarify that the CCP presents all the information required by Title 19.10.5 and not just 19.10.5.6.

As further discussed in these comments, the CHM CCP does not presently describe, for either facilities waived or for facilities not waived, measures that will be undertaken to ensure that any waste unit will meet all applicable federal and state laws, regulations and standards for air, surface water and ground water protection following closure (e.g., post-closure) and will not pose a current or future hazard to public health or safety. As previously mentioned, this requires the CHM CCP to comprehensively incorporate the requirements of AP-27 and DP-55.

4. Section 3.2.1 Cunningham Hill Mine Open Pit

Pit Wall Failure/Mass Wasting

Consistent with and as was noted in previous comments submitted to MMD by the New Mexico Mining Act Network (NMMAN) concerning the October 2020 CHM CCP Update, which this 2021 CHM CCP document replaces, a geotechnical investigation was conducted to evaluate the probable long-term stability of the Cunningham Hill Open Pit Slopes (Call & Nicholas, Inc. 1994). According to the CCP, the evaluation concluded that the current post-mining configuration is stable and that the probability of the occurrence of a large-scale slope failure is low. Our comments questioned the findings of the 1994 report and reliance by the agencies on "predictions" with a high level of uncertainty. In their response to MMD,[1] LAC dismissed the issue of open pit highwall stability suggesting it would be addressed by filing for a pit waiver and the construction of a fence to exclude people and wildlife, and suggesting any remaining issue will be addressed under AP-27.

As previously noted, NMMA Section 69-36-11B(3) requires that "… upon a showing that achieving a post-mining land use or self-sustaining ecosystem is not technically or economically feasible or is environmentally unsound, the director may waive the requirement to achieve a self-sustaining ecosystem or post-mining land use for an open pit or waste unit if measures will be taken to ensure that the open pit or waste unit will meet all applicable federal and state laws, regulations and standards for air, surface water and ground water protection following closure and will not pose a current or future hazard to public health or safety." (underline added) This suggests a pit waiver does not relieve the permittee from addressing pit stability. And while a fence may exclude people and wildlife, if it is adequate to do so, maintained, signed, and trespassing actively enforced, the location of the fence must consider the open pit boundaries as they become altered by slope failure and/or mass wasting over time. Slope stability will lead to changes in the exposure of potential acid generating material in the pit highwalls and to deterioration of source controls, neither of which are currently addressed in AP-27. As an exhibit demonstrating the extent to which open pit highwalls can deteriorate, a report I prepared on the Montana Tunnels mine is included as Appendix A. The example provided demonstrates the fast-progression of open failure caused by site-specific geologic factors. While those factors at the CHM are different, in general a similar result will occur over time as has already been seen in localized areas of the CHM open pit.

Recommendations: MMD and NMED should require as a condition of their permits that the previous geotechnical investigation conducted in 1994 be updated based on current site observations and modern methods. In conducting the evaluation, "long-term" should be defined as over geologic time. Safety should address not only "public" safety but the future safety of regulators and contractors who at some point in the future will be required to perform the site monitoring and maintenance, as well as any water treatment operations, next to or within the Open Pit and waterbody. For this reason, the investigations should also include a multi-stakeholder Failure Modes and Effects Analysis (FMEA) that considers the various types and extents of open pit wall failures that could occur (e.g., failure modes), the probability and consequences of occurrence, and mitigation measures that could be used to reduce the probability and/or consequences of occurrence.

[1] May 21, 2021, Hamatake, K., to Rose, C., MMD re: Technical Comments on Application for Revision 20-1, Closure/Closeout Plan Update, Cunningham Hill Mine, Permit No. SF002RE

MMD should require that post-closure (e.g., post 12-year revegetation sustainability period) measures and corresponding tasks be identified and details provided to address people and wildlife exclusion by fencing including how fencing will be maintained, signed, trespassing actively enforced, and how the location of the fence will consider the open pit boundaries as they become altered by slope failure and/or mass wasting over time.

The CHM CCP should explicitly identify how open pit highwall stability will be addressed under AP-27. The currently applicable Re-Issued Abatement Plan, AP-27, Cunningham Hill Reclamation Project issued on October 31, 2002 is attached as Appendix B. Examination of AP-27 does not indicate consideration has been given to how pit highwall failure and/or mass wasting of the pit area in general will result in ongoing/increased potential for acid generation and metals leaching over time affecting pit lake and/or groundwater quality. It does not describe or require any monitoring, maintenance or mitigation measures to address pit highwall failure and/or mass wasting impacts on water quality and therefore there is no financial assurance to address this potential issue, which if it does occur at some point in the future when LAC is no longer viable as an owner, will result in government and therefore public liability. NMED should require that this issue be addressed in an updated AP-27, or alternatively roll AP-27 into DP-55 and include requirements to address pit highwall stability.

It is also noted in making this recommendation that NMED required Freeport Mining Inc. to conduct an Open Pit Highwall Risk Analysis as part of the Tyrone Mine's DP-1341 under C110 Additional Studies. To address the potential/eventual open pit highwall failure as it would impact the CCP is an insightful requirement given that while pit highwall failure is inevitable and can have significant consequences, because it may not immediately occur it is nearly always overlooked in reclamation and closure planning. However, in the same way that water quality protection has made it clear that with many hardrock mines there is no such thing as "walk away reclamation," it will eventually also become clear that public safety and the long-term geological evolution of human created holes in the ground, or open pit mines, will also require a long-term commitment in many cases.

AWS Source Controls

As noted in the CHM CCP, it was originally predicted that the Open Pit would fill from the Upper Cunningham Gulch surface water diversions to an elevation of 6,900 ft amsl in 35 years, and in doing so would inundate Acid Wall Seeps (AWS) and improve water quality, and "… would not become acidic with time and would not detrimentally affect local surface and groundwater resources." However, according to the CHM CCP, "infiltration of stormwater through fractures to the pit walls resulted in oxidation of sulfides causing AWS and degraded the quality of the Open Pit waterbody" resulting in AP-27 and various water treatment approaches that have continued to the present. Additionally, the open pit lake water level has been reported as "… near steady-state level at 6,800 ft amsl elevation." According to the CHM CCP, as part of source controls required to meet AP-27 water quality standards, implementation of source controls occurred between 2012 and 2018, and included: 1) repairs to the Upper Cunningham Gulch diversion to mitigate the infiltration of stormwater into fractures that report to the open pit, 2) stormwater controls in and around the Open Pit, and 3) resurfacing access roads and some bench areas with caliche. As noted in the CHM CCP, instead of relying on stormwater to submerge and dilute acid generation from the open pit highwalls, the revised plan relies on source controls to prevent AWS.

Recommendations: In order for the current approach using "source controls" to be optimally effective in addressing water quality impacts from the open pit highwalls, a plan to monitor, repair and if

necessary, replace or enhance the source controls must be required by NMED and provided in sufficient detail in the CHM CCP and financial assurance. The plan should address requirements from a combination of both stormwater events and pit highwall failure and/or mass wasting. The plan should address stormwater design standards to address the potential for climate change to cause more intense and frequent storm events. Additional recommendations in regard to recognizing and addressing anthropogenic climate change are included as Attachment C.

Pit Lake Water Levels

According to CCP Appendix B (JSAI 2020) "Steady-state Open Pit water levels are predicted to range from 6,800 to 6,840 ft above mean seal level (amsl)." "The maximum expected open pit water level is 6,840 ft amsl, which would require an average open pit water level rise of 0.6 ft/yr over the next 60 to 70 years. The observed rise in open pit water levels over the last 4 years has been at an average rate of 2.0 ft/yr."

Recommendation: The CCP needs to recognize and address the predicted range in pit lake level, both due to greater and to less precipitation than might have been experienced or predicted. The CCP should address the range in discharge to groundwater that might occur at various levels of what corresponding impacts to water quality might be expected, and it similarly should address potential changes in surface water quality at various levels. The CCP should anticipate potential for both extreme drought and wet periods. The CCP should also anticipate potential fluctuations in the pit lake level due to events such as a catastrophic wildfire and subsequent flooding on the burned area and loss or increase in surface water flow. The CCP should identify what mitigation measures might potentially be required and include financial assurance for those measures, including contingencies. The CCP should provide additional information as to predicted future pit waterbody levels going out at least 200 years and identify the potential amount of fluctuation in the pit lake level over periods of drought, excess precipitation, and accounting for future climate change. The CCP should define and identify the bounds of steady-state that is expected to be achieved as "near steady-state level" is not a meaningful description without further context. If this information is not required to be included by the agencies in a revision of the current CCP then they should include this requirement as a condition of both MMD and NMED's permits.

5. Section 3.2.2 Reclaimed Waste Rock Pile

According to the CHM CCP, the waste rock pile is covered by a 12-inch layer of waste rock mixed with lime and a cover consisting of six to eight inches of subsoil, and 10 to 12 inches of growth medium composed of a sandy-clay loam material. The waste rock pile reclamation was completed in 1996. The CHM CCP notes between 2011 and 2016, "… significant improvements were made to shed stormwater runoff and reduce the potential for cover erosion" and "… stormwater diversion features also assisted with reducing infiltration and generation of ARD" and also notes East Groin stormwater channel investigation of infiltration and repairs conducted in 2019.

More recently, in response to increased waste rock leachate flows observed in the spring of 2019, a waste rock pile cover evaluation was conducted that identified cover material erosion, storm-water benches not promoting good drainage, and the poor condition of the East Groin Drainage Channel GCL. In 2021 LAC proposed to repair locations where rills have locally eroded cover material to minimize erosion and reestablish vegetation and to conduct repairs to the East Ground drainage.

Recommendations: The ongoing repairs and improvements together with a period of increased flows in 2019, 23 years after reclamation was "completed" in 1996, requiring further repairs and maintenance, serves as an exemplary case study as to the necessary requirement for ongoing monitoring, preventative maintenance, and planning for repairs and replacement, that accompanies any engineered cover or other system of addressing leachate from waste rock piles and similar features. The experience at CHM certainly brings into question any concept of post-closure monitoring once water quality standards are achieved of 10 years as suggested in AP-27, or even 25 years as has sometimes been suggested, given that the most recent repairs are unquestionably not the last that will be required. It also justifies requiring post-closure monitoring for as long as the risk of the failure of the cover system resulting in exceedances of standards might occur, which for all practical purposes is an indefinite period of time, certainly exceeding 100 years.

The agencies identifying current cover inadequacies and requiring LAC to undertake further investigations and repairs as reflected in the agency's conditional approval of waste rock pile cover repairs and MMD's most recent Mining Inspection Report of the CHM conducted on September 14, 2022 is appreciated. This approach, however, is reactive to conditions resulting on the ground potentially impacting water quality and could allow for exceedances of standards to occur over a significant period while investigations are conducted, repairs made, and conditions return to those expected to result in no exceedances. As an alternative we recommend an approach that emphasizes preventative maintenance. By conducting regularly scheduled maintenance based on site conditions and annual inspections situations where degradation or defects in the cover system leads to increases in infiltration and potential exceedances of water quality can be minimized. The primary components of a preventative maintenance approach consist of the following being done on a consistent annual basis:

A. Maintaining the site vegetative cover including fertilizing and restoring the vegetative cover if necessary. While this may be considered contradictory to MMD requirements for a self-sustaining ecosystem for a 12-year period, once MMD requirements are fulfilled this should be performed to fulfill NMED requirements as a means to address potential water quality issues.
B. Repairing surficial erosion and sloughing on perimeter slopes as it occurs including addressing any rilling observed.
C. Maintaining stormwater run-on and run-off conveyances and detention areas and conducting repairs as necessary to maintain intended function.
D. Repairing damage caused by wildlife or grazing animals, invasion of noxious weeds, drought or wildfire, or depletion of soil characteristics.
E. Repairing site roads including run-off controls and culverts on an as needed basis and in particular after significant storm events.
F. Repairing and/or replacing fencing, signs, locks and any damage caused by trespass or other unauthorized use.

In addition to preventing water quality impacts, a preventative maintenance approach, once committed to, will result in less expense to LAC and limit future public liability. Finally, a preventative approach is the only practical way to develop future tasks and estimate financial assurance for long-term purposes, as developing tasks and costs for situations resulting from a reactive approach is highly problematic from both a design and planning aspect.

6. Section 3.2.3 ARD Treatment Facility

This section of the CHM CCP describes the treatment and evaporation of ARD from the waste rock pile and suggests that as a result off actions implemented on the waste rock pile between 2011 to current flows have significant decreased and only evaporation using ponds A and B is presently required for treatment of the discharge.

Recommendation: CHM should identify the specific flow rates that have occurred prior to and from 2011 to current as well as the corresponding water chemistry and provide and discuss the discharge in terms of concentration and load in addition to flow, as ultimately load is the best measure as to the effectiveness of source controls and other measures. As the decrease in flow may be related to storm events any discussion and prediction of future flow rates should be made pending evaluation and consideration of the 2022 wet period which has occurred in NM. As the requirement for capture and treatment of ARD from the waste rock pile is long-term it's monitoring, operation and maintenance, for the entire range of expected future conditions, should be considered in post-closure planning and financial assurance.

7. Section 3.3 Past and Current Land Uses

According to the CHM CCP, "PMLU, as anticipated by this updated CCP, is and will continue to be for wildlife habitat. Livestock grazing may occur in the future if landownership changes. Currently, no livestock graze on the permit area."

Recommendation: The statement in the CCP points out the need for both clarity in PMLU, and land use controls to protect the source controls and other engineered measures intended to protect revegetation, soil and water quality. Livestock grazing may negatively affect the source controls and other engineered measures if it were to be allowed to occur in the future. As has been noted and utilized at Superfund sites where remedies need to be protected, Institutional Controls[2] such as Land Use Controls need to be implemented and enforced if the reclamation and other measures intended to protect water quality are to be maintained and continued as intended. LAC could include a covenant restricting land use to any future landowner and the Agencies should consider requiring this to be done in the event of sale as a condition of their respective permits.

8. Section 3.4.3 Climate

This section provides limited climate information consisting of average annual precipitation and the range of precipitation over the last 22 years, maximum (potential) evapotranspiration, and average monthly temperatures. This section does not address anthropogenic climate change.

As both MMD and NMED are well aware, physical impacts to both engineered cover systems and stormwater conveyances, and infiltration of stormwater into reclaimed mine facilities such as the CHM waste rock pile, as well as open pit water levels and water quality in some cases such as the CHM open pit lake, are primarily driven by other than average precipitation events either in terms of single precipitation events or by wet (or in some cases dry) periods. And has been noted by numerous authorities on climate change, while it is expected that total annual precipitation will decrease in places

[2] https://www.epa.gov/superfund/superfund-institutional-controls

like the Southwest, heavier rainfall events and periodic annual precipitation may become more intense.[3,4]

The National Weather Service provides information for specific weather stations including the Golden station referenced in the CHM CCP.[5] As shown in Table 1 and Figures 1 and 2, the expected precipitation from a 1 in 100 year 24-hr storm event is estimated at 3.37 inches whereas a 1 in 1,000 year 24-hr event is estimated at 4.51 inches. Precipitation from a 1 in 100-year wet period of 30-days is estimated at 8.55 inches whereas a 1 in 1,000 year 30-day event is estimated at 10.5 inches. As has been experienced over the past decade[6], 1 in 100 year 24-hr storm events are without question becoming more frequent, and 1 in 1,000-year events have occurred in the recent past and are equally if not more likely to occur in the future. This past 2022 Monsoon's precipitation amount was the second wettest in the 25-year period of record kept by Santa Fe County as shown in Figure 3.

Recommendations: The CHM CHP should be revised to recognize and address how climate is expected to be affected by climate change. The agencies should take into consideration the potential for more frequent intense storm events and wet years in their consideration as to the design, construction, maintenance and replacement of engineered covers and stormwater controls features as discussed later in these comments. Additionally, any models or other information that has been produced on behalf of LAC should be based on actual daily data and not average data which significantly compromises such efforts.

[3] Walsh, J., D. Wuebbles, K. Hayhoe, J. Kossin, K. Kunkel, G. Stephens, P. Thorne, R. Vose, M. Wehner, J. Willis, D. Anderson, S. Doney, R. Feely, P. Hennon, V. Kharin, T. Knutson, F. Landerer, T. Lenton, J. Kennedy, and R. Somerville. 2014. Ch. 2: Our changing climate. In Climate change impacts in the United States: The third national climate assessment, edited by J.M. Melillo, T.C. Richmond, and G.W. Yohe. Washington, DC: U.S. Global Change Research Program, 19–67.

[4] Climate Change and New Mexico's Water Resources: A 50-Year Outlook, New Mexico Bureau of Geology and Mineral Resources
https://www.nmlegis.gov/handouts/WNR%20072522%20Item%205%20Gutzler1.pdf

[5] https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nm

[6] https://www.abqjournal.com/1200424/santa-fe-flood-caused-by-historic-rainfall-hits-hard.html

Table 1. POINT PRECIPITATION FREQUENCY ESTIMATES, NOAA Atlas 14, Volume 1, Version 5 GOLDEN Station ID: 29-3592 Location name: Sandia Park, New Mexico, USA*

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]										
Duration	**Average recurrence interval (years)**									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
24-hr	**1.27** (1.16-1.39)	**1.58** (1.45-1.75)	**1.98** (1.81-2.17)	**2.29** (2.09-2.51)	**2.71** (2.46-2.97)	**3.03** (2.75-3.32)	**3.37** (3.04-3.68)	**3.70** (3.32-4.04)	**4.16** (3.71-4.53)	**4.51** (4.00-4.91)
7-day	**1.97** (1.81-2.15)	**2.45** (2.26-2.68)	**3.01** (2.77-3.29)	**3.46** (3.17-3.77)	**4.05** (3.70-4.41)	**4.49** (4.10-4.89)	**4.95** (4.50-5.38)	**5.40** (4.89-5.87)	**5.99** (5.40-6.52)	**6.44** (5.77-7.02)
30-day	**3.69** (3.42-3.98)	**4.59** (4.26-4.96)	**5.57** (5.17-6.02)	**6.30** (5.84-6.80)	**7.23** (6.69-7.80)	**7.90** (7.30-8.52)	**8.55** (7.89-9.21)	**9.18** (8.44-9.90)	**9.95** (9.13-10.7)	**10.5** (9.61-11.4)
60-day	**5.23** (4.88-5.61)	**6.51** (6.06-6.99)	**7.81** (7.27-8.39)	**8.74** (8.14-9.39)	**9.90** (9.20-10.6)	**10.7** (9.93-11.5)	**11.5** (10.6-12.3)	**12.2** (11.2-13.1)	**13.0** (12.0-14.0)	**13.6** (12.5-14.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

Figures 1 and 2. Graphs of POINT PRECIPITATION FREQUENCY ESTIMATES, NOAA Atlas 14, Volume 1, Version 5 GOLDEN Station ID: 29-3592 Location name: Sandia Park, New Mexico, USA*

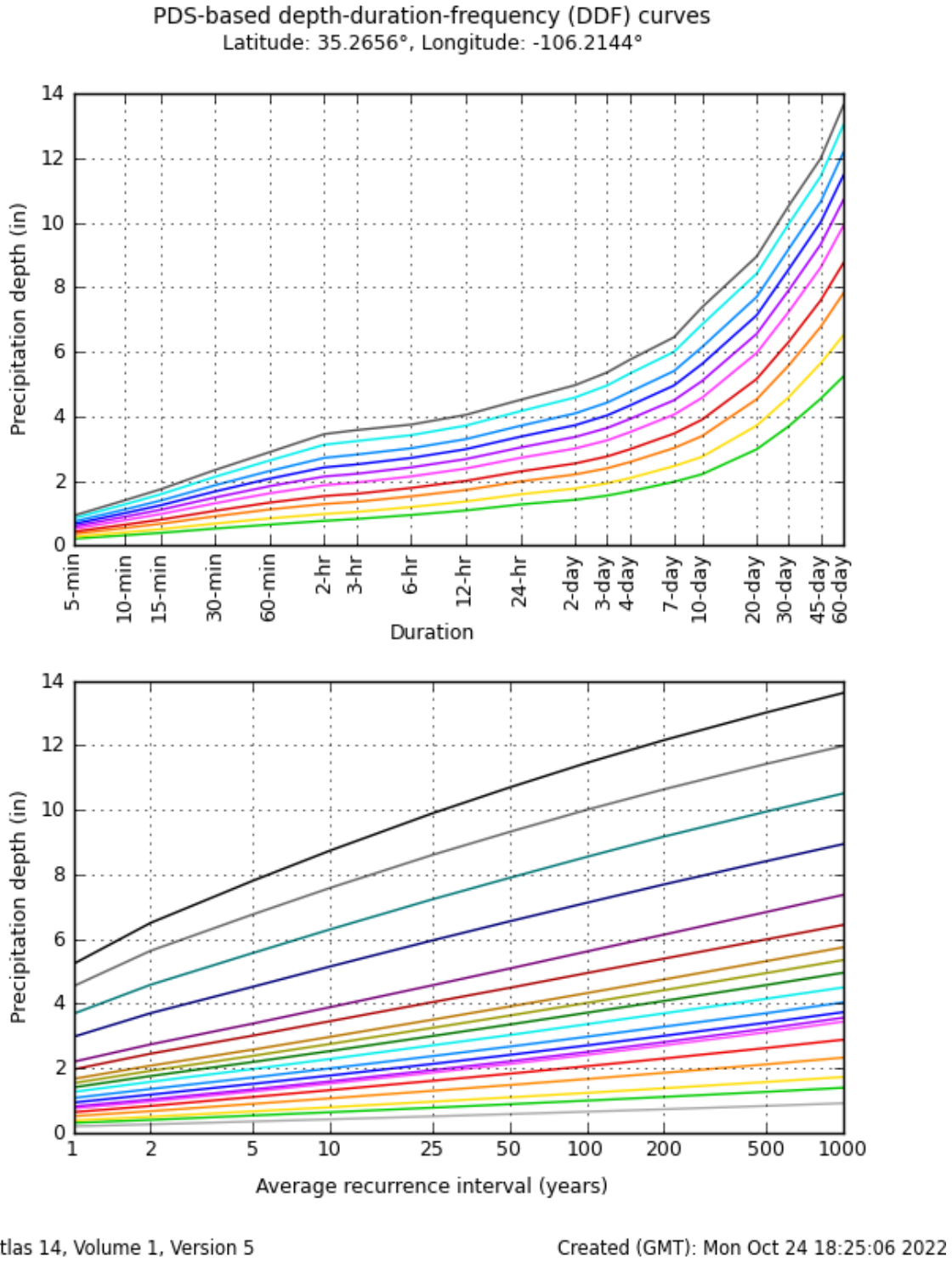
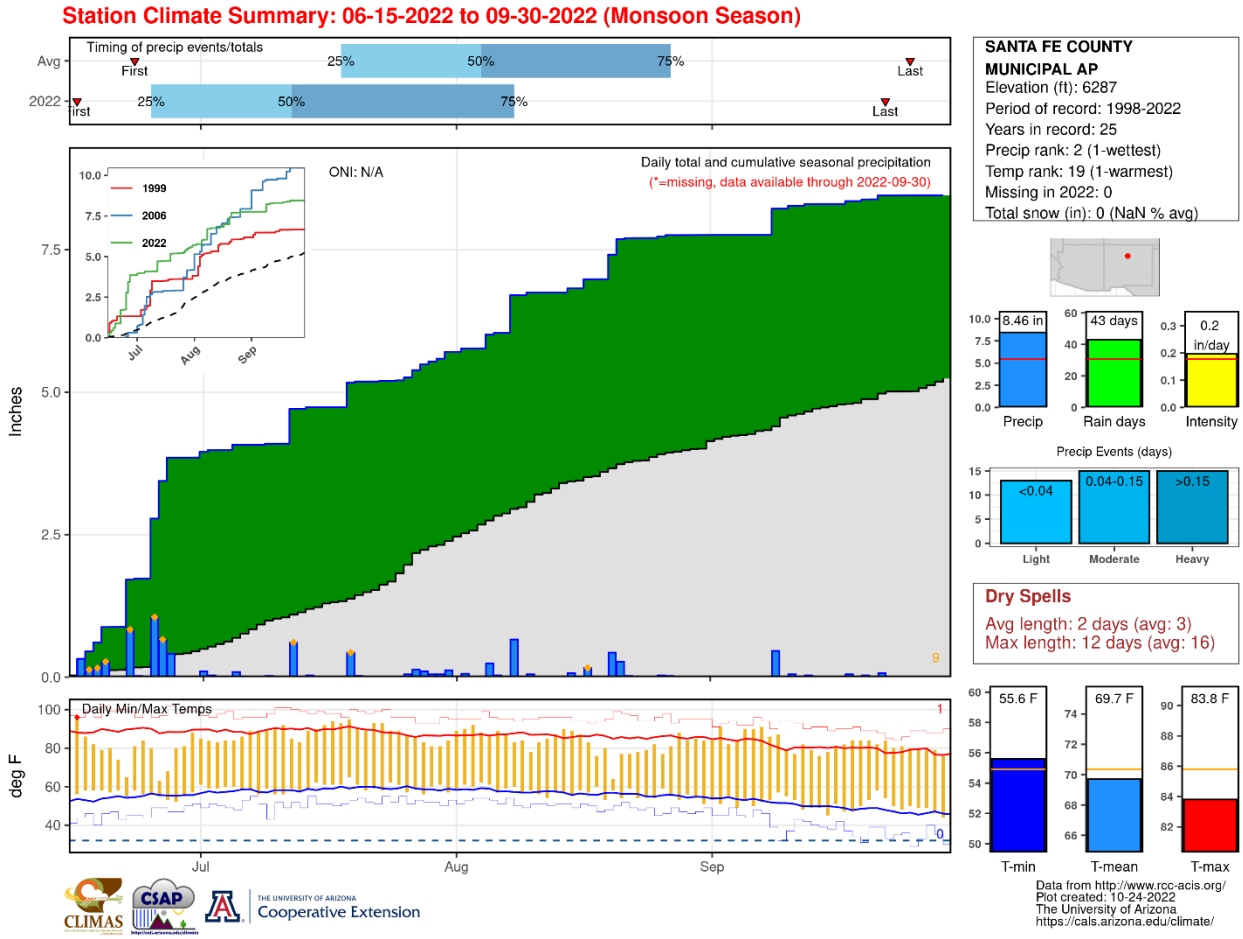


Figure 3. Santa Fe County Municipal Station Climate Summary



9. Section 4.0 RECLAMATION COMPLETED

The CHM CCP describes storm water benches and conveyance channels in addition to other engineered features where stormwater design criteria are both applicable and critical as suggested by our comments on climate. However, with the exception of the Open Pit outflow channel, which according to the CCP is designed to carry the 100-year, 24-hour storm event, the CCP does not identify the storm design criteria for the reclamation that has been completed or for reclamation that is planned.

Recommendations: The MMD Director should recognize that even current design standards such as 1 in 100-year storm events are grossly inadequate to protect public safety as well as to ensure the mining facilities are not impacted by stormwater resulting in both property loss as well as potential water quality impacts as well as impacts to reclamation post-closure. Executive Order 11988[7] was issued "as part of a national policy on resilience and risk reduction" consistent with the President's Climate Action Plan. The resulting Federal Flood Risk Management Standard defines one way of determining a

[7] https://www.whitehouse.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and-

floodplain as "(iii) the area subject to flooding by the 0.2 percent annual chance flood." Given that New Mexico's existing stormwater design criteria are antiquated with regard to climate change considerations, we recommend that the NMED recognize a 500-yr storm event standard as a measure of risk reduction related to both public and worker safety as well as minimization of property damage. The MMD Director should require at least a 200-yr/24-hour storm event and preferably a 500 yr/24-hour storm event and should adopt it as an executive action given the department's direct experience with the current standard being inadequate and the Department's own frequent observations of significant stormwater events exceeding the 100-yr standard at mine sites in New Mexico.

However, we would also note that as we have previously commented, others have found it is not possible to quantify the future effects of climate change on flood flows with any confidence, and instead have recommended an uplift of 10% to 20% applied to design storms or peak flows in response to this uncertainty (EGBC, 2018)[8]. If the agencies were to address the matter of climate change proactively in a similar manner, they would at least adopt the use of a 200-yr 24-hr flood event going forward as the stormwater design standard for CCPs.

10. Section 5.1 Open Pit

According to the CHM CCP, "As required by the NMMA Rules, the revised surface-water standards in 20.6.4.99 NMAC will replace the current AP-27 surface-water standards (see Appendices E and H). One of the Open Pit waterbody AP-27 performance standards will be meeting surface water quality standards for wildlife specified in 20.6.4.99 NMAC. According to JSAI (2020 revised 2021), included as Appendix E to the CCP, "The January 2021 open pit water-quality results meet the revised surface water quality standards for wildlife, livestock, and secondary contact."

The suggestion that the revised surface-water standards in 20.6.4.99 NMAC will replace the current AP-27 surface-water standards "as required by NMMA Rules" is not correct. As noted in Appendix E, Open Pit evaluation report by JSAI (2021), based on correspondence from the NMED (2021), AP-27 will be updated to include applicable surface-water standards related to 20.6.4.99 NMAC.

Table 3 from JSAI 2021 shows the original surface-water standards contained in the 2002 AP-27 and as presented in Appendix E. As indicated in Table 3, JSAI 2021 did not specifically address the open pit water quality results that do not meet the AP-27 groundwater discharge standards for sulfate and TDS. The following should also be noted:

- The AP-27 groundwater discharge standard for arsenic is 0.01 mg/L however the Open Pit water body January 2020 analysis apparently had a detection limit of 0.125 mg/L, rendering a comparison of the results as to the AP-27 groundwater discharge standard impossible.
- As noted in the table the Open Pit water body data is lacking a chromium VI analysis, and the chromium analysis had a detection limited of 0.030 mg/L, making a comparison to the Limited Aquatic Life – Acute Standard of 0.016 mg/L impossible.
- The Limited Aquatic Life – Acute Standard for copper is 0.05 mg/L as compared to the Open Pit water body analysis value of 0.04 mg/L. This means the copper concentration is presently just 0.01 mg/L from equaling the standard.

[8] Engineers and Geoscientists British Columbia (EGBC), 2018. *Legislated Flood Assessments in a Changing Climate in BC, Professional Practice Guidelines*. August 28. Version 2.1. British Columbia.

Table 3. Summary of AP-27 groundwater and surface-water quality standards and monitoring results

constituent	unit	AP-27 groundwater discharge Standard	surface water trigger level	Livestock Watering Standard	Wildlife Habitat Standard	Limited Aquatic Life - Acute Standard	Open Pit water body (4 ft depth) [2] May 2021	comment
alkalinity	mg/L		<20				37	
pH	S.U.	6 to 9					7.6	
chloride	mg/L	250					23.8	
sulfate	mg/L	1,200 b					**1,570**	
TDS	mg/L	2,000 b					**2,340**	
conductance	µS/cm		6,300				2,670	
aluminum [1]	mg/L	5				10.07	<0.40	
arsenic	mg/L	0.01		0.2		0.34	<0.125	
boron	mg/L	0.75		5.0				
cadmium [1]	mg/L	0.005		0.05		0.0065	0.000527	
chlorine residual	mg/L				0.011	0.019	<0.0002	January 2020 lab analysis
chromium III [1]	mg/L					1.77		total chromium is less than Cr III standard
chromium VI	mg/L					0.016	na	need lab analysis
chromium	mg/L	0.05		1.0			<0.030	
cobalt	mg/L	0.2 b		1.0			0.0469	
copper [1]	mg/L	1		0.5		0.05	0.04	January 2020 lab analysis
iron	mg/L	1					<0.50	
lead [1]	mg/L	0.002		0.1		0.28	<0.0075	January 2020 lab analysis
manganese [1]	mg/L	4.0 b				4.738	2.23	
mercury	mg/L	0.002			0.01	0.0014	<0.00020	
molybdenum	mg/L	1				7.920	<0.008	January 2020 lab analysis
nickel	mg/L	0.2				1.51	0.0237	January 2020 lab analysis
selenium	mg/L	0.05		0.05	0.005	0.02	<0.0030	
silver [1]	mg/L	0.05				0.035	na	need lab analysis
vanadium	mg/L			0.1			<0.005	January 2020 lab analysis
zinc [1]	mg/L	10		25		0.564	0.164	

b AP-27 groundwater discharge standard
red indicates exceedance of applicable standard
CHMRP - Cunningham Hill Mine Reclamation Project
TDS - total dissolved solids
mg/L - milligrams per liter
µS/cm - microsiemens per centimeter

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- The AP-27 groundwater discharge standard for lead is 0.002 mg/L however the Open Pit water body January 2020 analysis apparently had a detection limit of 0.0075 mg/L, rendering a comparison of the results as to the AP-27 groundwater discharge standard impossible.
- As noted in the table the Open Pit water body data is lacking a silver analysis, making a comparison to the Limited Aquatic Life – Acute Standard of 0.035 mg/L impossible.

Recommendations: The expectation in a CCP is that it will describe how standards will be maintained and not simply suggest that if standards are exceeded, additional water treatment will be performed as necessary. An Abatement Plan or approach based on meeting standards, and taking a "wait and see" approach and allowing for standards to be exceeded and then implementing mitigation measures once again, is not an abatement plan but instead the acceptance of exceedances of standards in perpetuity, if only "periodically." And this approach ensures that at some point in the future when the company no longer exists, the ability of the agencies to maintain standards even using a reactive approach will be tenuous, as there is no reasonable basis upon which to predict how often periodic treatment will be needed.

The CHM Open Pit lake will, without question, act as an evaporative sink and result in evapo-concentration of the contained constituents over time. In addition, it will continue to receive contaminants in stormwater to varying degrees depending on source controls and pit wall conditions among other factors. While it may not be necessary to conduct water treatment operations continuously in the future, until it can be demonstrated through actual water quality results for a

significant period of time, such as for a period of 25 years, the assumption should be that annual water treatment will continue to be necessary.

Additionally, the use of an Adaptive Management Planning approach should be used that includes triggers and actions intended to **prevent** future exceedances and applied immediately. As noted, the copper concentration in particular is 80% of the present standard. Using copper as an example, based on the Limited Aquatic Life – Acute Standard for copper of 0.05 mg/L being the most restrictive standard, the following protocols should be followed:

A. If the pit lake analysis is greater than 75% of the standard or 0.04 mg/L copper, water treatment is commenced,
B. Water treatment is continued until the pit lake analysis is less than 25% of the standard or 0.02 mg/L copper.

As suggested, our recommendation is that protocols similar to these would be applied for all applicable constituents over the next 25 years. Once the data from that period are evaluated, the longer-term requirements to prevent future exceedances, including whether periodic treatment will be adequate and how frequently, can be more confidently estimated. In the meantime, a conservative approach should be taken that assumes annual water treatment of the pit lake will be required for the foreseeable future.

11. Section 7.0 POST-RECLAMATION MONITORING AND MAINTENANCE

According to the CHM CCP, the post-reclamation monitoring program will include:

➢ Open Pit water quality (AP-27 and NMAC);
➢ vegetation success;
➢ erosion control;
➢ drainage channel and diversion structure monitoring;
➢ slope stability;
➢ wildlife monitoring, including inspection for damage from burrowing animals;
➢ site security; and
➢ routine inspections of all reclaimed units to assess their condition and to detect any unusual conditions.

The CCP goes on to suggest that the monitoring period will be 12 years except for water-quality remediation under DP-55, and the post-reclamation monitoring program is further described in the Updated Contingency Plan. The following is noted in the Updated Contingency Plan:

<u>3.2 Contingency Plan CHP-1</u>

- The approach describes reacting to water quality exceedances after they occur. This approach practically guarantees water quality standard exceedances will occur in the future, until corrective actions are taken, and does not **prevent** or even minimize water quality exceedances.
- The approach is exclusively based on exceedances of standards for wildlife use, or down-gradient water quality, but not the actual pit lake water quality itself.

3.3 Performance Standard CHP-2: Open Pit Hydrological Model

- As noted, steady-state Open Pit water levels are predicted to range between the present level of approximately 6,800 to as much as 6,840 ft above mean seal level (amsl). The contingency plan would conduct a hydrologic investigation if the Open Pit lake water levels rise above 6,840 ft. The hydrogeologic model has previously been revised in 1999, 2001, 2010, and 2020.

Review of the CCP and Updated Contingency Plan did not indicate any plans for monitoring and maintenance of any features beyond 12 years.

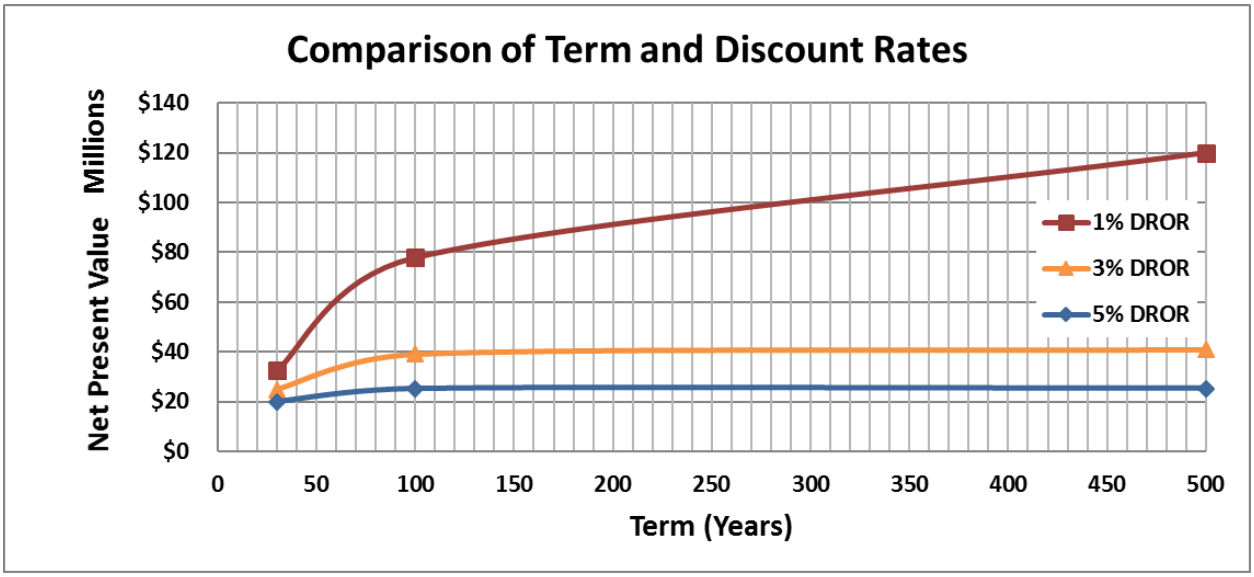
Recommendations: The Contingency Plan for the CHM CCP long-term monitoring and maintenance should be based on a preventative approach that would result in the objective of no future exceedances of applicable water quality standards as previously described in these comments. Consistent with that approach, it is also recommended that if the pit lake level reaches 6,820 ft amsl a hydrologic investigation be conducted as described, including to ascertain whether the pit level is likely to rise above 6,840 ft. It is also recommended that LAC and the agencies consider whether a better approach overall to long-term management and prevention of water quality exceedances might be to maintain the current pit lake water level by treating and discharging as required.

As suggested in NMED's comments contained in MMD's letter to LAC dated October 25, 2022 concerning Agency technical comments on the CHM CCP, the CCP should describe a long-term post-reclamation monitoring and maintenance program that assumes at least 100 years. This also needs to be reflected in the cost estimate. The program should include all aspects of the site related to water quality which is not exclusive of maintaining revegetation or source controls, and should include and address in sufficient detail all the items identified during the 12-year period but for at least 100 years. The CHM CCP should incorporate all requirements for AP-27 regardless of whether the cost estimate for AP-27 is performed separately.

12. Financial Assurance Cost Estimate

The comments from NMED and MMD concerning financial assurance in MMD's letter to LAC dated October 25, 2022 have been noted. It is our intention to provide more detailed comments specific to the financial assurance estimates upon LAC's response to MMD and NMED and their providing a separate cost estimate for AP-27. As suggested in our previous comments, the inclusion of tasks in the CCP and provisions in the financial assurance cost estimate for long-term monitoring, maintenance and water treatment is necessary to address the majority of the issues that have been raised herein.

In particular the requirement from NMED to consider long-term costs for activities for 100 years is significant in that the use of that time period is intended to address long-term costs that could actually occur over hundreds, thousands and even tens of thousands of years into the future if present circumstances were to be applied. The recognition that the CHM is not a walk-away proposition is important in that it signifies that in order to ensure that the liability for conducting the necessary future monitoring, maintenance and water treatment tasks does not ultimately become a public/taxpayer liability, a cash or equivalent trust fund based on conservative fiscal assumptions relative to financial assurance must be established. This means that in addition to ensuring the cost estimate is accurate, the estimate should also be performed assuming a longer time period such as 500-years, and a using a conservative assumption as to future inflation and interest, and assume a low net discount rate, such as 1%. How this approach affects the amount of financial assurance is shown in Table 4.
Table 4.



Depending on the Discounted Rate of Return (DROR), which is the rate of interest received on funds invested minus the inflation rate, the impact on the amount of funds estimated is significant. For a 100-year period, using this example, a 5% DROR would result in a Net Present Value (NPV) being calculated of approximately $25M, whereas using a 3% DROR would result in a NPV of approximately $38M, and a 1% DROR would result in a NPV of approximately $75M. It should be noted that currently, with inflation exceeding the interest rate obtainable on typical investment funds appropriate for financial assurance, the DROR would be negative resulting in an even larger amount of financial assurance being necessary than that calculated for the 1% case.

The impact of using a 500-year period is also demonstrated in Table 4. If a 5% DROR is used the result would be to add less than a percent to the NPV. If 3% is used the result would be to increase the amount from approximately $38M to $41M. However, if a conservative rate of 1% is used the NPV increases from approximately $75M if 100 years is used to approximately $120M is 500 years is used.

Recommendation: Given that even in the most accurate financial assurance cost estimate there is inherent uncertainty, but particularly when it comes to suggesting what might happen in the future the inherent uncertainty is large, it is recommended that NMED use a longer time period such as 500-years, and a conservative assumption as to future inflation and interest, and assume a low net discount rate, such as 1%.

MONTANA TUNNELS MINE EVALUATION

Appendix A

James R. Kuipers, P.E.

January 24, 2017

Kuipers & Associates LLC, Wisdom, MT | prepared for Montana Trout Unlimited

January 24, 2017

To: Bruce Farling, Montana TU
From: Jim Kuipers P.E., Kuipers & Associates

Re: **Montana Tunnels Mine Evaluation**

At your direction, I have reviewed the available information as referenced herein regarding the Montana Tunnels Mine. The following summarizes the current situation and my findings with respect to the present situation and compliance with the Montana Metal Mine Reclamation Act ("MMRA"). It includes the following sections: Executive Summary; Background; Major Site Features; Financial Assurance; MMRA Requirements and Conclusions; and Recommendations.

I. Executive Summary

This memo reviews the history of the Montana Tunnels mine and the current situation with respect to site conditions, reclamation and closure, and financial assurance. The Montana Tunnels mine was originally permitted by Pegasus Gold in 1998 and consists of an open pit, waste rock piles, flotation processing facility, and tailings storage facility as well as other ancillary features. Mining was ceased in 2009 and although a plan to expand the open pit and other site features was approved in 2008, the plan has not been implemented, and the site has been on "care and maintenance" since that time. Ownership of the mine passed from Pegasus Gold to its predecessor Apollo Gold and then to the present owner Eastern Resources, and it represents the continuing saga of Pegasus Gold and the Montana Department of Environmental Quality ("DEQ") with respect to financial assurance almost 20 years after Pegasus Gold bankruptcy.

Current conditions at the mine site have the potential to negatively affect public safety and the environment. This includes:

- issues with the available and currency of site data and evaluations;
- significant signs of open pit stability issues including unravelling and block failures and subsidence outside of the current pit boundary;
- concerns regarding the tailings storage facility and conformance with current industry best practice;
- concerns with impacts to waste rock piles associated with open pit instability;
- concerns with impacts to water quality associated with the pit lake, tailings storage facility seepage, and waste rock seepage;
- concerns with the current financial assurance of $15.9M in cash and $2.5M in real estate versus the current liability of approximately $35.8M as calculated herein;
- concerns with the likelihood of operator default and reliance by DEQ on future mining to resolve shortfalls.

To address these issues the following measures are recommended:

- Audit report to collect and review all available data and evaluate the data in comparison to current water quality and other environmental standards or MMRA requirements.
- Open pit stability evaluation to determine the ultimate extent to which the pit walls are likely to unravel or otherwise fail and lead to further subsidence of natural ground features outside of the current active pit area. Additionally, a Failure Modes and Effects Analysis (FMEA) should be undertaken to better define the potential for catastrophic failure as well as other potential environmental and public as well as worker safety impacts.
- An evaluation of open pit conformance with the Montana MMRA addressing how this and other mines meet the requirements of the act with regards to utility to humans and the environment as well as other factors.
- Mitigation of impacts to Clancy Creek in an expedited manner and additional mitigation identified and implemented as soon as possible to prevent the loss of flow into the pit on a permanent basis.
- Update of the financial assurance estimate to a current basis and require them to provide the increased amount or otherwise suspend the operator's license consistent with the requirements of the MMRA. DEQ should also collect the existing financial assurance to ensure it is invested in an interest-bearing account.
- DEQ should provide a formal evaluation of the situation that has led to the current shortfall in financial assurance and revise its approach, including yearly reviews if necessary, to ensure this is the last mine that the State of Montana's taxpayers can expect to pay the costs of reclamation as a result of failure to maintain adequate financial assurance.

II. Background

The Montana Tunnels Mine was granted an Operating Permit (00113) by the Montana Department of Environmental Quality (DEQ) and an approved Plan of Operations (No. MTM 82856) by the U.S. Bureau of Land Management (BLM)[1] and started mining operations in 1986.[2] The mine was originally permitted by U.S. Minerals Exploration/Centennial Minerals and then shortly following start-up in 1987 was sold to Pegasus Gold Corporation. The mine was retained by Apollo Gold Corporation following the bankruptcy and reorganization of Pegasus Gold Corporation in 1997. Apollo Gold and Elkhorn Goldfields formed a Joint Venture partnership in 2006 and the mine became the property of Elkhorn Goldfields in 2010 and subsequently ownership was transferred to Eastern Resources, Inc. in 2012.[3]

The mine was originally permitted as an open pit mine with a production rate of 15,000 tons per day and expected to mine a total of 102 million tons of ore. The ore was processed using flotation and gravity milling processes which crush and grind the ore and separate the valuable minerals from the waste and produce concentrates containing gold, silver, lead and zinc that were shipped off-site for further smelting and refining. Originally cyanidation was also used but discontinued in 1987.[4] The mine was projected to disturb approximately 1,200 acres at the cessation of mining and would include waste rock storage areas (426 acres), cap rock and low grade stockpiles (66 acres), ponds and tailings dam top (23

[1] 2008 FEIS Montana Tunnels Proposed M-Pit Mine Expansion, p. 1-1.
[2] Since 1986, Montana Tunnels has applied for and received 32 amendments and revisions to Operating Permit 00113. 2008 FEIS p. 1-3.
[3] Schaefer, John, Montana Tunnels Mining, Inc. Mine Redevelopment: Part II., 2012.
[4] 2008 FEIS p. 2-5.

acres), tailings storage facility (259 acres), and mine pit and pit perimeter (264 acres) in addition to facilities, gravel pit area, soil and gravel stockpiles, and miscellaneous (roads, air monitoring station, scale).[5]

Mining and milling operations continued until 2009 and resulted in 98 million tons of ore being processed. The mine has been on "care and maintenance" since 2009. A Mine Expansion Plan (M-Pit) was permitted in 2008 that would result in the mining of an additional 38 million tons of ore and add 9 years to the mine life. It was estimated in 2012 that $75M would be needed to restart operations.[6]

III. Major Site Features

The following section provides a general description, reclamation plans, and describes current conditions including recent photographs for the major site features (open pit mine, waste rock piles, tailings storage facility).

A. Open Pit Mine

2008 FEIS

The mine pit was originally permitted to extend from the 6,430-foot elevation to the 4,250-foot elevation at the pit bottom. The pit rim daylight elevation (the lowest point on the rim) would be 5,670 feet on the southeast side of the pit.[7] The pre-mining water table ranged from 5,650 to 5,750 feet and the average monthly rate of mine pit dewatering has varied over the past 20 years of mining from about 25 gpm (gallons per minute) to 900 gpm.[8]

All pit highwalls have shown instabilities except the north highwall in Lowland Creek Volcanics. If pit highwall stability is adversely affected by hydrostatic pressure, the pit highwalls would be dewatered by installing and pumping wells peripheral to the pit, by drilling horizontal drains into the pit highwall, and by reducing the highwall slope angles.[9]

Reclamation

Reclamation of the mine pit would leave highwalls as rock faces. At closure, most of the mine dewatering system would be shut off, and the L-Pit would begin to fill with water. Because of stability problems in the northwest highwall of the pit, vertical pumping wells would be maintained on the north, northwest, and southwest highwalls for 5 years during closure to provide factors of safety of at least 1.2 during the early stages of mine pit flooding. The L-Pit would remain accessible above the water level by way of the pit access ramp. Montana Tunnels' plan is to allow the pit highwalls to naturally weather and ravel into the pit, cover pit benches, and form talus slopes above the pit lake. Montana Tunnels would revegetate the pit perimeter and conduct weed control. The pit would be fenced and signed.[10]

[5] 2008 FEIS p. 2-4.
[6] Schaefer, 2012.
[7] 2008 FEIS p. 2-4, -5.
[8] 2008 FEIS p. 2-5.
[9] 2008 FEIS p. 2-5.
[10] 2008 FEIS p. 2-22.

During the 5-year closure period a variety of sources were expected to contribute to the pit water inflow including groundwater, TSF surface runoff, drain and recover well seepage, south pond stored water, and runoff from within the pit catchment area. The total pit surface water catchment area including the area of the mine pit and surrounding natural and reclaimed surfaces would be approximately 241 acres. After the 5-year closure period, Montana Tunnels would cease pumping water from the south pond to the pit.[11]

The model predicts that the pit lake would reach equilibrium almost two centuries after mining ceases at the 5,610-foot elevation, approximately 60 feet from the lowest rim of the pit (5,670 feet). The pit lake at equilibrium would not overtop the pit, and no surface water outflow from the lake would be anticipated.

The Clancy Creek channel in the vicinity of the mine pit would not be excavated by expansion of the pit, and the flow regime in Clancy Creek would not be altered. No impact to the Clancy Creek channel would be predicted in the foreseeable future. A contingency channel for Clancy Creek would be constructed in the existing flood plain away from the pit highwall by the end of the 5-year closure period. This channel would not be used unless a future connection between the mine pit and the existing channel develops. A berm would separate the contingency channel and the mine pit and would accommodate maximum flood events (such as the 100-year flood) and limit the potential for migration of the Clancy Creek channel towards the pit. [12]

A catastrophic event such as (1) the probable maximum flood (PMF), (2) geologic transformation of the landscape resulting from a large seismic event, or (3) a large mass failure of the pit highwall in the vicinity of the Clancy Creek could possibly reroute Clancy Creek into the mine pit sometime in the future. While possible, the likelihood of such a large event is considered remote in the foreseeable future (one century or less), but higher for geologic timeframes (several centuries). If such a large event were to occur, flow entering the pit (annualized average of about 100 gpm [0.22 cfs]) would no longer be available to Clancy Creek downstream of the pit. The loss of 100 gpm flow from Clancy Creek into the mine pit, if it were to occur, would be an adverse and long-term impact.

After mining ceases, Montana Tunnels would no longer need to appropriate and divert surface water from Clancy Creek for mill makeup water. Therefore, 50 gpm (0.11 cfs) to 250 gpm (0.56 cfs) of flow would be available to augment existing instream flows in Clancy Creek, assuming the water rights are not used for another purpose. The impact to water availability after mining ceases would be a beneficial and long-term impact.[13]

Current Conditions

From the time that mining was discontinued in 2009 until present the pit has been allowed to fill with water. It is unclear what sources or variety of sources have been used to fill the pit lake, or the current pit lake elevation. The current pit lake is shown in Figure 1. The pit lake, in the foreground, appears to be blue-green in color and is at least several hundred feet from the lowest pit highwall elevation.

[11] 2008 FEIS p. 2-22.
[12] p. 3-128
[13] P. 3-129

Figure 1. Montana Tunnels Mine Site Overview. (Photo by Christopher Boyer)

In an unmaintained condition since 2009, the pit highwalls as shown in Figure 2 and as described in the reclamation plan, have been allowed to "naturally weather and ravel into the pit, cover pit benches, and form talus slopes above the pit lake." In addition, the pit highwalls as contained in Figure 3, show significant signs of instability, including what appear to be block failures potentially enhanced by hydrostatic pressure, as evidenced by the appearance of water ponded on the pit benches. The instability is apparent beyond the existing pit walls as is evidenced by tension cracks outside of the pit walls including in the area of the mine shop buildings as shown in Figure 3, and outside of the pit wall adjacent to Clancy Creek in Figure 2. As shown in Figure 4, the degradation of the pit has resulted in the elimination of any safe access to the pit including for the purpose of pit lake water quality sampling.

Clancy Creek, instead of being unimpacted as predicted in the original 1998 and subsequent 2008 FEISs, was significantly impacted and has been moved into a 16-inch pipe around the mine pit highwall, as shown in Figure 5. It is evident that pit highwall degradation that has occurred since 2009 has resulted in the need to reroute Clancy Creek sooner rather than centuries into the future as predicted. Additionally, the contingency of constructing another channel is no longer viable, and it is clear that the highwall instabilities are extensive as evidenced by tension cracks extending well beyond the pit perimeter, and it is likely that Clancy Creek will be problematic to restore to an alternative channel, and maintaining the existing flow in a pipe may prove to be problematic as well if the highwall sloughs further or a mass instability occurs.

Figure 2. Montana Tunnels Pit Lake and Pit Highwall Unravelling. (Photo by Christopher Boyer)

Figure 3. Montana Tunnels Pit Highwall Instabilities. (Photo by Christopher Boyer)

Figure 4. Montana Tunnels Pit Entrance and Access Ramp. (Photo by Christopher Boyer)

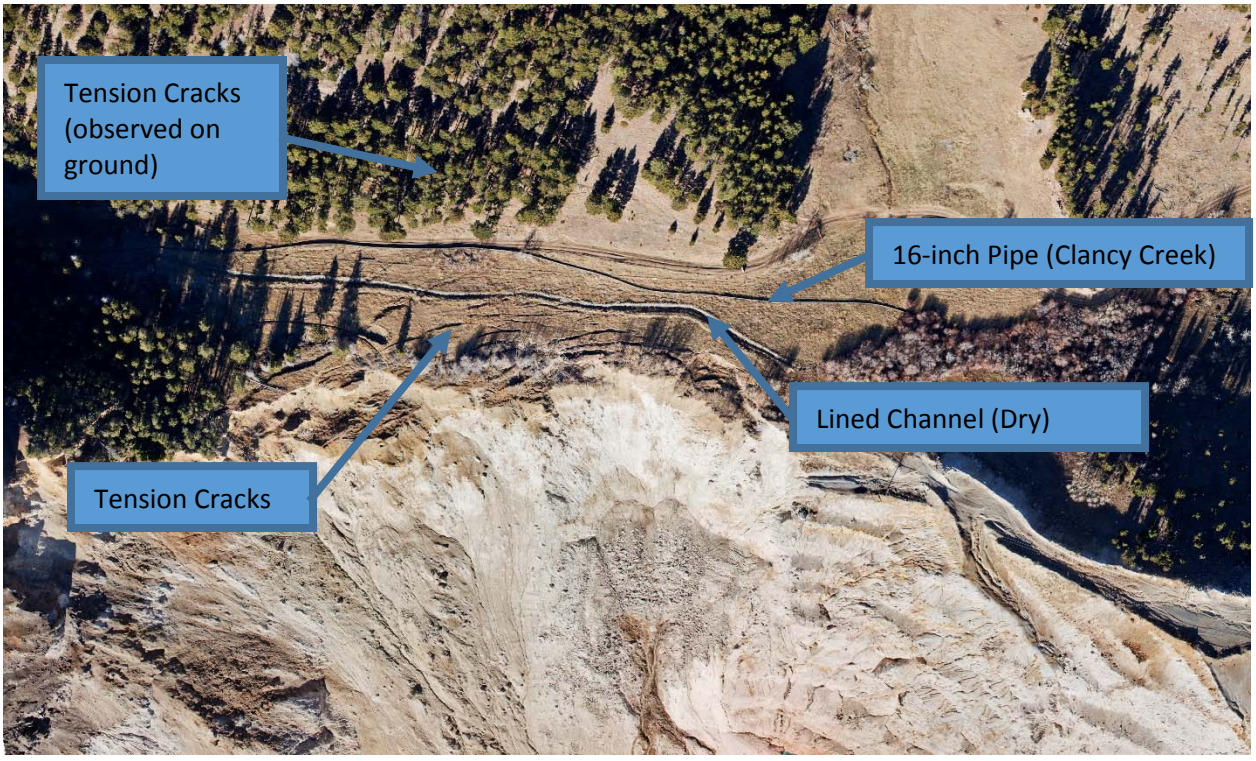


Figure 5. Montana Tunnels Open Pit Highwall Failure Along Clancy Creek. (Photo by Christopher Boyer)

B. Tailings Facility

2008 FEIS

The tailings storage facility (TSF) was incrementally permitted to the current elevation of 5,660 feet which apparently is sufficient to contain all tailings volume and maintain contingency freeboard under current conditions. Structural performance of the tailings embankment would be monitored after mining and ore processing have been completed. Stability monitoring would involve a continuation of piezometer readings within the embankment, monitoring of flows from the embankment combined drain system, and monitoring of tailings settlement during the closure and post-closure periods.[14]

Construction was adjusted from a downstream method to a modified centerline method in 1990. A design modification in 1994 included engineered adjustments to incrementally raise the ultimate embankment. This was followed by an amendment in 2002 to raise the TSF embankment. Construction of a waste rock buttress against the downstream slope of the tailings storage facility embankment began in 2002 to enhance embankment stability (permitted in March 1998 as Minor Revision 97-004). The first phase of the buttress was a compacted fill from the embankment base to the crest elevation. The waste rock buttress has been constructed to the crest elevation of the tailings storage facility embankment as each additional embankment lift is constructed. Montana Tunnels plans to place a minimum of 19.3 million cubic yards of waste rock to improve embankment stability.[15]

Pseudo-static (seismic) analysis indicates that there would be no significant deformation of the embankment during an MDE (maximum design earthquake). Post-liquefaction stability analysis shows that the static factor of safety is not reduced by liquefaction of the tailings. This indicates that the embankment would maintain stability regardless of the condition of the tailings, and that there is no potential for a flow slide or large deformation of the embankment following earthquake loading and liquefaction of the tailings.[16] The EIS also notes factors relative to TSF stability including tailings density, a wick drain program to enhance tailings density and embankment stability, projected pore pressures and long-term settlement of the tailings surface.[17]

Seepage water from the TSF is collected by wick drains and a recovery well system and reports to the south pond. According to the EIS, five recovery wells from prior to 2002 are used to provide make-up water and also used for groundwater monitoring with a pumping rate ranging from 50 to 80 gpm. Six new wells (post-2001) were drilled but do not produce large quantities of groundwater and would be pumped during the 5-year closure period and the extracted groundwater would be directed to the mine pit to aid initial pit flooding. TSF seepage exhibits elevated concentrations of sulfate, iron, cyanide and manganese however no concentrations above DEQ-7 human health standards.[18]

[14] 2008 FEIS p. 2-11.
[15] 2008 FEIS p. 2-11.
[16] 2008 FEIS p. 2-12.
[17] 2008 FEIS p. 2-12, -13.
[18] 2008 FEIS p. 2-14.

Reclamation

Reclamation of the tailings storage facility would begin at the conclusion of milling operations and last for 5 years.[19] The ponded water on the tailings storage facility surface would be removed during the first years following cessation of mining. Portable pumps would be used to remove the ponded water from the tailings storage facility as needed. Ponded water would be pumped to the mine pit during the 5-year closure period. Construction of water runoff controls on the tailings storage facility surface would occur when adequate consolidation of the tailings has taken place. The final surface of the TSF would have a 0.5 to 5 percent slope to the east toward the spillway. Drainage ditches would be constructed to channel stormwater toward the spillway channel. To prevent surface erosion and limit infiltration, the channels would be constructed with synthetic liners across the tailings storage facility surface.

Dust control would be provided during reclamation of tailings by progressively capping the sandy beach areas of the facility following removal of the pond. Water spigotting or sprays would be used, if necessary, to control dust on exposed surfaces of the tailings storage facility.

The anticipated consolidation of tailings would leave a natural low point in the southeast corner of the tailings storage facility. Using fill and grading, the tailings surface would be sloped to promote drainage to the spillway at the east end of the tailings storage facility embankment. Surface runoff after the 5-year closure period would report to a percolation pond constructed in the reclaimed south pond. The tailings surface would be capped with 36 inches of nonacid-generating rock and covered with an additional 24 inches of soil which would then be seeded to minimize water infiltration and to complete= final reclamation. More soil would need to be placed if additional settlement occurred after soil placement.

A spillway would be constructed on the east end of the tailings storage facility embankment as part of the closure activities to route stormwater off the tailings storage facility surface and minimize flows into the tailings. The spillway is designed to pass the probable maximum precipitation event to a percolation basin constructed in the former south pond.

Seepage from the tailings storage facility is controlled by an underdrain constructed using a bentonite amended soil liner, by an embankment drain, and a recovery well system located downgradient of the tailings storage facility embankment and south pond. The south pond receives water from on-site and off-site sources, including the recovery well system and the combined drains. After cessation of mining, the south pond would be used to capture stormwater and seepage water coming from the tailings combined drains during the 5-year closure period. This water would be pumped into the mine pit to accelerate pit lake formation. The recovery well system would continue to operate and pump water to the south pond during the 5-year closure period.[20]

Current Conditions

From the time that mining was discontinued in 2009 until present the TSF has been managed primarily to manage water levels to ensure adequate freeboard, and to control dust. Figure 5 shows the TSF as of November, 2016. At that time the water in the TSF covered approximately half of the surface area and was primarily contained against the northward hillside and within a beach (dry) distance of more than

[19] 2008 FEIS p. 2-21.
[20] 2008 FEIS p. 2-23, -24.

100 ft from the perimeter. The TSF waste rock embankment added for stability is shown in Figure 6 to the right of the TSF surface area. The South Pond where TSF seepage and groundwater recovery is directed is shown to the far right of the picture. The features are similarly shown in Figure 7.

C. Waste Rock Piles

2008 FEIS

122.3 million cubic yards of waste rock would eventually be placed in the 425.9 acres of waste rock storage areas. The primary waste rock storage area is adjacent to the west side of the tailings storage facility. A waste rock buttress downstream of the tailings storage facility embankment improves the stability of the tailings storage facility. The majority of the waste rock storage areas are permitted to have 2.5h:1v side slopes, although in some areas it is necessary to increase the steepness of the slopes to tie into original ground or minimize disturbance. Waste rock storage area slopes do not exceed 2h:1v in any situation.[21]

The waste rock storage plan for potentially acid generating (PAG) waste rock called for its placement within a perimeter of a 100-ft-wide lift of non-acid generating (NAG) rock. Top areas that contain PAG would be covered with 35 inches of NAG cap rock and then covered with 16 inches of soil. Where it is not possible to construct the outer perimeter with NAG, the slope is reduced and then covered with 36 inches of NAG and 16 inches of soil.

Figure 6. Montana Tunnels Tailings Storage Facility. (Photo by Christopher Boyer)

[21] 2008 FEIS p. 2-14.

Figure 7. Montana Tunnels Tailings Storage Facility with Waste Rock Pile and Open Pit. (Photo by Christopher Boyer)

Approximately every 100 feet in elevation, a wide bench is left for construction of a drainage ditch to minimize runoff and erosion on downgradient slopes. Unlined ditches are designed to pass a 100-year, 24-hour storm event. Final details of the design of all diversions and channels would be completed at the end of the mining operation. Use of riprap or other channel protection would be determined at that time and would be based on channel performance during the mining operation and functioning of the drainage and diversion system during post-closure.[22]

Reclamation

The waste rock storage areas are reclaimed incrementally as lifts are completed. Any reclamation of waste rock storage areas that cannot be completed concurrently with mining would be completed after closure.[23]

During reclamation, waste rock storage area slopes would be graded to a final slope of 2.5h:1v to enhance vegetation success and reduce erosion potential. Tops of waste rock storage areas would be essentially flat with less than 2 percent slopes. Waste rock storage area tops would be graded to eliminate depressions and to provide surface water flow away from the steeper side slopes. Three feet of cap rock would be spread over waste rock storage area tops or slopes if chemical testing indicates that the surface materials are PAG; the cap rock would not be added to slopes that did not exhibit PAG.

[22] 2008 FEIS p. 2-16.
[23] 2008 FEIS p. 2-21.

Sixteen inches of soil would be spread on all surfaces, regardless of whether the cap rock had been added or not. The surfaces would then be revegetated to minimize infiltration.[24]

Current Conditions

From the time that mining was discontinued in 2009 until present the waste rock piles left as they were when mining ceased. Figures 4, 5 and 6 show the unreclaimed and/or partially reclaimed waste rock piles as of November, 2016.

IV. Financial Assurance

According to the 2008 FEIS A 5-year closure period is planned to reclaim all areas disturbed by mining activities. A post-closure period is also planned for monitoring and maintenance. Approximately 30 percent of areas disturbed by mining will have been reclaimed by concurrent reclamation prior to closure. Reclamation of all remaining facilities would commence at the conclusion of mining operations. Closure of the tailings storage facility surface would require a 5-year period to allow time for sufficient dewatering and settlement of tailings solids.[25]

The Montana DEQ last updated the Montana Tunnels Financial Assurance Cost Estimate in January, 2008. At that time the estimate was $23.4M as summarized in Table 1.

Table 1. Montana Tunnels Closure Task Summary and Costs
Montana DEQ, January, 2008

Task	Cost
ITEM 1: Reclaim Waste Rock Dumps	$4,166,978
ITEM 2: Reclaim Low Grade Stockpiles	$907,503
ITEM 3: Reclaim Water Retention Ponds and Tailings Dam	$251,071
ITEM 4: Reclaim Tailings Impoundment	$7,424,985
ITEM 5: Reclaim Pit Perimeter	$106,474
ITEM 6: Reclaim Facilities	$550,305
ITEM 7: Reclaim Miscellaneous Areas	$1,271,625
ITEM 8: Reclaim Open Pit	$841,751
ITEM 9: Monitoring and Closure/Post Closure Care	$889,500
ITEM 10: Miscellaneous Expenses	$429,500
TOTAL CLOSURE TASK COSTS	$16,839,692
29% Contingency, Engineering, Mobilization, Inflation	$4,883,511
10% Reclamation Administration	$1,683,969
TOTAL ESTIMATED COST OF CLOSURE	$23,407,172

[24] 2008 FEIS p. 2-24, -25.
[25] 2008 FEIS p. 2-21.

Open Pit

The cost includes reclamation of the pit perimeter (Item 5) consisting of 16 acres for $106,474 and pumping of water from tailings recovery systems to the pit ($747,983) and reclamation of the upper pit haul ramp ($93,769) for a total of $841,751.

TSF

The cost of the TSF reclamation (Item 4) includes dewatering the supernatant pond, haul and place settlement rock, reclamation of the tailings surface, and construction of an embankment spillway, and is expected to cost $7,424,985.

Waste Rock

The cost of the waste rock pile reclamation (Item 1) includes reclamation of the dump slopes and tops as well as roads, construction of drainage channels and misc. areas, and is expected to cost $4,166,978.

Monitoring and Closure/Post Closure Care

The $889,500 total cost estimate includes the following:

- Groundwater and surface water monitoring, 25-year period, $177,500 total ($7,100/yr average)
- Weed control, 10-year period, $312,000 total ($31,200/yr average)
- Inspections and Maintenance of Facilities and Drainage Systems, 30-year period, $200,000 total ($6,667/yr average)
- Overhead (supervision, engineering, consulting, costs), 30-year period, $200,000 total ($6,667/yr average)

Current Financial Assurance

According to MDEQ, the current financial assurance held by the State of Montana is $18.4M consisting of $15.9M in cash and $2.5M in appraised real estate. In conversations with Warren McCullough, head of the MDEQ Hardrock Permitting Bureau, he has stated that the department does not believe they can require the project owner, Eastern Resources, to provide an increased financial assurance amount commensurate with the current site liability without forcing the company to go bankrupt. MDEQ believes it is preferable to hope that the owner can require the necessary capital, including financial assurance, to mine the proposed M-Pit, permitted in the 2008 FEIS.

V. Comments and Conclusions

The Montana Metal Mining Reclamation Act (MMRA) includes the following requirements relative to the current situation at the Montana Tunnels mine site.

General Requirements

According to the MMRA, MCA Section 82-4-336, Reclamation plan and specific reclamation requirements, (10) *The reclamation plan must provide sufficient measures to ensure public safety and to prevent the pollution of air or water and the degradation of adjacent lands.* As is discussed further in

these comments, the reclamation plan and specific reclamation requirements currently approved by MDEQ fail to consider existing site features that have developed which could threaten public safety including that of MDEQ employees inspecting and monitoring the site, and to ensure prevention of pollution of groundwater resources, and impacts to surface water resources.

Open Pit

MMRA, MCA Section 82-4-336 requires (9) (b) *With regard to open pits and rock faces, the reclamation plan must provide sufficient measures for reclamation to a condition:*

(i) of stability structurally competent to withstand geologic and climatic conditions without significant failure that would be a threat to public safety and the environment;
(ii) that affords some utility to humans or the environment;
(iii) that mitigates postreclamation visual contrasts between reclamation lands and adjacent lands; and
(iv) that mitigates or prevents undesirable offsite environmental impacts.

While the reclamation plan may have allowed for unravelling of the pit, as it is presently evidenced at Montana Tunnels, the result does not appear to meet the requirements of the MMRA. The evidence of various forms of mass failure, including erosion, unravelling and block failures, and extensive surface cracking showing the failures are likely to extend significantly further beyond the current pit boundary, suggests that current conditions are conducive to a significant failure of the pit walls potentially affecting the pit lake. This would certainly be a risk to public safety were access not restricted. However, the current financial assurance calculations do not identify tasks or include funds for either maintenance of fencing and signs, or any form of site security. Even if access is restricted, the pit and pit lake will be an attractive nuisance for trespassers. The risk relative to public safety will never be eliminated.

A significant mass failure of the pit walls could have several potential impacts including displacement of the pit lake water and/or impacts to pit lake water quality. Displacement of pit lake water such as that which has occurred on several occasions in the Berkeley Pit is likely to occur at Montana Tunnels which could endanger workers and/or equipment. Displacement of specific sections of the pit wall containing higher mineralized contents could impact pit lake geochemistry. The risk of a catastrophic release due to a failure may exist once the pit lake level reaches equilibrium if its elevation is proximate to that of the “daylight” pit level.

It is difficult to imagine how the current or ultimate pit and pit lake will afford any utility to humans or the environment. If the site operator becomes bankrupt the State of Montana would assume responsibility for the property and de facto ownership if no other party claims it as an asset, which is entirely probable. In that event the State of Montana and its citizens would own the pit and pit lake and instead of it being an asset in terms of affording utility, it would instead be a significant risk to public safety and a long-term liability.

Nothing has been proposed to mitigate post-reclamation visual contrast. This is likely to become more evident to adjacent property owners and even others more distant from the mine as the pit boundary is further expanded beyond the present configuration by the unravelling and/or collapse of the pit walls. Similarly, the plan as evidenced does nothing to mitigate or prevent undesirable offsite environmental impacts. Because no impacts were predicted off-site, no mitigation has been identified. However,

consideration of a number of failure modes, in particular related to pit water displacement and pit lake water quality, indicate that there may be relatively high potential for off-site impacts to occur in the future.

Stability issues and their potential impacts are highly evident at the Montana Tunnels Mine, and are also evident at other Montana mines including the Berkeley Pit and Golden Sunlight Mines. While to some extent they may be mitigated such as has been proposed for the Golden Sunlight Mine in terms of prevention of a pit lake, in other cases such as the Berkeley pit the risk to both human health in terms of both workers and the public, as well as to wildlife, have only been made all to evident by recent events. However, even at the Golden Sunlight Mine, risks to worker safety in terms of maintaining and monitoring the pit dewatering system will remain in perpetuity. And risks to public safety will similarly remain even if the sites are fenced and/or signed. In conclusion, it would appear that the MMRA in its present form fails to result in a clean and health environment when it comes to addressing open pits and rock faces, suggesting that consideration of requiring mitigation methods, including that of at least partial (e.g. to prevent pit lake formation and stabilize highwalls) if not complete backfill, should be considered.

The impacts that have occurred to Clancy Creek as a result of pit wall unravelling have already been significant in terms of requiring removal of the creek from its natural channel and use of a pipe to route the flow around the subsidence area that would otherwise have resulted in the loss of creek water to the open pit. Given present conditions, it is questionable whether the pipe will not be displaced by future subsidence that is occurring into the pit that extends well beyond the current fenced area. In that event the pipe will no longer function in its present location, and it is probable that a loss of flow from Clancy Creek will be permanent unless further and potentially costly additional mitigation is undertaken.

TSF

In response to and in acknowledgement of the potential for catastrophic release as evidenced by mine tailings storage facilities worldwide, Montana was the first and thus far only state to enact specific requirements for TSFs. While in the author's opinion the statute is not entirely consistent with the recommendations of industry experts and cannot replace the need for additional measures to ensure good corporate governance, it does contain requirements that should not only be applied to new TSFs and expansion of existing TSFs, but also requirements that should be equally applicable to existing TSFs to ensure they are operated, maintained, monitored and closed in a manner that is protective of public safety and the environment. This should include the requirements of Section 82-4-376, Tailings storage facility; Section 82-4-377, Independent Review Panel; Section 82-4-378 Quality Assurance During Construction; Section 82-4-379 Tailings Operation, Maintenance, and Surveillance Manual; Section 82-4-380, Periodic Review Required; Section 82-4-381, Annual Inspections. In addition, Section 82-4-336 (13) *The reclamation plan must include, if applicable, the requirements for post-closure monitoring of a tailings storage facility agreed to by a panel pursuant to 82-4-377*.

The present plan assumes that the TSF will not produce seepage with constituents that would impact groundwater quality. While geochemical testing and predictions suggest TSF seepage water quality may not be an issue, this needs to be verified given the potential for neutral or alkaline drainage resulting in Mine Influenced Water (MIW). Additionally, currently applicable non-degradation discharge standards,

which are significantly more stringent than when the permit was issued in 1998, need to be applied to both surface water and groundwater results.

Waste Rock Piles

The present plan assumes that the waste rock piles will not produce seepage with constituents that would impact groundwater quality. While geochemical testing and predictions suggest waste rock seepage water quality may not be an issue, this needs to be verified given the potential for neutral or alkaline drainage resulting in Mine Influenced Water (MIW). Additionally, currently applicable non-degradation discharge standards, which are significantly more stringent than when the permit was issued in 1998, need to be applied to both surface water and groundwater results.

In addition, given the apparent underlying geological conditions as well as evidence of pit highwall subsidence affecting waste rock stability as evidenced by stress cracks affecting waste rock features, there is reason for concern as to both waste rock stability and impacts to existing waste rock reclamation.

Financial Assurance

The MMRA requires the following with respect to financial assurance (e.g. bond).

82-4-338. Performance bond.
(1) (a) The bond may not be less than the estimated cost to the state to ensure compliance with Title 75, chapters 2 and 5, this part, the rules, and the permit, including the potential cost of department management, operation, and maintenance of the site upon temporary or permanent operator insolvency or abandonment, until full bond liquidation can be effected.
(3) (a) The department shall conduct an overview of the amount of each bond annually and shall conduct a comprehensive bond review at least every 5 years. (c) If a licensee or permittee fails to post bond in accordance with subsection (3)(a) or (3)(b) in the required amounts by the required deadlines, the license or permit is suspended by operation of law and the licensee or permittee shall immediately cease mining and exploration operations until the required bond is posted with and approved by the department.

Although the MDEQ has had exceptional knowledge of the potential cost of taking over a mine site in the event of temporary or permanent operator insolvency since 1998 when they and other agencies first took over several sites such as Zortman-Landusky and Beal Mountain resulting from Pegasus initial bankruptcy, inexplicably, the 2008 financial assurance estimate for the current mine configuration, summarized previously in Table 1 and totaling $23.4M, did not include the potential cost of department management, operation, and maintenance for the site. They did include the cost, typically termed “site management” by DEQ, in the financial estimate that was also performed in 2008 for the proposed expansion project for the site (M-Pit). That estimate, which totaled $4.1M, included interim maintenance and shut down for a one-year period followed by site management and maintenance for a three-year period. If that amount had been added to the 2008 financial assurance estimate for the current conditions as the MMRA requires, the total in 2008 dollars should have been $27.5M.

MDEQ has not conducted an overview of the financial assurance amount since January 2008 resulting in a nine-year lag between the estimated financial assurance and current costs. The accepted simplified

approach to updating the financial assurance amount, using an inflation cost indicator such as the Engineering News Record Construction Cost Indicator (ENR CCI), follows:

ENR CCI (January 2008) = 8,090
ENR CCI (January 2017) = 10,532

Current Cost = $2008 x [ENR CCI (2017)/ENR CCI (2008)] = $27.5M x (10,532/8,090) = $35.8M

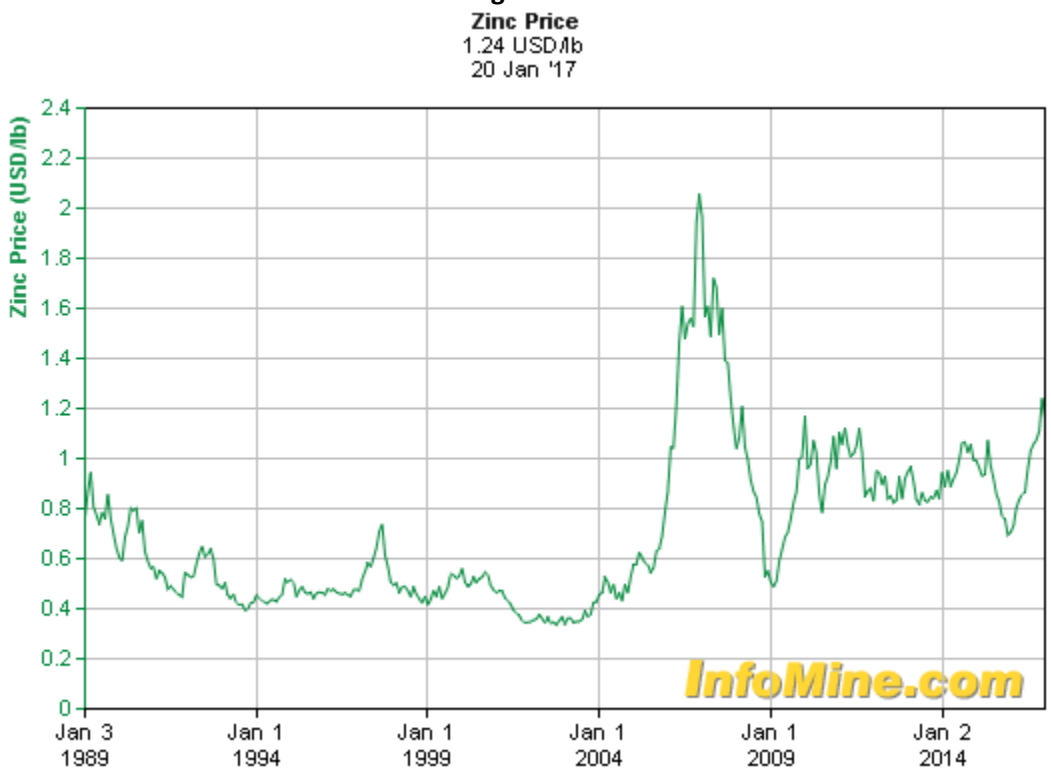
None of the costs reflect the likely long-term care requirements for the site including site security, maintenance and monitoring which will be required for hundreds if not thousands of years into the future.

Future Mine Feasibility

Smith and Nagle estimated Montana Tunnels required a zinc price of $1.10/pound and a lead price of 85-cents/pound to justify a restart.[26]

Figure 8 shows the historic price trend for zinc. The expansion project was proposed in 2006 and permitting was completed in 2008, coincidental to a historic high zinc price occurring during that period. Shortly following the high the price decreased significantly and then recovered to a range of $0.82/lb to $1.20/lb.

Figure 8



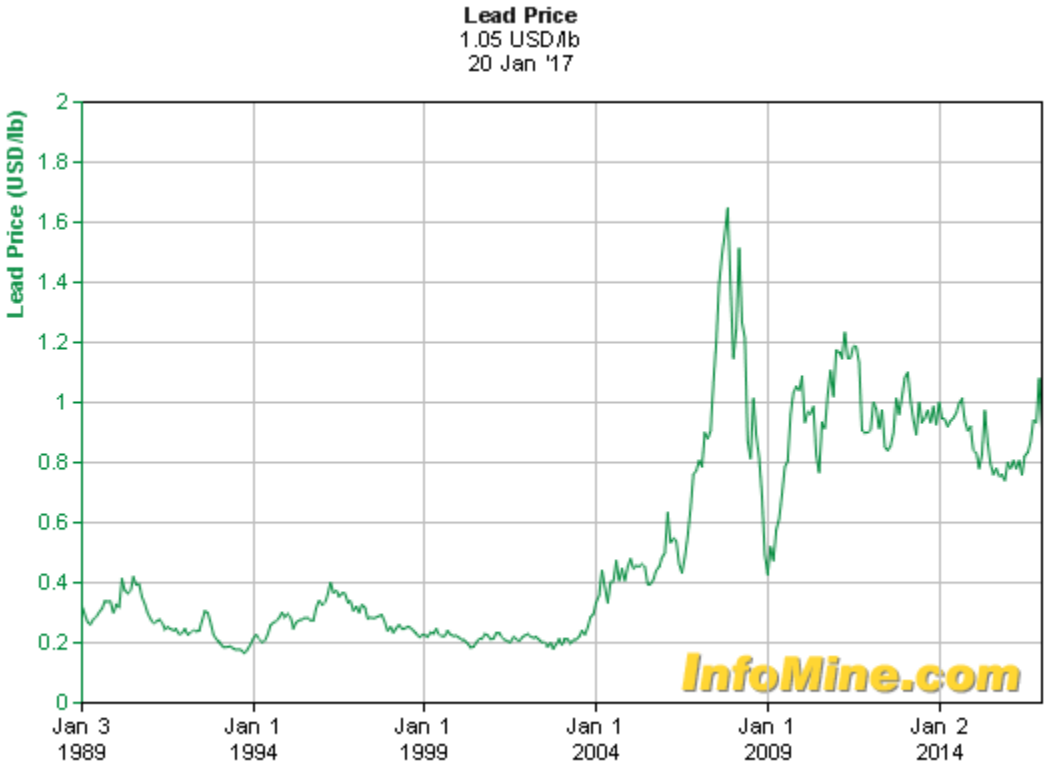
[26] http://www.mineweb.com/archive/haywood-gives-thumbs-up-to-apollo-golds-montana-tunnels-sale/

Figure 9 shows the historic price trend for lead. Similarly, the expansion project was proposed and permitting was completed coincidental to a historic high lead price occurring during that period. Shortly following the high the price decreased significantly and it has recovered in the $0.80/lb to $1.20/lb range.

Although prices have periodically been in the range of justification suggested for a restart, mining operations have yet to be restarted at the Montana Tunnels Mine. The mine's owners, Eastern Resources, have not announced a restart date and according to the company's website "are focusing our initial development efforts of the Golden Dream at the Elkhorn Goldfields."

Based on the apparent marginal economics, limited size of the existing ore deposit, and uncertainty of future zinc and lead prices, there is no assurance the Montana Tunnels mine will ever be re-opened. At the same time, the longer time passes, the likelihood similarly increases that the owner will go bankrupt and abandon the site to the State of Montana.

Figure 9



VI. Recommendations

Based on the information presented herein and the requirements and conclusions related to the MMRA, the following recommendations are made with respect to the current and future situation at the Montana Tunnels Mine.

- **Audit Report.** An audit report that reviewed all aspects of the mine operation plan and the current mine status, including the below recommendations specific to the major site features, should be performed for the Montana Tunnels mine site. The current conditions and available data have not been collected and evaluated in a comprehensive manner relative to current water quality standards and best professional practice and otherwise provided to DEQ or conducted by DEQ and available for public review. The current situation at the mine site also supports the requirement for an audit report on a regular (3 year) basis conducted by a qualified independent consulting firm.

- **Open Pit Stability.** A mass stability evaluation needs to be undertaken to determine the ultimate extent to which the pit walls are likely to unravel or otherwise fail to retain their current shape and lead to further subsidence of natural ground features outside of the current active pit area. Additionally, a Failure Modes and Effects Analysis (FMEA) should be undertaken to better define the potential for catastrophic failure as well as other potential environmental and public as well as worker safety impacts that could result from failure of the pit walls both in the current condition, and also when the pit lake equilibrium level is reached. If the potential for significant impacts is determined, then appropriate mitigation measures should also be identified and implemented.

- **Open Pit Conformance with MMRA.** The unreclaimed open pit, together with the pit lake, present an example of how in many cases involving major open pit mines, and in some cases smaller mines, following the cessation of mining activities, no utility is afforded to humans or the environment. This may particularly be true where either a pit lake, or pit highwall instability, or in a worst case both, are present at the site such as Montana Tunnels. This example should be used to reconsider the requirements of the MMRA, or at least the predictions made by the industry and accepted by DEQ that open pits would meet the requirements of the MMRA.

- **Open Pit Water Quality.** The project owner or alternatively DEQ should provide and perform a comparison of originally predicted values, 2008 EIS data and predictions, and all additional pit lake water quality data up to present and provide trend analysis including a graph of the key values over time. The values should be compared to current applicable water quality standards. If data has not been collected for safety reasons, which is reasonable, it should have been and could be collected in the future using remote (e.g. drone assisted) means.

- **Clancy Creek Mitigation.** The current situation with Clancy Creek (pipeline) and the potential for additional highwall subsidence in the area of the creek channel and pipeline needs to be evaluated in an expedited manner and additional mitigation identified and implemented as soon as possible to prevent the loss of flow into the pit on a permanent basis. If necessary, DEQ should require the operator to conduct the activities or use the existing financial assurance, although it was not intended for the necessary mitigation because it was only identified as a potential contingency, to conduct the activities.

- **TSF Stability.** The requirements of the MMRA for expansion of existing and new TSFs should be used to ensure that the Montana Tunnels TSF is being maintained and would be closed if necessary in a manner the conforms with current industry best practice. This should include a failure modes effects analysis (FMEA) to better define the potential for catastrophic failure as well as other potential environmental and public safety impacts.

- **TSF Water Quality.** The project owner or alternatively DEQ should provide and perform a comparison of originally predicted values, 2008 EIS combined drain data, and all additional TSF drain and recovery well data up to present and provide trend analysis including a graph of the key values over time. The values should be compared to current applicable water quality standards.

- **Waste Rock Stability.** The impacts to existing waste rock piles including previously reclaimed piles from subsidence related to the pit highwall instability needs to be evaluated and additional mitigation if necessary identified and included in future financial assurance estimates. The evaluation should consider not only the current impacts but also long-term impacts associated with the long-term effects of pit wall subsidence.

- **TSF Water Quality.** The project owner or alternatively DEQ should provide and perform a comparison of originally predicted values, 2008 EIS combined drain data, and all additional waste rock monitoring well data up to present and provide trend analysis including a graph of the key values over time. The values should be compared to current applicable water quality standards.

- **Financial Assurance Estimation.** DEQ should undertake a current financial assurance calculation for the mine site and include both short-term site management and long-term site maintenance and management consistent with DEQ inclusion of those costs at other sites. DEQ should provide the new cost estimate to the operator and require them to provide the increased amount or otherwise suspend the operator's license consistent with the requirements of the MMRA.

- **Financial Assurance Administration.** Unless the existing financial assurance, $15.9M in cash and $2.5M in appraised real estate, is increasing in value at a rate greater than inflation as a result of accrued interest or increased worth respectively, then MDEQ should take whatever actions are available and necessary to claim the existing financial assurance. The cash could then be invested in an interest-bearing account and the real estate could be sold over time in a manner to optimize its value.

- **DEQ Administration.** The DEQ should be required to formally explain how the current situation with respect to both site conditions as well as financial assurance has come to result at the Montana Tunnels site. DEQ should also be required to formally explain its rationale for not requiring updated and current plans for reclamation of the mine site in its current condition as well as requisite financial assurance. Finally, DEQ should be required to provide a plan for ensuring that this will be the last mine site in the State of Montana to not be regularly reviewed and adequate financial assurance estimated as needed, including doing comprehensive evaluations and updates on a yearly basis if required.

Mailed 11/7/02

State of New Mexico
ENVIRONMENT DEPARTMENT
Ground Water Quality Bureau
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2918 phone
(505) 827-2965 fax

GARY E. JOHNSON
GOVERNOR

JOHN R. D'ANTONIO
Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

CC. 7001 2510 0000 8012 0418

October 31, 2002

Ms. Melissa A. Monk
LAC Minerals (USA) LLC
Cunningham Hill Mine Reclamation Project
582 County Road #55
Cerrillos, NM 87010

Re: <u>Re-Issued</u> Abatement Plan, AP-27, Cunningham Hill Mine Reclamation Project

Dear Ms. Monk:

On September 27, 2002, the New Mexico Environment Department (NMED) issued the abatement plan for the Cunningham Hill Reclamation Project, AP-27. Please find enclosed the re-issued abatement plan, which contains the revised financial assurance values associated with the approved abatement activities. The financial assurance amount has been revised based on recent cost estimates associated with the closure of the brine ponds, located on top of the waste rock pile. This re-issued abatement plan supercedes the original abatement plan dated September 27, 2002.

If you have any questions, please contact either Mary Ann Menetrey at (505) 827-2944 or Jeff Sanders at (505) 827-2906

Sincerely,

Marcy Leavitt, Chief
Ground Water Quality Bureau

Appendix B

Cc: Mary Ann Menetrey, Mining Environmental Compliance Section
Courte Voorhees, District Manager, NMED, Dist. 2
AP-27 File

State of New Mexico
ENVIRONMENT DEPARTMENT
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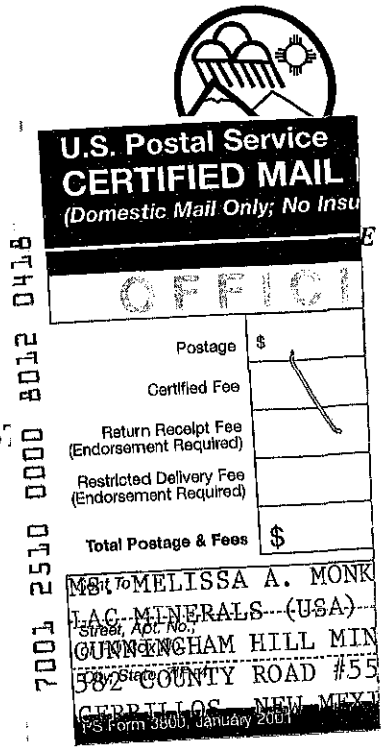

CERTIFIED MAIL – RETURN RECEIPT REQUEST

September 27, 2002

Ms. Melissa A. Monk
LAC Minerals (USA) LLC
Cunningham Hill Mine Reclamation Project
582 County Road #55
Cerrillos, NM 87010

Re: Re-issued: Stage 1 and Stage 2 Abatement Plan Approval for the Cunningham Hill Mine Reclamation Project, Cerrillos New Mexico, (AP-27)

Dear Ms. Monk:

Pursuant to the Water Quality Control Commission (WQCC) Regulation 20.6.2.4109.F NMAC, the Stage 1 and Stage 2 Abatement Plan proposal (AP-27), submitted by LAC Minerals (USA) LLC (LAC) for the Cunningham Hill Mine Reclamation Project, is hereby approved, subject to the conditions listed below. **This abatement plan approval supercedes the previous approval dated September 27, 2002.** The site is located approximately 6 miles south of Cerrillos in unsurveyed portions of Township 13 North, Range 8 East and Township 13 North and Range 7 East, Santa Fe County. In approving this abatement plan, the New Mexico Environment Department (NMED) Ground Water Quality Bureau has determined that the requirements of WQCC Regulations 20.6.2.4106.C and 20.6.2.4106.E NMAC have been met.

Mining of gold ore at the Cunningham Hill Mine produced an open pit, which has disturbed approximately 34 acres. During mining, the open pit floor was kept dry by diverting runoff from Upper Cunningham Gulch around the open pit and operating dewatering wells to lower the ground water level below the pit floor. After cessation of mining activities in 1987, the dewatered open pit began to fill as a result of natural ground water inflow and surface runoff. Since the wall of the open pit consists of rock containing pyrite and other sulfide minerals, acid rock drainage (ARD) is currently being produced as a result of the rock being exposed to air and water. The acidic seepage has impacted the water within the open pit pool, resulting in elevated concentrations of total dissolved solids, sulfate, manganese and cobalt. As the pit continues to fill, some of the impacted water will migrate into the surrounding ground water. LAC initiated

the addition of alkaline material (lime) to the open pit pool in 1997. The long-term solution for controlling water quality in the open pit pool and surrounding ground water includes the diversion of Upper Cunningham Gulch directly into the open pit. Surface runoff from the diversion of upper Cunningham Gulch will dilute the concentrations of the contaminants in the open pit pool and will, over time, inundate most of the ARD occurring from the pit walls. Additionally, the water in the pit is currently being treated using reverse osmosis and, as a result, the open pit pool water quality is improving. The gradual filling of the open pit with water is expected to reduce contaminant concentrations in the open pit pool and the impact on the surrounding ground water system.

In March 2001 LAC proposed alternative abatement standards for some constituents, which are detected in the open pit pool and are predicted to exceed the standards of 20.6.2.4103 NMAC in surrounding ground water. The WQCC approved these alternative abatement standards for the following constituents and the values listed in milligrams per liter (mg/l):

Sulfate:	1,200 mg/l
Total Dissolved Solids:	2,000 mg/l
Manganese:	4.0 mg/l
Cobalt:	0.20 mg/l

These alternative abatement standards apply to ground water outside the open pit and within a defined area inside the LAC property boundary.

The Cunningham Hill Mine site also includes a reclaimed residue pile, waste rock pile and ore treatment area. These facilities and associated ground water contaminant plumes are covered under Discharge Permit 55 (DP-55). LAC is currently conducting an extensive quarterly ground water monitoring program as part of DP-55.

This Abatement Plan approval is based on materials submitted by LAC in July and August 1997, April, September and October 1999 and March 2001. The Stage 1 and 2 abatement shall be conducted in accordance with the approved plan.

Approval of this Stage 1 and 2 Abatement Plan does not relieve LAC of its responsibility to comply with any other applicable federal, state and/or local laws and regulations such as zoning requirements or nuisance ordinances.

CONDITIONS FOR APPROVAL

General Conditions

1. Within 60 days of receipt of this letter, LAC shall submit to NMED any past monitoring data collected by LAC to meet the monitoring requirements described in Performance Standards CHP-1 and APS-1. Sampling and analytical results associated with the requirements of Performance Standard APS-1 shall be reported to NMED according to the schedule described in Table 4 of Performance Standard CHP-1.

2. LAC shall notify NMED prior to initiation or discontinuation of any water treatment operation associated with the open pit pool. This includes, but is not limited to, reverse osmosis and lime treatment. For pump-and-treat systems, such as reverse osmosis, LAC shall provide NMED with total monthly pit pool inflow and outflow volumes.

3. LAC shall routinely inspect the Upper Cunningham Gulch diversion, and perform maintenance as necessary, to ensure protection of water quality.

Financial Assurance Conditions

4. LAC shall maintain financial assurance in an amount sufficient to cover the cost of a third party to implement the requirements of this abatement plan, should LAC be unable, unwilling, or otherwise fail to implement those requirements.

5. Within 60 days of receipt of this letter, LAC shall submit to NMED for approval a draft of its proposed financial assurance instruments that meet the requirements of Conditions 4 through 9. Such instruments shall include: 1) a surety bond or other financial assurance instrument or instruments comprising a "financial assurance package," and 2) a standby trust agreement.

6. Within 30 days after NMED approval of the draft financial assurance instrument package, LAC shall execute each financial assurance instrument which, in combination, shall be sufficient to ensure the payment of the estimated costs of implementing the abatement plan, which total $2,491,094 in current dollars ($927,433 NPV). Each financial assurance instrument shall name NMED (or NMED and the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department for joint financial assurance) as the beneficiary. Each financial assurance instrument shall be in a form approved by NMED. Financial assurance in a form approved by NMED shall be maintained until the financial assurance is released.

7. Within 30 days after NMED approval of the draft standby trust agreement, LAC shall establish a standby trust to fund abatement activities, and shall execute a standby trust agreement. The standby trust agreement shall name NMED (or NMED and MMD for joint financial assurance) as the beneficiary. The standby trust agreement shall be in a form approved by NMED. It shall incorporate the provisions of Condition 4. The standby trust shall be maintained until the financial assurance is released. Upon forfeiture of the financial assurance, the forfeited amounts shall be deposited directly into the standby trust to fund closure activities.

8. Within 35 days after NMED approval of the draft financial assurance instruments, LAC shall provide NMED with an original signed and notarized copy of each of the financial assurance instruments.

9. The financial assurance, including any revised financial assurance, shall meet the following standard requirements:

   a. The financial assurance shall be executed in an amount equal to the NMED approved abatement cost estimate, including escalation and discounting as approved by NMED. The abatement cost estimate shall include direct costs associated with third party implementation

of the abatement plan, contingency costs and NMED oversight and administration costs, including indirect costs.

b. Except as provided herein, NMED shall be named as the sole beneficiary in each financial assurance instrument. LAC may select a joint financial assurance instrument to meet the requirements of NMED and the MMD. If a joint instrument is selected, both NMED and EMNRD shall be named as joint beneficiaries and the joint instrument shall meet the requirements of both agencies.

c. The financial assurance shall remain in effect throughout the term of the abatement activities, and until replaced or released by NMED. The financial assurance shall remain in place at all times during the abatement period.

d. The financial assurance shall include a method for adjustments due to inflation, new technologies, and NMED approved revisions to the abatement plan based on continued investigations or other information.

e. No more than once every 12 months, LAC may request that NMED review remaining abatement measures, including alternate abatement measures that NMED has approved. The request for abatement review shall describe the abatement measures certified completed and shall contain an updated cost estimate for remaining abatement measures. If NMED approves the description of abatement measures and the cost estimate for remaining abatement measures, NMED will adjust the total amount of required financial assurance to reflect the revised cost estimate.

f. The financial assurance package shall be evaluated, and if necessary, revised to comply with WQCC financial assurance regulations, if and when such regulations are promulgated and become effective.

g. Each financial assurance instrument shall include a provision, which requires the financial assurance provider to provide at least 120 days written notice to NMED and LAC prior to cancellation or non-renewal of the financial assurance instrument. LAC shall obtain an NMED-approved alternate financial assurance mechanism within 60 days of such notice. If LAC fails to obtain alternate financial assurance within 60 days, the current financial assurance shall become immediately payable to the standby trust fund.

h. If NMED determines that LAC is unable or unwilling or will otherwise fail to conduct or complete the abatement requirements of this abatement plan approval, then NMED may proceed with forfeiture of all or part of the financial assurance. Prior to beginning a forfeiture proceeding, NMED will provide written notice, by certified mail return receipt requested, to LAC and to all financial assurance providers, if applicable, informing them of the determination to forfeit all or a portion of the financial assurance. The written notice will state the reasons for the forfeiture and the amount to be forfeited. The amount shall be based on the total remaining cost of performing abatement activities in accordance with this abatement plan approval and all applicable laws and regulations. NMED will also advise LAC and all financial assurance providers, if applicable, of the conditions under which forfeiture may be

avoided. Such conditions may include, without limitation, an agreement by LAC, by a financial assurance provider, or by an NMED approved third party, to perform closure in accordance with this abatement plan approval and all applicable laws and regulations, and a demonstration that such person has the financial ability and technical qualifications to do so. Financial assurance forfeited shall become immediately payable to the standby trust fund. Forfeited funds shall be used to complete performance of the abatement plan. If the forfeited amount is insufficient, LAC shall be liable for the remaining costs. If the amount forfeited is more than necessary, the excess amount shall be refunded to the person from whom it was collected.

i. All or part of the financial assurance shall be released or modified when NMED determines that abatement measures covered by the financial assurance have been completed according to the abatement plan requirements of this approval.

j. Within 30 days of NMED approval of a revised Abatement Plan, or upon a determination that the existing financial assurance is inadequate, LAC shall submit to NMED for approval a revised abatement cost estimate and financial assurance instruments. Within 30 days of NMED approval of the revised financial assurance instrument, LAC shall execute the revised financial assurance instruments and submit signed, notarized copies to NMED.

SUMMARY OF ABATEMENT PLAN REQUIREMENTS

1. Impacts to ground water quality for the open pit pool shall be addressed though diversion of Upper Cunningham Gulch into the pit and short-term treatment of water within the open pit pool using a reverse osmosis system to reduce the current loading of sulfate and other constituents. LAC shall utilize the reverse osmosis system until the sulfate concentration in the open pit pool is reduced below 600 mg/l.

2. After the reverse-osmosis treatment has been completed, LAC shall comply with Performance Standard APS-1 and Contingency Plan APC-1 for the open pit pool which are included as Appendix A in the *Second Amendment to Abatement Plan 27*, which was submitted to NMED by LAC on March 16, 2001.

3. LAC shall observe sulfate trigger levels for the open pit pool as outlined in APS-1 and will enact Contingency plan APC-1 if these levels are exceeded.

4. Surface water quality in the open pit pool shall be addressed as described under Performance Standard CHP-1 in Appendix B of the *Second Amendment to Abatement Plan 27*, submitted to NMED on March 16, 2001. Performance Standard CHP-1 provides applicable surface water quality standards for wildlife use in the open pit pool, and surface water quality trigger levels. If surface water quality standards or trigger levels for electrical conductivity, manganese, sulfate, pH or alkalinity are exceeded, Contingency Plan CHP-1 will be enacted.

5. LAC shall monitor the open pit pool surface water quality on a quarterly basis as described in CHP-1. The open pit pool shall be sampled at four depths. Analytical parameter and reporting shall be as described in Table 4 of Performance Standard CHP-1. LAC shall include copies of

the original laboratory data sheets with all monitoring reports containing analytical data.

6. LAC shall monitor the open pit pool and ground water monitoring wells MW84-7 and MW79-3 as described in Performance Standard APS-1. The analytical parameters and the sampling frequency shall be as provided in the APS-1 Monitoring Requirements.

GENERAL ABATEMENT PLAN REQUIREMENTS

In addition to any other requirements provided by law, approval of this Abatement Plan is subject to the general requirements specified in the WQCC Regulation 20.6.2.4107 NMAC. This provides for:

1. NMED entry, inspection and sampling on the site and on the property under LAC's control;

2. Notification to NMED of sampling and well plugging, abandonment or destruction; and

3. Requirements for well plugging, abandonment or destruction.

ENFORCEMENT

The requirements and provisions of this abatement plan are enforceable pursuant to § 74-6-10 NMSA 1978. Violations of this abatement plan may subject LAC to a notice of violation, compliance order and/or a compliance order assessing a civil penalty or an action in district court. Penalties assessed as part of a compliance order shall not exceed $10,000 per day. Violations may also subject LAC to NMED notification of this abatement plan pursuant to WQCC Regulation 20.6.2.4111.B NMAC.

MODIFICATIONS

Pursuant to WQCC Regulation 20.6.2.4111.A NMAC, LAC shall notify NMED of any proposed modifications to this approved plan and shall obtain NMED's written approval for such notification. WQCC Regulation 20.6.2.4111.B NMAC also provides for future amendment of the abatement plan by NMED.

DISPUTE RESOLUTION AND RIGHT TO APPEAL

If dissatisfied with the action taken by NMED, LAC may either initiate the dispute resolution procedures of WQCC Regulation 20.6.2.4113 NMAC, of file a petition for a hearing before the WQCC pursuant to WQCC Regulation 20.6.2.4114 NMAC. Either request shall be made within thirty (30) days of the receipt of this letter. The notification of a dispute shall be by certified mail to the secretary of NMED. The petition for hearing shall be in writing to the Water Quality Control Commission. Unless a timely request for dispute resolution or hearing is made, the decision of NMED shall be final.

TRANSFER OF ABATEMENT PLAN

Pursuant to WQCC Regulation 20.6.2.4104.B NMAC, at least thirty (30) days prior to any transfer of ownership of this facility, LAC shall notify the transferee in writing that the abatement plan has been required or approved for this facility, and shall deliver or send by certified mail to NMED a copy of such notification or other proof that such notification has in fact been received by the transferee.

NMED appreciates your continued cooperation in this matter. If you have any questions, please contact either Mary Ann Menetrey at (505) 827-2944 or Jeff Sanders at (505) 827-2906.

Sincerely,

Marcy Leavitt, Chief
Ground Water Quality Bureau

Ml: JS/js

CC: Mary Ann Menetrey, Program Manager, MECS
Courte Voorhees, District Manager, NMED , Dist 2
AP-27 File

SECOND AMENDMENT
to
ABATEMENT PLAN-27

for

CUNNINGHAM HILL MINE
RECLAMATION PROJECT

Submitted to:

State of New Mexico Environment Department
Ground Water Quality Bureau

Submitted by:

LAC Minerals (USA) LLC

Prepared by:

LAC Minerals (USA) LLC
582 County Road No. 55
Cerrillos, New Mexico 87010

Original, April 1999
First Amendment, October 1999
Second Amendment, March 2001

LAC Minerals (USA) LLC, ("LAC") had previously submitted Abatement Plan-27, with one amendment (First Amendment 1999), to the New Mexico Environment Department ("NMED") and had petitioned the New Mexico Water Quality Control Commission ("WQCC") for alternative abatement standards for sulfate, total dissolved solids ("TDS"), manganese and cobalt for groundwater within the property boundary at the Cunningham Hill Mine Reclamation Project. A hearing before the WQCC was scheduled for November 9, 1999; the hearing has been continued at the joint request of LAC and NMED. The hearing is now scheduled for April 10, 2001. LAC is submitting this Second Amendment to Abatement Plan-27 to modify its request for alternative abatement standards for sulfate, TDS, manganese and cobalt.

The existing New Mexico groundwater standards are: 600 mg/l sulfate, 1,000 mg/l TDS, 0.2 mg/l manganese and 0.05 mg/l cobalt. These standards are not health-based; the sulfate and TDS standards are secondary drinking water standards and the cobalt standard is for irrigation. The manganese standard is an aesthetic standard to ensure that plumbing fixtures do not become discolored.

LAC is amending Abatement Plan-27 to request the following alternative abatement standards for groundwater outside the open pit and within the property boundary of the Cunningham Hill Mine Reclamation Project:

Sulfate:	1,200 mg/l
Total Dissolved Solids:	2,000 mg/l
Manganese	4.0 mg/l
Cobalt	0.20 mg/l

The WQCC approval of these alternative abatement standards is sought pursuant to 20 NMAC 6.2, 4103.F.

Subsequent to the postponement of the WQCC hearing in November 1999, LAC and NMED had discussions about the viability of using a reverse-osmosis system to treat the water in the open pit pool. LAC agreed to use a reverse-osmosis treatment system; treatment began in April 2000. Through October 5, 2000, when the system was shut down for the winter, approximately 46.4 million gallons of water were pumped from the open pit pool for treatment. As a result of treatment, the sulfate concentration in the open pit pool (averaged over four depth samples) was reduced from 1,650 mg/l to 1,102 mg/l. The TDS concentration in the open pit pool was reduced from 2,270 mg/l to 1,377 mg/l. As of March 1, 2001, the sulfate concentration in the open pit pool was 962 mg/l; the TDS concentration was 1,380 mg/l.

LAC will reactivate the reverse-osmosis treatment system this year. LAC will attempt to reduce the sulfate concentration in the open pit pool to below 600 mg/l as a result of this short-term treatment effort.

The Open Pit Pool Performance Standard ("APS-1") and Contingency Plan ("APC-1") are attached as Appendix A. After the reverse-osmosis treatment has been completed, LAC will comply with this Performance Standard and Contingency Plan to monitor the open pit pool. The Performance Standard has an upper trigger level for sulfate in the open pit pool of 1,000 mg/l for

eight consecutive quarters, which is less then the requested alternative abatement standard of 1,200 mg/l. The trigger level for sulfate of 1,000 mg/l would correspond to a TDS concentration of approximately 1,630 mg/l; this concentration is less than the requested alternative abatement standard for TDS of 2,000 mg/l. If the sulfate trigger level is reached, LAC is required to submit a remediation plan to NMED. This remediation plan may include treatment of the open pit pool water, another technically feasible method to achieve compliance, or a petition for modified alternative abatement standards. APS-1 and APC-1 also require quarterly monitoring of the open pit pool at different depths and semi-annual monitoring of existing monitoring wells MW84-7 and MW79-3. If a trigger level in the open pit pool is reached, the monitoring frequency for wells MW84-7 and MW79-3 will be increased to quarterly.

Monitoring of the pH of the open pit pool is presented in Performance Standard CHP-1 and Contingency Plan CHP-1, which are attached as Appendix B. If sampling indicates that the open pit pool has a pH of less than 6.0 Standard Units or alkalinity less than 20 mg/l (as $CaCO_3$), LAC is required to add a sufficient quantity of suitable alkaline amendment to raise the pH and alkalinity. LAC initiated the addition of alkaline material (lime) to the open pit pool in September 1997. Since then, approximately 79.6 tons of lime has been added to maintain adequate alkalinity in the pool. Maintenance of the alkalinity should limit the concentrations of soluble cobalt and soluble manganese in the open pit pool.

A July 1999 Report was completed by Shomaker & Associates, Inc. and Michael A. Jones (Shomaker 1999 Supplemental Report) that included a groundwater fate-transport model to project the concentrations of sulfate and TDS in the groundwater downgradient from the open pit. LAC submitted the Shomaker 1999 Supplemental Report to NMED as part of the technical supporting documentation for AP-27. The 1999 model, using higher concentrations than proposed under this Amended Abatement Plan-27, showed that the groundwater will meet New Mexico groundwater quality standards for sulfate and TDS within the property boundary. Based on a qualitative geochemical analysis, the Shomaker 1999 Supplemental Report concluded that manganese and cobalt in excess of natural concentrations will not migrate far from the open pit and that New Mexico groundwater quality standards will be met within the property boundary.

To support this second amendment to Abatement Plan-27, a report entitled "Updated Results From The Ground-Water Transport Model For Predicting Potential Effects From The Cunningham Hill Mine Open Pit" (John Shomaker & Associates, Inc. and Michael A. Jones; March 2001) (hereinafter "Shomaker 2001 Report") was prepared. The Shomaker 2001 Report transport model simulated the three-dimensional projections of sulfate and TDS in excess of New Mexico ground water standards in two hydrogeologic layers (Layers 1 and 2) (Figures 5a-c, 6a-c, 7a-c, 8a-c). The model shows that neither sulfate nor TDS migrate very far from the open pit. The requested affected area (for which alternative abatement standards are sought) is larger than the projected area of plume migration. The requested affected area is highly mineralized, and has variable concentrations of sulfate and TDS due to the complexity of its geologic system and its naturally-occurring mineral sources of sulfate and other elements. The Shomaker 2001 Report concludes that manganese in excess of natural concentrations will not go beyond the requested affected area. The Shomaker 2001 Report concludes that cobalt in excess of the ground water standards will not go beyond the requested affected area.

The property boundary is approximately 3,700 feet downgradient (via the ground water flow path) from the requested affected area.

LAC requests that the alternative abatement standards for sulfate and TDS remain in effect for the duration of the monitoring program in AP-27, and that the alternative abatement standards for cobalt and manganese remain in effect indefinitely.

APPENDIX A

OPEN PIT POOL PERFORMANCE STANDARD AND CONTINGENCY PLAN

The following Performance Standard (APS-1) and Contingency Plan (APC-1) have been established to manage the open pit pool.

Performance Standard APS-1:

Open Pit Pool Triggers

Trigger No 1. - Open Pit Pool exceeds 1,000 mg/l sulfate[1] for a. period of eight consecutive quarters.

Trigger No. 2 - Open Pit Pool exceeds 600 mg/l sulfate[2] but remains below 1,000 mg/l sulfate for a consecutive period of eight years (32 quarters).

APS -1 Monitoring Requirements

Monitoring Location	Parameters	Frequency
Open Pit Pool[3]	Sulfate, TDS, Alkalinity, Manganese, Cobalt, pH (lab) & Open Pit Pool Water Elevation	Quarterly
Ground water Monitoring Wells: MW84-7 & MW79-3	Sulfate, TDS, Alkalinity, Manganese, Cobalt, pH (lab) & Water Level	Semi-annually[4]

Quarterly open pit pool results shall be calculated as the average of the depth samples taken during the quarter.

Contingency Plan APC-1:

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[1] If a new sulfate groundwater standard is promulgated in New Mexico and it exceeds 1,000 mg/l, Trigger No. 2 will be no longer be in effect and Trigger No. 1 will be increased to match the new sulfate groundwater standard.

[2] If a new sulfate groundwater standard is promulgated in New Mexico and it exceeds 600 mg/l but is less than 1,000 mg/l, Trigger No. 2 will be increased to match the new sulfate groundwater standard.

[3] The open pit pool will be sampled at four depths: four feet below the upper surface water level, and the upper one-third, middle one-third and lower one-third of the pool depth.

[4] If a trigger level in the open pit pool is reached, the monitoring frequency for wells MW84-7 and MW79-3 will be increased to quarterly.

Re-sampling and notification: If the sample result of the open pit pool causes a trigger level set forth above to be exceeded, the Company shall re-sample to confirm the test results. If one of the foregoing triggers has been exceeded, the Company shall notify NMED within 10 business days and proceed as provided below.

Re-calibration of Open Pit Pool Chemistry Model: If the open pit pool sulfate concentration exceeds either Trigger No. 1 or Trigger No. 2, the Company shall re-calibrate the open pit pool chemistry model based on the sampling data, and submit the updated model to NMED within 90 days of notification.

Re-calibration of the Transport Model: If the Company is required to re-calibrate the open pit pool chemistry model, the Company shall update the groundwater transport model for predicting potential effects on groundwater from the open pit pool and submit the updated model to NMED within 90 days of the notification.

Remediation: If the trigger level of 1,000 mg/l[1] sulfate for a period of eight consecutive quarters is exceeded (Trigger No. 1), the Company shall notify NMED within 10 business days and submit a remediation plan (including an implementation schedule) to NMED within 180 days of notification to achieve compliance with Performance Standard APS-1. Such a plan may include treatment of the open pit pool water, another technically feasible method to achieve compliance, or a petition for an alternative abatement standard.

If the trigger level exceeds 600 mg/l[2] sulfate but remains below 1,000 mg/l sulfate for a period of eight consecutive years (32 quarters) (Trigger No. 2), the Company shall notify NMED within 10 business days and submit a remediation plan (including an implementation schedule) to NMED within 180 days to achieve compliance with Performance Standard APS-1. Such a plan may include treatment of the open pit pool water, another technically feasible method to achieve compliance or a petition for an alternative abatement standard.

Termination of the Monitoring Program: The Company may notify NMED that it is the Company's intent to terminate the groundwater remediation program in 90 days if: (1) the average of quarterly samples for a period of ten consecutive years (40 quarters) in the open pit pool is below 600 mg/l[1] sulfate, or the applicable sulfate groundwater standard, whichever is higher; and (2) an updated open pit pool chemistry model prepared by the Company at the time demonstrates that Performance Standard APS-1 will be achieved.

[1] If a new sulfate groundwater standard is promulgated in New Mexico and it exceeds 1,000 mg/l, Trigger No. 2 will be no longer be in effect and Trigger No. 1 will be increased to match the new sulfate groundwater standard.

[2] If a new sulfate groundwater standard is promulgated in New Mexico and it exceeds 600 mg/l but is less than 1,000 mg/l, Trigger No. 2 will be increased to match the new sulfate groundwater standard.

APPENDIX B

PERFORMANCE STANDARD CHP-1: OPEN PIT WATER QUALITY

The quality of the surface water in the Cunningham Hill open pit pool shall meet applicable New Mexico surface water quality standards for wildlife use. Specifically, water in the open pit pool shall be free of toxic substances attributable to point or nonpoint source discharge(s) in amounts, concentrations, or combinations which are toxic to wildlife using aquatic environments for habitation or aquatic organisms for food, or to other animals drinking such water (see 20 NMAC 6.1, 1102.F) The surface water wildlife use standards are shown below:

Surface Water Wildlife Use Standards

- Total recoverable selenium – 5 ug/l
- Total mercury – 0.77 ug/l
- Chlorine – 11 ppb

Acute and chronic water quality levels for wildlife use have been developed by applying the above quoted requirements of 20 NMAC 6.1 § 1102.F. The acute level developed for electrical conductivity is 15,000 mhos/cm; the acute level developed for manganese is 250 mg/l.

The chronic level developed for electrical conductivity is 4,000 mhos/cm; the chronic level developed for sulfate is 5,000 mg/l.

The following trigger levels, which are at 90 percent of the acute and chronic levels, have been set as levels requiring further action:

Surface Water Acute Trigger Levels

- Electrical conductivity – 13,500 mhos/cm
- Manganese – 225 mg/l

Surface Water Chronic Trigger Levels

- Electrical conductivity – 3,600 mhos/cm
- Sulfate – 4,500 mg/l

The following trigger levels for both pH and alkalinity also have been set as levels requiring further action:

Surface Water pH and Alkalinity Trigger Levels

- pH (SU) – <6.0 SU
- Alkalinity – <20mg/l as $CaCO_3$

The Companies may propose revised surface water wildlife use standards or revised trigger levels, which are based on a site-specific ecological risk assessment to NMED for review and approval.

Monitoring

Quarterly monitoring shall be conducted by the Companies and reported to NMED as described in Table 4.

Table 4. Cunningham Hill Open Pit Pool Quarterly Monitoring Schedule	
1st Qtr:	Sample, submit report by April 31
2nd Qtr:	Sample, submit report by July 30
3rd Qtr:	Sample, submit report by October 30
4th Qtr:	Sample, submit report by January 31
Stations to Monitor	Constituents to Monitor[1]
Open Pit Pool	pH - Lab, electrical conductivity, temperature, TDS, Alkalinity, HCO_3, CO_3, Ca, Mg, K, Na, SO_4, Chloride, Chlorine, total Hg, total recoverable Se, Fe, Mn, Al, As, Cr, Cd, Co, Zn, Pit Water Level, and Volume

[1] - all concentrations are in the dissolved form unless noted otherwise

[2] - The open pit pool will be sampled at four depths: four feet below the upper surface water level, and the upper one-third, middle one-third and lower one-third of the pool depth.

Contingency Plan CHP-1:

Resampling: If a surface sample of the open pit pool exceeds the surface water wildlife use standards (total recoverable selenium, total mercury or chlorine) or the surface water acute trigger levels (electrical conductivity or manganese), the Companies shall collect surface grab samples on four consecutive days and shall submit the samples for analysis. The average of the four daily samples shall be compared to these standards and acute trigger levels. If re-sampling confirms that the open pit pool exceeds any of these standards or acute trigger levels, the Companies shall take Actions for Restricting Wildlife Exposure to the surface water as described below.

If a surface sample of the open pit pool exceeds a surface water chronic trigger level (electrical conductivity or sulfate), the Companies shall collect surface grab samples on four consecutive days and shall submit the samples for analysis. The average of the four daily samples shall be compared to the chronic trigger levels. If re-sampling confirms that the open pit pool exceeds any of the chronic trigger levels, then the Companies shall conduct a Wildlife Impact Evaluation as described below.

If a surface sample of the open pit pool has a pH of less than 6.0 SU or alkalinity less than 20 mg/l (as $CaCO_3$), the Companies shall collect surface grab samples on four consecutive days and shall submit the samples for analysis. The average of the four daily samples shall be compared to the surface water pH and alkalinity trigger levels. If re-sampling confirms that the open pit pool has a pH of less than 6.0 SU or alkalinity less than 20 mg/l (as $CaCO_3$), the Companies shall, as soon as practicable, add a sufficient quantity of a suitable alkaline amendment to raise the pH of the open pit pool to 6.0 SU or higher and the alkalinity (as $CaCO_3$) of the open pit pool to 20 mg/l or higher. The Companies shall notify NMED within 30 days of making any alkaline amendment additions.

Actions for Restricting Wildlife Exposure: If the average of the four daily surface water samples exceeds any of the surface water wildlife use standards or the surface water acute trigger levels, as described above, the Companies shall take immediate measures to prevent, to the extent practicable, wildlife exposure to the open pit pool. Unless inappropriate, alternative water sources for wildlife use shall be provided. In addition, a Follow-Up Investigation shall be conducted.

Wildlife Impact Evaluation: If the average of the four daily surface water samples exceeds the surface water chronic trigger levels, the Companies shall evaluate whether the concentration of the constituent is adversely affecting or will adversely affect wildlife in the area. If the evaluation shows that wildlife are not or will not be affected by the water quality of the open pit pool, the Companies may propose revisions to the surface water chronic trigger levels as described below under Standard or Trigger Level Review.

If the evaluation shows that area wildlife are being or will be adversely affected by the water quality of the open pit pool, the Companies shall take Actions for Restricting Wildlife Exposure as described above.

Follow-Up Investigation: A follow-up investigation shall be conducted if the Companies take Actions for Restricting Wildlife Exposure. A follow-up investigation may also be required by NMED to identify the reason for observed changes in water quality that cause exceedances of the surface water chronic trigger levels. The Follow-Up Investigation may include additional water sampling and analysis, site investigation, and determination of potential effects on downgradient surface or groundwater water quality.If the Follow-Up Investigation shows that area wildlife are not being and will not be adversely affected, the Companies may propose revised surface water acute or chronic trigger levels, a variance to the surface water wildlife use

standards, or a revised, site-specific surface water wildlife use standard as described below under Standard or Trigger Level Review.

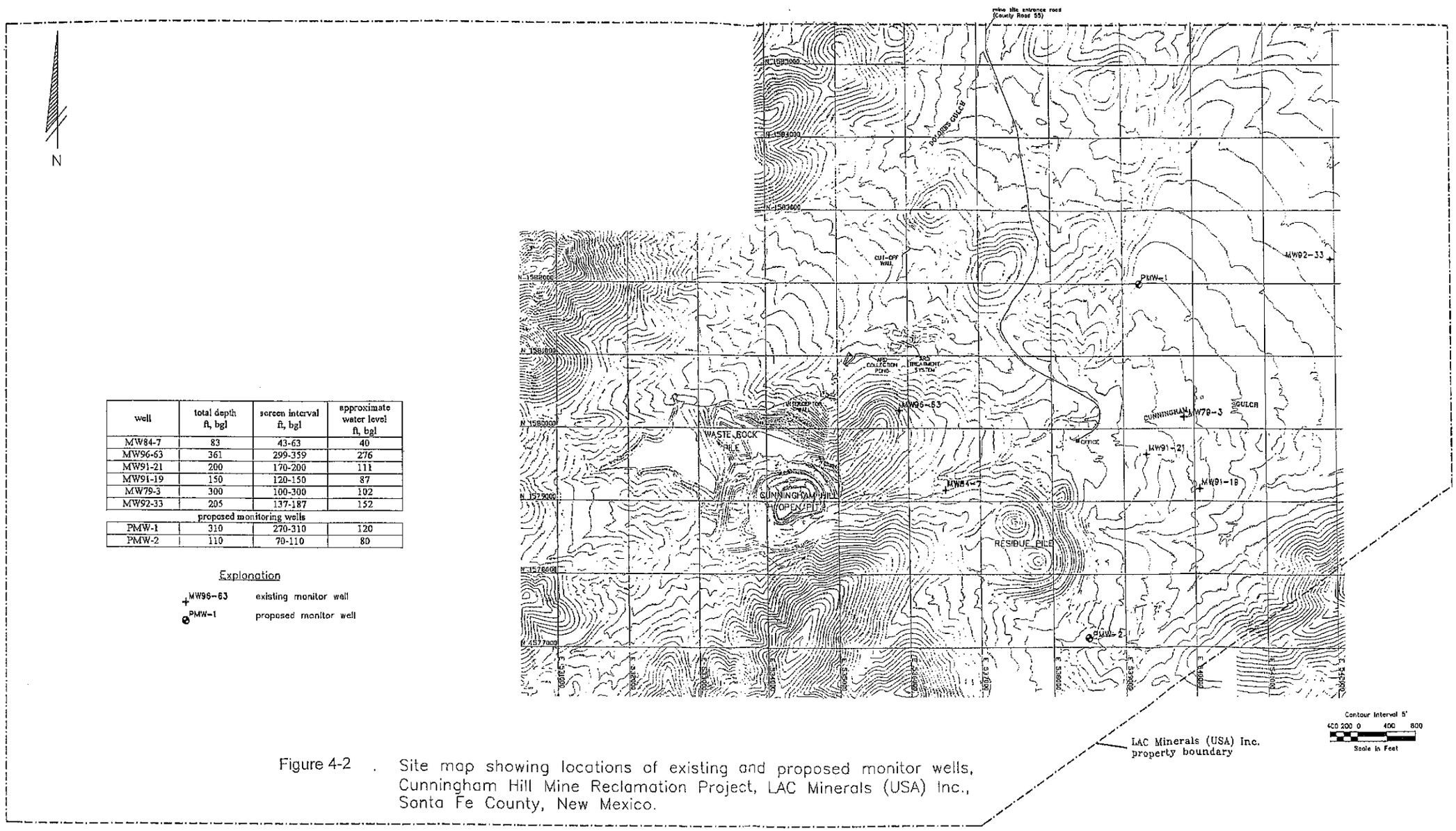
If the Follow-Up Investigation indicates that the changes in water quality are adversely affecting or will adversely affect wildlife using the open pit pool, then a Mitigation Plan shall be developed by the Companies.

Standard or Trigger Level Review: If the Wildlife Impact Evaluation or the Follow-Up Investigation shows that area wildlife are not being and will not be adversely affected, the Companies may propose revised surface water acute trigger levels or revised surface water chronic trigger levels to NMED for review and approval.

If the Follow-Up Investigation shows that area wildlife are not being and will not be adversely affected, the Companies may propose either a variance to the surface water wildlife use standards or a revised, site-specific surface water wildlife use standard to NMED for review and approval.

The NMED-approved revised surface water acute trigger levels, revised surface water chronic trigger levels, and the NMED-approved (or New Mexico Water Quality Control Commission-approved) revised site-specific surface water wildlife use standards shall thereafter become the applicable trigger levels or standards.

Mitigation Plan: The mitigation plan, if required, will evaluate alternative measures for reducing the impacts associated with the open pit pool mitigation program, the observed results, and a summary of long-term implications to wildlife.



well	total depth ft, bgl	screen interval ft, bgl	approximate water level ft, bgl
MW84-7	83	43-63	40
MW96-63	361	299-359	276
MW91-21	200	170-200	111
MW91-19	150	120-150	87
MW79-3	300	100-300	102
MW92-33	205	137-187	152
proposed monitoring wells			
PMW-1	310	270-310	120
PMW-2	110	70-110	80

Explanation

+MW96-63 existing monitor well

⊕PMW-1 proposed monitor well

Figure 4-2 . Site map showing locations of existing and proposed monitor wells, Cunningham Hill Mine Reclamation Project, LAC Minerals (USA) Inc., Santa Fe County, New Mexico.

Base map compiled by LAC Minerals and Schafer & Associates, Dated 3/25/88

JOHN SHOMAKER & ASSOCIATES, INC.

ATTACHMENT C – Recommendations to MMD and NMED concerning Stormwater Events and Anthropogenic Climate Change

The CCP describes storm water conveyance channels and down drains in addition to other engineered features, yet as previously noted in some past CCPs produced as a requirement of the NMMA, the CCP the design storm event for the stormwater drainage control system. MMD's rules and regulations do not address specific storm event criteria, while the NM WQA Copper Rule does include storm event criteria (e.g., 100-yr 24-hr). Given the importance of stormwater controls in the process of reclamation and closure and in particular achieving a sustainable eco-system and protecting groundwater, the following is a summary of our recommendations to MMD and NMED in this regard.

- It is our understanding based on financial assurance discussions of stormwater tasks, without that commitment being described or otherwise contained in the CCP's, that most if not all mines subject to the NMMA and NM WQA are designed based on a 100-yr 24-hr design storm with an appropriate regional peak rainfall distribution. The agencies should require that the stormwater design basis be clearly provided where drainage controls are described in the CCP and as it applies to any other information contained in or supporting the CCP such as the pit lake water balance.

- The current NOAA statistics for storm events are not highly accurate and events greater than predicted for 100-year events have occurred on a much more regular basis than can readily be explained. We can argue as to the cause or whether meaningful predictions for the future can be made, but in our experience that would not lead to progress on this issue. Instead, we recommend that mines conduct an engineering trade-off and risk analysis that compares 100-yr, 200-yr, 500-yr, and potentially the PMF, and first consider the results internally, and then provide the study to the agencies and public as justification for either the existing criteria or for new criteria. In light of climate change variables, we believe the mining industry might realize internally that the incremental cost of constructing to a 500-yr design event offsets the potential risk to valuable assets and from a business standpoint, at least in some circumstances such as where conveyances are critical for the protection of covers or other reclamation features, application of a more conservative storm event should be performed. We also believe this is an example of where the Copper Rule and other regulations that include design criteria need to be revisited periodically to determine whether they reflect current regulatory and industry best practices.

- It is our recommendation that the MMD Director recognize that the current design standards in the NMMA are grossly inadequate to protect public safety as well as to ensure the mining facilities are not impacted by stormwater resulting in both property loss as well as potential water quality impacts as well as impacts to reclamation post-closure. Executive Order 11988[1] was issued "as part of a national policy on resilience and risk reduction" consistent with the President's Climate Action Plan. The resulting Federal Flood Risk Management Standard defines one way of determining a floodplain as "(iii) the area subject to flooding by the 0.2 percent annual chance flood." Given that New Mexico's existing stormwater design criteria are antiquated with regard to climate change considerations, we recommend that the NMED

[1] https://www.whitehouse.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and-

recognize a 500-yr storm event standard as a measure of risk reduction related to both public and worker safety as well as minimization of property damage. The MMD Director should require at least a 200-yr/24-hour storm event and preferably a 500 yr/24-hour storm event and should adopt it as an executive action given the department's direct experience with the current standard being inadequate and the Department's own frequent observations of significant stormwater events exceeding the 100-yr standard at mine sites in New Mexico.

- As we have previously commented, others have found it is not possible to quantify the future effects of climate change on flood flows with any confidence, and instead have recommended an uplift of 10% to 20% applied to design storms or peak flows in response to this uncertainty (EGBC, 2018)[2]. If the agencies were to address the matter of climate change proactively they would adopt the use of a 200-yr 24-hr flood event going forward as the stormwater design standard.

[2] Engineers and Geoscientists British Columbia (EGBC), 2018. *Legislated Flood Assessments in a Changing Climate in BC, Professional Practice Guidelines*. August 28. Version 2.1. British Columbia.