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February 28, 2019

Ms. Sherry Burt-Kested, Manager
Environment Services
Freeport-McMoRan Chino Mines Company
P.O. Box 10
Bayard, New Mexico 88023

RE: Approval of Lambright Investigation Unit Ecological Risk Assessment (LIU ERA), dated May 2018, Chino Administrative Order on Consent (AOC)

Dear Ms. Burt-Kested:

The New Mexico Environment Department (NMED) has reviewed the LIU ERA dated May 2018. This document has undergone numerous revisions during the past six years. Comments received from the public and comments from Freeport McMoRan Inc., Chino Mines (Chino), between 2014-2018 will be included in the final version to be placed in the AOC repositories. In addition to the responses to comments received from the public and Chino included in this letter, text will be added or corrected as noted below.

Based on comments received from the New Mexico Department of Game and Fish, NMED review, and consultation with U.S Environmental Protection Agency (EPA) and Chino, NMED will issue a separate letter requiring a new population census for presence/absence and a habitat survey for suitable or marginal habitat to update the status of the Chiricahua Leopard Frog (CLF) due to uncertainties concluded in the LIU ERA.

NMED is providing approval of the LIU ERA, subject to completion of a new CLF population survey.

Comments received from the public during the open comment period

1) Conclusion of no/low ecological risk is unreliable due to lack of data

Overall, the assessment of ecological risks is based on very limited data; these limitations are noted at least eight times in the report. Much of the data from the baseline ecological risk assessment were not

comparable, so no trends in concentrations over time can be discerned. Therefore, the assessment that there is no ecological risk, or low ecological risk, is not reliable.

NMED Response: *The limited amount of data from within the LIU ERA reflects the initial approach for the Sitewide Baseline Environmental Site Assessment (BERA) in which NMED sought to establish concentration-based criteria from sitewide data analysis as tools for assessment of individual Investigation Units (IUs) (See planning documents, especially Technical Memorandum 1 for the Chino ERA [Schafer & Associates 1999]). The LIU ERA summarizes that assessment and reviews the results of all data collected within the LIU. This includes Sitewide BERA data, initial LIU Remedial Investigation (RI) data and additional supplemental sampling data from the LIU to support the risk assessment. We believe that the data collected from the LIU are adequate to support the conclusions provided in the LIU ERA.*

It is unclear what is meant by "data from the baseline ecological risk assessment were not comparable". Data collected from the LIU for the Sitewide BERA and the LIU RI were obtained using the same methods as other IUs. We believe the assessment tools developed from the Sitewide BERA are applicable. Also, collection of data to assess concentrations over time was not a goal of the Sitewide or LIU BERA effort.

Schafer (Schafer & Associates). 1999. *Chino Mines Administrative Order on Consent Site-wide Ecological Risk Assessment Technical Memorandum No. 1 (TM-1): ERA Workplan. May 14.*

2) Ecological receptors for the LIU should include herpetofauna

U.S. Environmental Protection Agency (EPA) guidance on ERAs is a one-size-fits-all approach that is not necessarily applicable to every region of the country. Here in the desert southwest, reptiles are abundant and ubiquitous, a crucial part to the proper functioning of our ecosystem and the food web. Birds are often used as a surrogate species for reptiles, such as snakes and lizards (herpetofauna) in ERAs; however, to be representative, the surrogate needs to be "at least as sensitive as the target taxon and/or (2) exposures to the surrogate are greater than that of the target taxon[1].

Herpetofauna are known to bioaccumulate, or biomagnify, heavy metals [2]. Herpetofauna are much less mobile than birds, remaining in a limited area throughout their life cycle. They den in the soil, exposing them to contaminants dermally, as well as incidental oral ingestion. On an individual level, exposure to acidic soil adversely affects eggs, resulting in smaller and slower hatchlings, and those effects last through adulthood.

Herptofauna consume invertebrates, which are also impacted by contaminants. In turn, although "small ground-feeding birds" were noted as being the most vulnerable receptor, most carnivorous and omnivorous animals prey upon herpetofauna, including birds such as roadrunners and ravens, and

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1 Weir, SM, JG Suski, and CJ Salice. (2010) Ecological risk of anthropogenic pollutants to reptiles: Evaluating assumptions of sensitivity and exposure, in Environmental Pollution 158(12):3596-606 · December 2010.
2 Márquez-Ferrando, R, X Santos, JM Pleguezuelos, and D Ontiveros. (2009) Bioaccumulation of Heavy Metals in the Lizard Psammodromus algirus After a Tailing-Dam Collapse in Aznalcóllar (Southwest Spain), Archives of Environmental Contamination and Toxicology 56: 276.

mammalian predators and raptors. However, mammalian predators and raptors were judged as being at relatively low risk (ERA page 12).

The EPA has adopted the use of herpetofauna in ERAs of certain pesticide-impacted sites, although noting that birds may be more sensitive to some pesticides[3]. However, herpetofauna are more sensitive to heavy metals than birds.

We are very concerned that the ERA for the LIU is of limited value, since "existing risk assessment schemes lose their predictive value when important taxa, such as reptiles, are missing, especially in risk assessments performed for terrestrial arid ecosystems4."

***NMED Response**: EPA ERA Guidance is meant to be customized to site-specific conditions wherever it is used. Use of the guidance was customized for assessment at the Chino Mine site. NMED and our risk assessors would be happy to discuss this point further if it would help clarify how the ERA methods were specifically developed for Chino.*

*It is correct that toxicity data on reptiles is lacking and is a general uncertainty in ERAs at many sites around the United States. EPA explicitly recommends using Avian-based toxicity factors as surrogates for assessing risk to reptiles in pesticide registration process and risk assessments. (see Section 4.2 of the T-HERP citation, and USEPA "Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)" (2003) [*e.g., *page ES-2] In the absence of specific data this is the most appropriate option. With respect to the statement "*herpetofauna are more sensitive to heavy metals than birds" *Table 2 in Wier et al. (2010) suggests only one metal (lead acetate) was evaluated, and it appears to be no more toxic to reptiles than birds.*

NMED will add text to the report explicitly recognizing this as a source of uncertainty.

Comments received from FMI on draft and final document:

1) Terrestrial Vegetation. Chino appreciates NMED's incorporation of previous comments regarding terrestrial vegetation and has no additional comments at this time.

***NMED Response:** Comment noted.*

2) Terrestrial Wildlife. Chino appreciates NMED's incorporation of previous comments regarding terrestrial wildlife and has no additional comments at this time.

***NMED Response:** Comment noted.*

3) Chiricahua leopard frog. Chino appreciates NMED's incorporation of USFWS critical habitat, the 1-3-5 rule, and referencing the Jennings 1998 report in order to identify CLF populations distal to the

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3 U.S. Environmental Protection Agency (2008) T-HERPS Version 1.0 User's Guide for Risk to Amphibians and Reptiles from Pesticides, Terrestrial Herpetofaunal Exposure Residue Program Simulation USEPA, September 4, 2008. Environmental Fate and Effects Division, U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, D.C.

4 van der Valk, Harold (1997) Community Structure and Dynamics in Desert Ecosystems: Potential Implications for Insecticide Risk Assessment, in Archives of Environmental Contamination and Toxicology 32(1):11-21, February 1997.

LIU (Figure 1). Figure 1 details physical reaches of drainages surveyed and actual locations of CLF populations found per communications with Randy Jennings (March 6, 2014). This is indicative that even during the period when the CLF population was still thriving, none were found in the LIU study area. Though this lack of habitat is now clearly stated in the ERA, the ERA still contains and screens surface water concentrations against CLF NOEC/LOEC values and the ERA includes the following statement, "risk to the CLF cannot be dismissed". Chino does not agree with this statement. Chino believes that the existing information showing where CLF are and have been present and absent, along with the lack of scientific information to support that the CLF may someday be present, eliminates any reasonable risk and without further scientific evidence on how CLF populations could develop in the LIU study area, the ERA should acknowledge this. Chino would like to reiterate that no populations and no critical habitat have ever been identified in LIU, and there is no reasonable potential for CLF to disperse to LIU from current surrounding populations. Thus, this statement is inconsistent with the available information regarding locations and dispersion of CLF populations relative to the LIU area of Chino.

NMED Response: *NMED has reviewed the information provided and stands by the statement 'risk to the CLF cannot be dismissed'. In response to this comment text has been added to Section 4.4 as follows: "...the unknown presence/absence of suitable or marginal unoccupied habitats within the LIU but known former populations within LIU drainages, dispersal of the CLF into the LIU from areas where the frog was historically observed is unlikely but cannot be entirely dismissed in either Tributary 1 or Tributary 2 or in Lampbright Draw. Therefore, the risk analysis presented in this document is relevant if the state or federal agencies that are tasked with the protection of the CLF as a threatened species agree that the CLF is a key management endpoint for the Site." Guidance received from New Mexico Fish and Game and the U.S. Fish and Wildlife Service indicates that the currently available information is not adequate to rule out the presence of suitable or marginal unoccupied habitats within the LIU based on the 1-3-5 Rule.*

Surveys designed to determine the presence/absence of suitable habitat as well as an updated survey of the presence/absence of CLF populations in the LIU could be used to reduce the uncertainty in the conclusions.

4) Chino has also thoroughly reviewed the Little and Calfee 2008 study and noted multiple uncertainties regarding the study design that could impact the reported effect concentrations. These uncertainties were presented in the Site-Specific Copper Toxicity Model Report Appendix F1 and are briefly bulleted below and discussed in greater detail in Attachment A.

- Laboratory dilution water versus site water chemistry: Laboratory dilution water used in the CLF studies was a mixture of deionized water and well water, and therefore not representative of site-specific water chemistry that has been previously measured across the Chino mine site. In particular, dissolved organic carbon in the laboratory water is expected to be very low relative to site surface waters. The mitigating effects of water chemistry on copper toxicity are well-documented in the scientific literature and in the recent site-specific copper toxicity study performed in Chino surface waters that are adjacent to LIU.

- Chronic Toxicity Test: The most sensitive CLF copper effect concentrations were derived from the 60-day static renewal exposure test. The following sub-bullets discuss the uncertainties with chronic toxicity study design:

o Analytical Measurements: The 60-day copper exposure test included only a limited number of analytical measurements. Over the course of the 60-day exposure to copper, metals were measured only twice and the two measurements were made at the end of exposure periods (on days 30 and 60) when metal concentrations are likely to be lowest (particularly following feeding, as was described in the study). The average of these two measurements was used as the effect concentration in the study's results. The use of the average concentration of the two measurements could introduce significant uncertainty around the actual effect concentration because exposure solutions were renewed twice weekly for 8.5 weeks (this equals about 18 separate renewals). Finally, the copper concentrations measured at the LOEC treatments were only 16 to 25% of the nominal/target concentrations, which suggests copper decreased towards the end of an exposure period and that toxicity of copper to CLF tadpoles might be 4 to 6 times less than the reported effect concentrations indicate.

o Replication and Sample Size: The chronic test only used three replicates per concentration with three tadpoles per replicate (9 tadpoles per test concentration). The nine tadpoles is less than the minimum (20) number of organisms typically required when performing definitive toxicity testing.

o Growth-Based Endpoint Measurements: The study did not include sufficient data to determine if there were weight and length variability of tested organisms at the initiation of the test.

- Acute Toxicity Test: The 96-hour LC50 concentration appears to be based on nominal exposure concentrations, because the report does not specify or present measured copper concentrations for this acute test. In general, metal-toxicity studies that do not report measured concentrations are not considered of high enough quality for inclusion in criteria-derivation calculations.

Given the lack of habitat, no identified populations, no reasonable potential for the CLF to disperse to the LIU, and the uncertainties surrounding the CLF toxicity test design and effect concentrations; the use of CLF toxicity reference values (TRVs) to characterize aquatic life risks is inappropriate for LIU.

***NMED Response**: The information provided was reviewed and text has been added to Section 4.1 regarding the various uncertainties discussed in these comments. The information provided was considered as part of the conclusions for the CLF receptor.*

5) Risk by Tributary: Each of the tributaries in LIU is also regulated under other regulatory programs (i.e., Sitewide Abatement). Chino previously requested that discussion of risks be broken out by each tributary, both to make it clear for the reader and for Chino and other stakeholders to understand the ramifications of the ERA for these programs. The updated ERA has broken out discussion of the data by tributaries, which is a good first step. However, in the conclusions section of 4.3, it would still also be helpful to discuss results by tributary.

***NMED Response:** The changes were made in the revised document as requested.*

6) Tributary 1 Aquatic Life Surface Water Exposure.
In Tributary 1, there is only one location with an exceedance of NM surface water criteria (LBT-1-BF1) and two locations with exceedances of the CLF LOEC for copper (LB7S and LBT-1-BF1). These

locations have not been sampled since 2008 and there have been operational changes over the last five years that make the 2008 data obsolete.

- LB7S – the New Mexico Energy Minerals and Natural Resources Department, Mining & Mineral Division (MMD) permit design boundary incorporates the upper reach of Tributary 1 and includes the location of LB7S, therefore this sample should be removed from the ERA. See Figure 2.

- LBT1-BF1 – Only one sample at LBT-BF1 was collected in 2008, with no additional sampling in subsequent years. Since 2008, however, source control has been implemented in the Dam 8 area resulting in a reduced loading and decreased surface water concentrations at LBT1-BF1. Currently LBT1-BF1 cannot be located, but two other monitoring wells (376-2007-03 and LB5) are located in the immediate vicinity and LB5 is continuously sampled.

Tributary 1 is currently under investigation for DP-376 and Sitewide Abatement and the tributary has been surveyed for seeps (Chino, 1995 and Golder, 2007). Through the work performed by that program, the drainage has been characterized as ephemeral, with baseflow described as temporally and spatially discontinuous, and when present, occurring as seeps and stagnant pools with little or no flow (Golder, 2009). Any risk management decision undertaken for LBT1-BF1 should be addressed under DP-376 or Sitewide Abatement program rather than the AOC.

Given these lines of evidence, the more appropriate conclusion for Tributary 1 is that risk to aquatic life from surface water exposure at Tributary 1 is unlikely.

***NMED Response**: The information regarding sampling locations LB7S and LBT1-BF1 has been incorporated into the revised document.*

As indicated in Section 6 of the ERA, risk to aquatic receptors in Tributary 1 is likely to be low, but additional data regarding the presence/absence of suitable CLF habitat is required to make a final determination of risk.

7. Tributary 2/2A Aquatic Life Surface Water Exposure. Chino appreciates NMED's incorporation of previous comments regarding Tributary 2 and NMED's acknowledgement that the elevated zinc concentrations appear to *[be]* isolated as there are no exceedances up or downstream of LBT-11. Tributary 2 is located in a highly mineralized area where zinc veins are present. Therefore, Chino would appreciate if NMED would include a short discussion on the mineralized background in the vicinity of Tributary 2 and how that could impact the water quality at LBT-11.

***NMED Response:** The text has been modified in response to this comment.*

8. Sediment Exposure. Chino would like to reiterate their position that TECs/PECs were developed to assess the likelihood of harmful effects to sediment-dwelling organisms under chronic exposure conditions and given the low exceedance rate of these overly- conservative benchmarks in this investigation unit, the risks associated with sediment exposure are unlikely in LIU.

The following paragraph (4th paragraph, page 24) is an overstatement of risk, "As a result, the potential for risk to the aquatic community endpoint from exposure to copper concentrations in LIU sediment is

somewhat uncertain. It is unknown to what extent sediment-dwelling invertebrates inhabit the LIU drainage due to the ephemeral nature of the system. It is clear, however, that the risk of adverse effects is elevated within Tributaries 1 and 2, especially in the areas where copper concentrations exceed the PEC."

During the time period since the sediment samples were taken in 1999/2009 and present day, there have been MMD design boundary changes in LIU. The Lampbright MMD design boundary has expanded to include sample locations 2214 (Trib 1), 2215 (Trib 1), and 376-05-04 (Trib 1) as shown in the Figure 2. Therefore, there are only two copper PEC exceedances in LIU at locations 2202 and 2206 in Tributary 2A. The PEC exceedance at 2202 (183 mg/kg) and 2206 (164 mg/kg) are just slightly above the copper criteria (149 mg/kg).

Furthermore, NMED failed to incorporate the LIU specific SPLP data and persistent surface water location information requested in the April 2012 comment letter. The SPLP data for Tributary 1, presented in the LIU RI, provides an additional line of evidence showing that the leachable fractions of metals form *[Sic]* sediments are below aquatic criteria. These SPLP results can be used to address the toxicity testing data gap by showing that surface water concentrations will not exceed surface water criteria.

As Chino has commented previously, the potential presence of aquatic habitat could aid in determining if the single PEC exceedance translates into aquatic life risk. If PEC exceedances are located in ephemeral reaches of the Lampbright Tributaries the risk to sediment dwelling organisms may be overstated.

NMED Response: *The SPLP data for the LIU have been included in the revised document.*

The risk assessment concludes that risks in the LIU from sediment are likely to be low. Conclusions based on sediment exceedances of the TEC/PEC benchmarks were revised to state that presence of persistent aquatic habitat is an important determining factor regarding the potential for chronic risk to aquatic receptors. The assessment states: "If the PEC exceedances correspond with areas of persistent benthic habitat, risk in those areas may be higher than predicted elsewhere. The presence or absence of aquatic habitat and/or habitat for the Chiricahua leopard frog or other amphibians is a source of uncertainty for the LIU ERA; however, SPLP data indicate that sediment leaching to surface water is not expected to be a significant source of COPCs."

NMED believes that the conclusions are appropriate, and the presence/absence of aquatic habitat should be considered as part of the risk management process.

If you have any questions, please contact me at (575) 956-1550.

Sincerely,

David W Mercer

David Mercer, Chino AOC Project Manager
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Ground Water Quality Bureau
New Mexico Environment Department
Silver City Field Office

DWM: dwm

cc:

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