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June 5, 2015

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

RE: Response to Chino comment letter dated May 10, 2013 regarding the Hanover and Whitewater Creeks Investigation Unit Ecological Risk Assessment Report, Chino Administrative Order on Consent.

Dear Ms. Burt-Kested:

The Ground Water Quality Bureau of the New Mexico Environment Department (NMED) received the above referenced comments dated May 10, 2013. NMED completed revision of the risk assessment report and have compiled follow-up responses to the comments. In many cases, no response was necessary since Chino was commenting on previous NMED response to Chino comments. These responses were intended to accompany the revised ecological risk assessment report for the Hanover and Whitewater Creeks Investigation Unit, which was dated April 10, 2015. Where appropriate, this revision incorporates changes requested by Chino in previous comments. I apologize for the delay in delivery of these comments due to our transition in staff.

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

Sincerely,

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

DWM: dwm

cc: Petra Sanchez, USEPA (via email)
Michelle Hunter, NMED (via email)
Kurt Vollbrecht, NMED (via email)
Joe Fox, NMED (via email)
Mark Lewis, Formation Environmental (via email)
Joe Allen, Formation Environmental (via email)
Ned Hall, Freeport-McMoRan Inc. (via email)
Pam Pinson, Freeport-McMoRan Chino Mines Company (via email)

New Mexico Environment Department's Followup Responses to Chino Mine Company's Response to Comment Letter on the draft Ecological Risk Assessment for the Hanover/Whitewater Creek Investigation Unit

This document presents the New Mexico Environment Department's (NMED's) followup responses to Freeport-McMoRan Chino Mines Company's (Chino's) Response to Comment letter dated May 10, 2013 concerning the draft Ecological Risk Assessment for the Hanover/Whitewater Creek Investigation Unit (HWCIU). This document is organized to present a response to active comments between NMED and Chino. Original responses by NMED from April 19, 2013 to Chino's comment letter dated September 7, 2012 are reproduced below in bold, followed by Chino's followup response to each response in italics from May 10, 2013, followed by NMED's followup response in this document dated June 5, 2015.

This document is divided into two sections: 1) responses to the General Comments; and 2) responses to the Specific Comments. The General Comments section of the Chino letter covers a wide range of topics for vegetation, wildlife, and surface water/sediment risk analysis, but is not presented in a discrete comment format. Best efforts have been made to respond to the comments in the order that they were presented.

<u>General Comment responses</u>
Risk Analysis for Vegetation

NMED Response: NMED disagrees that results of the ERA analysis should be qualified as "not necessarily representative for habitat units" or "inconclusive for the HWCIU." Uncertainty in environmental investigations is inevitable, and is explicitly acknowledged in the HWCIU ERA, the Sitewide BERA, and ERAs for other investigation units. Guidance on RI/FS and risk assessments explicitly recognize this fact and description of uncertainty is a key part of the process. We believe the uncertainty in data and analysis conducted has been fairly and adequately characterized, including identification of potential data gaps for risk managers.

As in the past, spatial scale of data presentation and context is one of Chino's main themes. Specifically, Chino cites the variability among sampling locations (or within sampling locations) as so great that attempts to draw conclusions from the data are rendered invalid. This is especially true for the Site-wide BERA sampling locations and data from the vegetation analysis (i.e., co-located community, soil type, soil chemistry, and vegetation chemistry) which were used to generate tools to assess potential risks from affected soils. Variability among sampling locations and data types was anticipated in the study design, and report preparation. Presentation of data for multiple levels is warranted, but risk is never interpreted on the scale of "individual plants" as is suggested in the comments. Chino suggests that, when averaged across 'habitat unit' that the effects are not different from background. However, if averaged across a large enough area, effects of

contamination can be 'averaged out' of most data sets. The scale of data interpretation in the HWCIU ERA is intended to provide risk managers with information on spatial variability that they may need to make decisions based on multiple spatial scales, including large landscape-scales.

Recall that the initial co-located vegetation analyses were intended to represent a gradient of environmental conditions, especially soil pH and copper concentrations. This approach was adopted early in the process so that the outcome could be used to assess risk based on soil chemistry and physical conditions when the RIs for individual IUs were completed. As a result, the ERA sampling locations were not intended to be used in statistical comparisons with background, or between exposure areas.

> Chino Followup Response: *Chino appreciates NMED's perspective on pCu and respects NMED's wish to delay some of the changes until the FS. Even with the delay, the intent of Chino's comments still stand and the identified pCu issues will arise during pre-FS RAC [sic] the Feasibility Study (FS) discussions for HWCIU if not addressed in the revised ERA.*
>
> NMED Followup Response: *The comment is noted and was taken into consideration in the revisions to the document.*

NMED Response: At no point in the analysis process did the ERA attempt to estimate pCu2+ from phytotoxicity tests, as is stated in Chino's comments. Also, alfalfa is not a grass.

> Chino Response: *To clarify, the pCu threshold for a PEL and DEL is partially based on phytotoxicity study results in the sitewide ERA as well as vegetation community results and thus phytotoxicity studies do affect selected pCu risk thresholds. Chino agrees that alfalfa is a legume, not a grass; a mistake missed during the editing process.*
>
> NMED Followup Response: *No response required.*

NMED Response: The Chino comment indicates that root and shoot length were the only endpoints considered in the phytotoxicity testing, and specifically that emergence and survival were not considered. During the workplan development, emergence and survival were identified as important endpoints for vegetation recruitment in surface soils. This is true for herbaceous species, as well as woody plants that reproduce through seed dispersal. Data on these endpoints were collected from toxicity tests and included in analysis in the Site-wide BERA. The potential implications that analysis of surface soil may have more limited application to established, and deep-rooted woody plants has been acknowledged since the early phases of Problem Formulation. However, the decision to assess primarily surface materials was made because main mode of contaminant transport that is relevant to ecological receptors is surface deposition after wind or fluvial transport.

Chino Response: Chino recognizes survival and emergence were also appropriately evaluated in the phytotoxicity test. The comment is not that these endpoints were not considered but, as the Sitewide ERA states on p. 2-17 'Growth parameters such as root and shoot weight and length were more sensitive indicators of toxicity than emergence and survival.

NMED Followup Response: *The comment is noted and was taken into consideration in the revisions to the document.*

NMED Response: NMED agrees that if Chino wishes to consider reference areas as part of the HWCIU ERA, additional discussion is required to agree upon what constitutes a suitable reference location.

Chino Response: Chino would like to discuss with NMED the need to identify reference sites for comparison to HWCIU sites in the FS.

NMED Followup Response: *No response necessary.*

Risk Analysis for Terrestrial Wildlife

NMED Response: Use of BAFs vs. Regression Equations To Calculate RBCs
NMED agrees that the use of regression equations to estimate tissue concentrations is a less uncertain approach for calculating RBCs and will consider the calculations provided by Chino in Figures 3 through 6. However, we are unable to reproduce the calculations provided because it is unclear what data were used in the calculations. In addition, a Table 2 is referenced in the comments as showing tests of predictive power for the regression equations provided and Chino's calculation of dose to the small ground-feeding bird using the regression equations. Table 2 does not appear to have been included in the response to comments. Please provide both a summary of the data used to calculate the regression equations in Figures 3 through 6 and a copy of Table 2.

Chino Response: The data used to calculate the regression BAFs are included in the attached Table 1. Table 2 was missing from the original comment letter on the HWC ERA and is also attached (called Table 2).

NMED Followup Response: *Thank you. The information provided was considered in the revisions to the document.*

NMED Response: Risk Calculated via RBCs
Soil concentrations were compared to RBCs in Section 3.4.1 through 3.4.4 only at those locations where tissue data were not available. The comment indicates that forward-based risk calculations are more appropriate for use. This comment will be further considered following resolution of the previous comment because only with the use of regression-based

bioaccumulation models would the comparisons provided in Sections 3.4.1 through 3.4.4 change based on the direction of calculation.

In addition, the comment indicates that the 95UCL of each exposure unit (physical reach) should be the first comparison to the RBC rather than individual sampling locations. Such an approach would not be appropriate for several reasons. First, the use of 95UCLs as initial exposure point concentrations could mask areas of high COPC concentrations related to point sources or overbanks that have received higher than average sediment deposition, particularly in physical reaches with large datasets. Second, the available data in several of the physical reaches is not sufficient to calculate a reliable 95UCL. Third, data from several of the datasets were not collected from randomly selected locations, particularly ERI data, but were selected based on an assumed gradient of copper concentration and soil pH making their inclusion in 95UCL calculations invalid. The sections will be modified to make a more consistent presentation of the data by first presenting the point-by-point comparisons to the RBC (or via forward risk calculation pending resolution of the comment above) and then the 95th percentile concentration will be compared to the RBC.

> *Chino Response: Chino appreciates that NMED will revise the RBC comparisons to include both point-by-point and 95 UCL concentrations.*
>
> NMED Followup Response: *No response necessary.*

Risk Analysis for Surface Water

NMED Response: We assume that when Chino refers to New Mexico AWQC (or NM AWQC), they mean New Mexico Water Quality Criteria or New Mexico Aquatic Life Criteria. We are unaware of New Mexico Ambient Water Quality Criteria.

> *Chino Response: New Mexico AWQC can be replaced with New Mexico Aquatic Life Criteria.*
>
> NMED Followup Response: *No response necessary.*

NMED Response: The discussion in the comments that references Stephan et al (1985) and the federal Ambient Water Quality Criteria application is unclear to us. The ERA does not claim to assess appropriate application of the Federal Clean Water Act or the New Mexico Water Quality Act. The ERA uses NM aquatic life criteria as risk-based (i.e., in this case, toxicologically based) values on which to assess potential toxicity to aquatic species when/if sufficient water were to be present for aquatic life to establish. The analysis considers the limited nature of aquatic environment both by acknowledging that the acute thresholds

may be appropriate given the water-limited nature of the systems. This is consistent with state rules for application of aquatic life criteria.

Chino Response: The reference to Stephen et al (1985) was intended to acknowledge the level of protection provided by national AWQC (which New Mexico has also adopted for their New Mexico Aquatic Life Criteria), criteria the ERA uses to evaluate risk. These numeric criteria values are calculated by estimating the concentration of a material that corresponds to a cumulative probability of 0.05 in the approved set of toxicity values (which must include freshwater species in at least eight different families). As a result, criteria values are expected to be protective of 95% of aquatic species. The additional reference to commercially or recreationally important species is based on criteria calculation guidelines (Stephan et al 1985), and specifies that numeric criteria values can be lowered if an approved toxicity value (e.g., LC50 or EC50) for a commercially or recreationally important species is lower than the above value that corresponds to the cumulative probability of 0.05. This criteria discussion was provided in the comments to highlight the high-level of protection provided by New Mexico Aquatic Life Criteria (and national AWQC). Based on potential adjustments to the CLF thresholds (see below), and decisions regarding the appropriate CLF threshold (i.e., LOEC or EC50) and endpoint (i.e., growth or mortality), it is possible the current NM aquatic life criteria may be more stringent than the adjusted CLF threshold(s).

NMED Followup Response: *The comment is noted and was taken into consideration in the revisions to the document.*

NMED Response: In any case, the ERA does not seek to use 'more conservative criteria' for any of the waterways, except in the case of the CLF. The USFWS conducted the Little and Calfee (2008) study largely with the intent of assessing risk and injury to CLF. The data and thresholds from Little and Calfee (2008) are included in the ERA to assess potential risk to CLF if it were present in a given water body. Use of the Little and Calfee (2008) thresholds in site cleanup decisions will depend on risk management decisions which, we assume, will require more specific information on presence or absence of CLF in the drainages in question.

Chino Response: Chino agrees that interpretation of the CLF thresholds from Little Calfee 2008 study should be limited to water bodies where the CLF is present. Additionally, the CLF thresholds can be adjusted based on water hardness relationships (see above response), and could also be adjusted based on results from the ongoing Water Effect Ratio studies.

NMED Followup Response: *The comment is noted and was taken into consideration in the revisions to recalculated risk thresholds.*

NMED Response: Chino cites adjustment of CLF metal thresholds for water hardness. NMED agrees that this adjustment should be made if adequate information is available to assess the sensitivity of CLF toxicity to hardness.

Chino Response: Frogs are sensitive to hardness (see Horne and Dunson 1995 paper provided by Chino) as are other aquatic life forms and there is no reason that the CLF will not be sensitive. The recommended hardness adjustment for the CLF is based on NM aquatic criteria:

- *LC50 @ HWC hardness = (LC50 @ lab hardness)*{[(HWC hardness)/(lab hardness)]^slope}, where slope = the metal-specific NMWQC hardness-adjustment slope (second attachment).*
- *For acute criteria, the slopes are: Cd = 0.8968, Cu = 0.9422, Ni =0.8460, Pb = 1.273, Zn = 0.9094.*
- *For chronic criteria, the slopes are: Cd = 0.7647, Cu = 0.8545, Ni = 0.8460, Pb = 1.273, Zn = 0.9094.*

NMED Followup Response: *CLF benchmarks were adjusted for hardness as suggested.*

NMED Response: Alternative Water Quality Values
NMED agrees that such water quality screening criteria could be adjusted to better reflect the composition of the aquatic invertebrate and amphibian community that is likely to be present. The initial approach of using acute aquatic life criteria was intended to accomplish something similar. However, the document will be revised to include the requested adjustments to the screening levels.

Chino Response: Chino appreciates that NMED will revise the water quality screening criteria to better reflect the composition of aquatic invertebrates and amphibian community.

NMED Followup Response: *Water quality screening criteria were adjusted as suggested. No additional response required.*

Risk Analysis for Sediment

NMED Response: Chino is correct in assuming the TECs and PECs were used as screening tools in the ERA(s). This approach was deemed adequate given the limited nature of the aquatic environment. However, given the potential presence of CLF habitat and the further Chino comments, the requested adjustments to the sediment screening levels will be made in revising the document. Such factors may affect risk screening for cadmium, but the overall conclusions for copper, lead, and zinc are likely to be similar.

Chino Response: Chino appreciates NMED's willingness to use the T_{10} and T_{20} values from McDonald et al. 2009 in place of the McDonald et al. 2000 TECs/PECs.

NMED Followup Response: *Values from McDonald et al. 2009 were incorporated into the analysis for this draft. No additional response required.*

Specific Comment Responses

Risk Analysis for Terrestrial Wildlife

NMED Response 4) Section 3.3 – Copper Risk Analysis

a) The RBC and the pre-FS-RAC were both calculated using regression-based BAFs as agreed with Chino during Dispute Resolution and discussed in Formation (2010)

Chino Response: As previously discussed, please remove the BAF regressions from the bulleted list of parameters used in the revised RBC calculations. The RBCs of 1,114 and 1,600 were not calculated using regression BAFs and their inclusion adds confusions as to how these were calculated. They were calculated using 95UCLs for invertebrate tissue and seeds were not included because a 100% invertebrate diet is assumed.

NMED Followup Response: *The comment is noted and was taken into consideration in the revisions to the document.*

NMED Response 4) Section 3.3 – Copper Risk Analysis

b) The text is correct on how the 1,114 mg/kg RBC was calculated, based on discussions between Chino and NMED. Additional discussion with Chino may be required to clarify this point relating back to Dispute Resolution.

Chino Response: Chino agrees that the 1,114 mg/kg RBC was corrected calculated. Chino's original comment regarded the calculation of the 1,600 mg/kg RAC, not the calculation of the 1,114 mg/kg RBC. As previously discussed, the following sentence is incorrect:

"In addition, NMED provided Chino with a pre-Feasibility Study Remedial Action Criteria (pre-FS RAC) for the STSIU for copper equal to the 1,600 mg/kg, which was calculated using the same model as the RBC but with a small ground-feeding bird diet of 70% invertebrates and 30% seeds."

Formation stated in their May 9, 2013 email communication to clarify their response to Chino comments that "The 70/30 split diet was used to calculate a number that approximated 1,600 mg/kg. But that calculation also comes with adjustments in the soil ingestion rate and soil bioavailability that are not explicit in the report." Though Chino still maintains the pre-FS RAC of 1,600 mg/kg was determined using a 100% invertebrate diet and a 95UCL of STSIU tissue with the removal of the outlier sample location ERA-15 (NMED and Chino STSIU Dispute Resolution meeting February 17, 2011), Chino requests that Formation explicitly state all parameters used in the 70/30 diet that allows the calculation of a 1,600 mg/kg pre-FS RAC.

NMED Followup Response: *The comment is noted and based on additional discussions with Chino, the document was revised.*

NMED Response 5) Section 3.4 – Additional COPCs.

a) Review of the lead RBCs provided in Table 3.4.1 indicates that both the NOAEL and LOAEL RBCs were correctly calculated using 'wet-weight' ingestion rates for invertebrates and 'dry-weight' ingestion rates for seeds. Further information regarding Chino's belief that they are calculated incorrectly is required.

Chino Response: As per Formation's May 9, 2013 email communication, please update the current soil ingestion rate of 3% to the correct soil ingestion rate of 10%.

NMED Followup Response: *The requested revisions have been made.*

NMED Response 5) Section 3.4 – Additional COPCs.

b) Review of the zinc RBCs provided in Table 3.4.1 indicates that the RBCs were correctly calculated using 100% soil bioavailability. Further information regarding Chino's belief that they are calculated incorrectly is required.

Chino Response: As per Formation's May 9, 2013 email communication, please update the current soil ingestion rate of 3% to the correct soil ingestion rate of 10%.

NMED Followup Response: *The requested revisions have been made.*

NMED Response 9) Table 4.2-1

a) The data are provided in the table for informational purposes. No change necessary. A qualitative assessment of all COPC concentrations versus background concentrations would be acceptable provided that agreement can be reached between Chino and NMED regarding appropriate background concentrations for the HWCIU.

Chino Response: Chino is open to starting discussions to determine the appropriate background concentrations for HWCIU.

NMED Followup Response: *NMED agrees.*

Note that NMED earlier responded to Chino request to eliminate Physical Reaches 5 and 6. The locations affected have been removed from the HWCIU analysis.