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# New Mexico Copper Corporation Response to NM MMD's March 22st, 2018 Technical Comments on Baseline Data Reports for Copper Flat Mine, Sierra County Predictive Geochemistry Modeling of Pit Lake Water Quality at the Copper Flat Project, December 2017 Probable Hydrologic Consequences of the Copper Flat Project, December 12, 2017 Permit Tracking No. SIO27RN May 22, 2018

## Agency Review of Updated MORP

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| **Reviewer: David (DJ) Ennis, P.G.**<br>**Agency: NM Mining and Minerals Division** | **Review Date: March 22, 2018** |

| Item # | Section/Page (or general) | Topic | Comment |
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| MMD Comment 1 | General Comment | Monitoring to verify model predictions | The two reports, *Predictive Geochemistry Modeling of Pit Lake Water quality at the Copper Flat Project* and *Probable Hydrologic Consequences of the Copper Flat Project* provide good, technical analyses of what may happen to water quality and quantity during and after mining on the permit and affected areas. The operational and reclamation plans will need to incorporate surface and groundwater monitoring to verify the predicted direction of the models. Monitoring will be a future permit condition. |
| | **NMCC Response** | | *The Monitoring Plan contained in Appendix E of NMCC's Discharge Plan Application which is incorporated into NMCC's Mining Operation and Reclamation Plan meets part of the MMD's request to provide surface and groundwater monitoring to verify predicted direction of the models. In addition, a monitoring plan has been developed to verify the similarity of the hydrologic balance in the potentially affected areas, a copy of which is provided herewith.* |
| MMD Comment 2 | General Comment | Executive Summary Request | Please provide a detailed executive summary using these two reports addressing the probable hydrologic consequences of the operation on both the permit and affected areas. Specifically, please explain how the performance and reclamation standard, addressed in 19.10.6.603.C(4) NMAC (Hydrologic Balance), is achieved. Please explain how the reclamation shall result in a hydrologic balance similar to pre-mining conditions and how this will be verified at the end of reclamation. |

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| | **NMCC Response** | | *NMCC has prepared the summary requested by MMD that explains how the performance and reclamation standard of 19.10.6.603.C(4) is achieved, how NMCC's proposed reclamation will result in a hydrologic balance similar to pre-mining conditions and how it will be verified. The requested executive summary is attached herewith. NMCC's attached Monitoring Plan provided in response to Comment 1, above, is also a part of NMCC's response to this comment.* |
| MMD Comment 3 | Figure 3-1 | LRG-10948 well | Figure 3.1: The 1 foot contour in this figure shows an abrupt turn to the east on the north side of Percha Creek. This figure is similar to Figure 3-19b in the Draft Environmental Impact Statement ("DEIS", November 2015), which appears to show that this portion of the contour is controlled by negligible predicted drawdown in well LRG-10948, as shown in Figure A14 of the JSAI Report. However, LRG-10948 is listed in the Baseline Data Report ("BDR"; June 2012 by Intera) as a Percha Creek alluvial well (see Section 8.2.4.3.3 of the BDR) whereas Figure 3.1 represents projected groundwater drawdown in the Santa Fe Group ("SFG") aquifer. If LRG-10948 is an alluvial creek well, the predicted 1 foot contour would likely continue in the DFG south across Percha Creek. Please comment on whether LRG-10948 is modeled as an alluvial creek well or as a SFG well and changes this may make on the predicted drawdown within the SFG at the end of mining. |
| | **NMCC Response** | | *The shape of the 1-foot contour in the Santa Fe Group south and east of the site to Percha Creek shown on Figure 3.1 of the PHC Report and on Figure 3-19b of the DEIS is controlled by the westernmost fault boundary shown on Figure 3.6 of the PHC together with the recharge from Percha Creek. This causes the contour to show up as the abrupt turn by the model. An additional factor is the small (1-foot) magnitude of the drawdown relative to grid spacing of the model. MMD's confusion with respect to this contour is understandable given the manner in which the BDR discusses well LRG-10948 and the Upper Percha well. The issue is further compounded by historic miss-location of well LRG-10948 by INTERA in the BDR and JSAI in subsequent documents since the BDR was issued as result of incorrect location by the NMOSE database. NMCC has confirmed that well LRG-10948 is actually located a number of miles to the west of Hillsboro, NM, as indicated by the attached water rights declaration document. As such, it has not been used in the hydrologic analyses performed by JSAI in the ground water model or the PHC. It is not at the location shown on Figure 8-21 of the BDR, Figure 3-19b of* |

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| | **NMCC Response (Cont.)** | | *the DEIS or Figure A1 of the PHC. As such, Figure A14 is not a hydrograph of LRG-1048. Therefore, Figures A1 and A14 have been removed from the revised PHC so as to prevent future confusion.* |
| MMD Comment 4 | Figure 3.12 vs. Figure A1 | Contour Intervals | The drawdown contour intervals of Figure 3.12 versus Figure A1 are different. Please include an approximate 1 foot drawdown contour of Figure A1 to allow for comparison of the end-of-mine drawdown versus the anticipated effects 100-years after mining. |
| | **NMCC Response** | | *Figure A1 of the PHC Report has been revised to include the 1-foot drawdown contour.* |
| MMD Comment 5 | Figure A1 | Cone of Depression | Figure A1 appears to show propagation of the pit cone of depression within the crystalline aquifer post-mining. At about 40 to 50 years post-mining, the propagation of the cone of depression seems to diminish (i.e. see Figure A23, projected water levels at Ready Pay well). Please comment on this apparent propagation including how the water levels are projected to stabilize over time. |
| | **NMCC Response** | | *Water levels in the bedrock near the pit rapidly equilibrate to the pit water level. The rate of propagation of the drawdown away from the pit is a function of the low permeability of the andesite bedrock. Locations closer to the pit reach equilibrium sooner (see Figure A21) than locations farther from the pit (see Figure A23). By 100 years post-mining, the propagation of drawdown has essentially stopped; the contours in Figure A1 represent the post-mining equilibrium condition. Appendix A of the PHC has been updated to reflect this response.* |
| MMD Comment 6 | Figure 3.1 vs Figure A1 | Cumulative effects of groundwater drawdown | There appears to be an area of groundwater drawdown overlap in Grayback/Greenhorn arroyos between the crystalline aquifer and the SFG aquifer immediately east of the permit area (e.g. between the eastern edge of the permit area and monitoring well MW-8). Figure 3.1 shows approximately 10 feet of drawdown in the SFG in this area at the end-of-mining and Figure A1 shows up to 20 feet of drawdown in the crystalline aquifer 100-years after mining. Please comment on whether there are any anticipated cumulative effects of groundwater drawdown in this area. |

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| | **NMCC Response** | | *Drawdown in the bedrock reduces recharge to the SFG aquifer along Grayback Arroyo, as shown on both Figures 3.1 and A1. Figure 3.1 shows the cumulative effect at the end of mining, i.e., in the near-term and Figure A1 shows the long-term post-mining cumulative effect, i.e., 100 years after mining.* |
| MMD Comment 7 | Figure 3.14 | Pit Lake water surface stability | Figure 3.14 of the report indicates that the pit lake surface will stabilize at the ~4,897 foot elevation and remain there for a number of years. What is the probability that it will remain at this level; either drop below or go above? What are the environmental circumstances that would allow the level to decrease or increase beyond the ~4,897 foot level? What might be the impacts on water quality or quantity? |
| | **NMCC Response** | | *The probability that the pit lake water level will remain at this level is very high. Page 28 and Figure 3.14 of the PHC indicate the model simulated average near-term pit water level after rapid-fill and reclamation will be 4,894 ft. amsl and the final long-term water level of 4,897 ft. amsl. The pit lake is expected to average about 22 acres in size. JSAI's Technical Memorandum titled, "Hydrologic Effects of proposed Rapid Fill Reclamation of Copper Flat Open Pit" submitted to NMED on October 13, 2017, indicates "water levels will fluctuate around the mean by a few feet, rising and falling seasonally and with wet and dry climate conditions…" Stormwater runoff is, by far, the largest input to the pit water balance. The largest potential effect on pit water levels would result from environmental circumstances such as a 100 year flood event or the occurrence of a prolonged drought. Probability is an indicator for the likelihood of an event's occurrence. As such, the probability that a 100 year flood will occur in any one year is 1 in a 100 or 1 percent. The historical precipitation record at Hillsboro indicates that a 100-year 24 hours precipitation event is 3.29 inches (JSAI, September 25, 2017 Technical Memorandum regarding OPSDA runoff). Utilizing this data, such an event would generate 36 acre-feet of runoff to the pit. Therefore, there is a 1 percent chance that the pit water level could rise 1.6 ft. in any one year. Conversely, if there was zero runoff for one year, i.e., a worst-case drought in any one year, the water level of the pit lake would decline 2.6 ft. due to evaporation. Therefore, the bracket for maximum short-term potential rise and decline would be 4898.6 ft. to 4891.4 ft. amsl., albeit with a low probability. The impact to water quantity would be very small, a change of less than 3 percent in total volume. Such a change in water quantity would not be expected to result in a significant change in water quality. Section 3.2.2 of the PHC has been updated to reflect this response.* |

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| MMD Comment 8 | Section 3.1.8 and Figure 3-1 | Placement of reclamation materials below the waterline of the future pit lake | Section 3.1.8 and Figure 3-1 indicate that the pit bottom will covered with a suitable reclamation material before pit flooding occurs, however the October 13, 2017, amendment to Mining Operation and Reclamation Plan ("MORP") submitted by NMCC does not propose to place reclamation materials below the waterline of the future pit lake. As stated in Section 6.2, the covered and submerged portions of pit reclamation are excluded from the surface area available (Table 6-1) for leaching and therefore the pit lake modeling results present in Section 6.6. It is MMD's opinion that any pit surface area exposed before submerging will lieely be available to leaching. NMCC should plan to cover as much of the pit surface area as possible after mining to limit the amount of leaching, even those areas to be submerged. This would assist with reclamation prior to inundation of the pit using the rapid pit proposal. Please address. |
| | **NMCC Response** | | *The representations made by NMCC in its October 13, 2017 amendment to the MORP indicating that it does not propose to place reclamation materials below the waterline of the future pit lake are correct. The SRK Report has been revised to reflect this. Because the proposed rapid filling of the pit will occur within 6 months of the end of mining the length of time that the exposed surface area before submerging will be very short and, therefore, not available for leaching. Placing cover in the submerged area will not assist with reclamation prior to inundation as postulated by MMD.* |
| MMD Comment 9 | General | Model Run to predict existing pit lake chemistry over 100 years | Please utilize the calibrated PHREEQC model to predict the pit lake chemistry for the small pit lake that currently exists at the Copper Flat site. The model for the existing pit lake should utilize the same time steps used in the future pit lake model. Please provide comments/discussion on the results and compare them to the model results for the future pit lake. |
| | **NMCC RESPONSE** | | *Per MMD's request, NMCC will provide the model run for the existing pit lake under separate cover and not incorporated into the SRK report. NMCC believes that the purpose of performing this analysis should be viewed, in effect, as a "no action" alternative analysis. While it may allow some comparison to be made between projected water quality and quantity of the existing pit lake over 100 years and the proposed future pit lake after mining, However, the results of this analysis have little to no bearing on the chemistry predicted for the future pit lake.* |

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| MMD Comment 10 | Figures 5-1 and 6-1 | Conceptual model parameters | Figure 5-1 and 6-1 show different rates of evaporation, direct precipitation, pit wall run-on, etc., and a different final pit lake elevation. Please explain the differences between the values presented in these two figures. |
| | **NMCC Response (Cont.)** | | *The two figures illustrate the projected pit water balance 100 years post-mining, for the un-reclaimed pit without rapid fill (Figure 5-1) and the reclaimed pit with rapid fill Figure 6-1). The values represented in these figures are averages over the 100-year period and, therefore, represent different ranges of values over time in each scenario. These differences between the two water balances include:*<br>• *Pit lake elevation is eight feet lower in Figure 5-1 than in Figure 6-1 because it takes longer than 100 years to reach the equilibrium stage in the un-reclaimed pit model with natural fill.*<br>• *Direct precipitation is a lower minimum value in Figure 5-1 because in the natural fill case direct precipitation onto the pit water body is very low while the size of the water body is small and increases over time as the lake size increases. This results in a lesser maximum volume than that shown in Figure 6-1 over 100 years. Similarly, direct precipitation has a lower maximum for the natural fill case because the final water level is lower, thus the lake is smaller and direct precipitation on the water surface is less. In Figure 6-1 the direct precipitation values are higher because the pit lake water is fully formed in six months resulting in a larger surface area for direct precipitation and the surface area of the water body is slightly larger at the end of 100 years.*<br>• *Evaporation is lower in Figure 5-1 for the natural fill case because the pit starts out empty (evaporation zero), as compared to Figure 6-1 because the pit water body is filled within six months of end-of mining, and because in the natural case the pit lake has not filled completely in 100 years.*<br>• *The contribution to groundwater inflow is higher in Figure 5-1 for the natural fill case because the pit water level is lower than the rapid fill case.*<br>• *Pit-wall and haul road runoff is different for the two cases because reclamation takes place in the Figure 6-1 case providing more runoff control whereas in the Figure 5-1 case there is a larger pit un-reclaimed catchment area over time due to lower water level and, therefore, more area above the water line contributing to runoff.* |

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| MMD Comment 11 | | Other Agency Comments | Agency Comments are attached and shall be addressed in writing. |
| | **NMCC Response** | | *NMCC's responses to agency comments are included below* |
| NMOSE Comment 1 | General Comment | | I (Eric Keyes, OSE Hydrologist) have reviewed the December 12, 2017 report "Probable Hydrologic Consequences of the Copper Flat Project Sierra County New Mexico," authored by John Shomaker & Associates (JSAI). I do not have any objections to the report technical content. The report addresses and adheres to a concern made by myself for the Hydrology bureau at the Office of the State Engineer (OSE) when reviewing the EIS model. I agree with JSAI on the methodology on the treatment of mine pumping impacts on the general head boundary on the northern portion of the Palomas Graben and how those impacts relate to impacts on the Rio Grande. Other calculations in the JSAI report that are outside of the numerical model such as potential tailings liner leakage and the estimation of potential land subsidence look reasonable. In any kind of modeling as new information becomes available, the modeling can change. At present, this is the best available tool in the determination of mine impacts. |
| | **NMCC Response** | | *New Mexico Copper appreciates the efforts of the OSE in its review of these reports and looks forward to working with the State Engineer as we proceed to permit approval.* |
| NMDG&F Comment 1 | General Comment on SRK Report | Uncertainty of Model Predictions | The modeling report concludes that "…changes to the hydrologic balance of the future pit water body that will form post-mining will be nil or minimal and the water quality will be very similar to that of the existing pit lake". The Department believes that the geological and hydrological complexities and inherent uncertainties make accurately predicting future pit lake water quality difficult. We believe that some type of mitigation strategy should be in place and implemented if pit lake water quality degrades to the point where it becomes hazardous to wildlife. The modeling efforts are limited to projecting pit lake water quality for 100 years. However, the pit lake will persist "in perpetuity", and the time span over which over which the water quality can deviate from pre-mining conditions can be on the order from hundreds to thousands of years. |

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| | **NMCC Response** | | *NMCC acknowledges NMDG&F's recognition of the geological and hydrological complexities and inherent uncertainties of the analyses that it has presented. The Departments' concerns notwithstanding, NMCC is confident of its predictions, in particular with respect to modeling for 100 years. New Mexico's mine reclamation and water quality protection regulations, and the permit approvals obtained therefrom, contain sufficient mitigation strategies to provide the protections conceived within the reasonable timeframe. Specifically, the MMD regulations require that NMCC's reclamation plan be designed to ensure that a self-sustaining ecosystem be established without perpetual care. Please note that the MMD will*<br>*Require that NMCC perform monitoring of site conditions to verify the results of the modeling. The agency may require mitigation action of NMCC should it be determined necessary per regulatory requirements. NMCC's response to MMD Comment no. 1, above, contains NMCC's proposed monitoring program.* |
| NMDG&F Comment 2 | General Comment on SRK Report | Predicted evaporation rates & climate change | The Department also questions the also questions the predicted rate of evaporation that will concentrate chloride, sulfate, total dissolved solids (TDS) and trace elements in the pit lake over time, and may eventually lead to water quality conditions that deleterious to wildlife. The current model appears to rely on historic climate data to predict the rate of evapoconcentration. The modeling should consider projected future climate regimes that would provide a plausible range of possible pit late water quality outcomes. A hotter and drier climate for the region could result in substantially higher rates of evapoconcentration. |
| | **NMCC Response** | | *See NMCC response to MMD comment No. 1, above. Additionally, NMCC believes that it is inappropriate to take an oversimplified view of postulated effects of global warming, as local climate trends may be complex. The climate models do not provide clarity on predicting local climate conditions, therefore the best scientific method for water models is to rely on the longest period of record from local climate data that provides a reasonable bracket of climate conditions, such as the 1950s drought and the late 1980s wet period. Based on the Hillsboro meteorological data and the Penman Monteith ET0 formula, an increase of 2 degrees Centigrade would result in an annual evaporation increase of 2 inches per year, a minor change. Assumptions regarding the future changes in precipitation are speculative.* |

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| NMDG&F Comment 3 & 4 | General Comment on SRK Report | Alternative features to attract wildlife away from the pit lake | The proposed rapid fill reclamation scenario uses clean water from the production wells to achieve higher initial water quality of the pit lake. This approach informed the Department's previous comments to MMD regarding pit reclamation in the Mining Operations and Reclamation Plan to improve the value of the pit lake for wildlife habitat. These recommendations involved modifications to the high wall to create ledges and cavities, and modifications to the Expanded 4900 Catch Basin to create a shallow littoral zone for aquatic plants. Because the pit lake is anticipated to exist in perpetuity and accurately predicting water quality and associated hazards to wildlife for that duration is questionable, the Department no longer supports creating features that may attract wildlife to the pit lake. Alternatively, we suggest installing clean water sources, such as impermeable rainwater catchment drinkers, that would attract wildlife away from the pit lake area. The Department also recommends additional modifications to the pit shell area that are designed to mitigate the impacts of periodic wall seep events on the pit lake. |
| | **NMCC Response** | | *See NMCC response to MMD comment No. 1, above. Additionally, as indicated in NMCC's previous responses to the Department's comments, NMCC will work with the Department in a reasonable manner to address its concerns, including consideration of developing water retention features such as swales and shallow ponding areas in reclaimed areas away from the future pit lake.* |
| NMDG&F Comment 5 | General Comment on JSAI PHC Report | Effects of pumping on reaches of perennial flow | The Department's primary concern remains the reaches of perennial flow and riparian habitat along Las Animas and Percha Creeks. These areas may be affected by the cone of depression caused by the pumping of production wells in the Santa Fe Group (SFG) aquifer. |
| | **NMCC Response** | | *See NMCC response to MMD comment No. 1, above. Additionally, the Department's concern notwithstanding, NMCC believes that the analysis presented by NMCC and its hydrology consultants adequately demonstrates that there will be no significant effect on perennial flow and riparian habitat along Las Animas and Percha Creeks.* |

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| NMDG&F Comment 6 | Page 20 JSAI PHC Report | Riparian habitat for Arizona Sycamore along Las Animas Creek | The Department is particularly concerned about the riparian habitat along Las Animas Creek. This habitat is located less than one mile north of the production wells and supports the northernmost riparian forest dominated by Arizona Sycamore (Platanus wrightii) trees. The JSAI report states on page 20 that:<br>"the increased transmissivity of the SFG results in water levels dropping below the bottom of the alluvium, forming a hydrologic disconnection between the SFG aquifer and the alluvial groundwater system. As a result, water flows from the alluvium to the SFG, through low-permeability clay beds, only by gravity; pumping from the SFG does not increase the flow or change water levels in the alluvium."<br>The JSAI report projects "non-measurable small changes in surface flow and riparian evapotranspiration" based on the presence of the low-permeability clay beds that minimize effects to shallow groundwater. It is unclear to the Department whether these changes are considered to be non-measurable relative to a range of normal or average flows, or whether withdrawals would create disproportionately greater reductions in surface water levels during low-flow periods. |
| | **NMCC Response** | | *See NMCC response to MMD comment No. 1, above. Additionally, the model does not independently simulate streamflow, but rather includes flow (groundwater inflow and recharge) into the alluvial system and evapotranspiration from the riparian area. This is similar to the description of Las Animas Creek by Davie and Spegiel (1967) in which they stated "the stream plus the adjoining shallow aquifer is called a water course." Most of the temporary reduction in flow into the alluvial system will be manifested as a reduction in evapotranspiration, rather than a reduction in stream flow. The model-simulated changes are non-measurable because they are such a small part of the system water balance, and because they are temporary. Furthermore, the model is conservative by assuming a hydraulic connection between the Las Animas alluvial system and the underlying Santa Fe Group west of MW-11 to the Animas uplift. The model may be overstating the reduction in flow to the alluvial system. The water budget for perennial segments of Las Animas Creek is more significantly influenced by inflow from snowmelt runoff, and infiltration of storm water runoff events than by groundwater inflow from the Santa Fe Group aquifer. Any above-average snowmelt or storm runoff event will mask the model-simulated reduction of inflow from SFG groundwater. Likewise, just one irrigation well pumping from the alluvial aquifer, such as those on Ladder Ranch and other locations along Animas Creek, will obscure smaller potential effects to streamflow.* |

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| | **NMCC Response (Cont)** | | *Maximum model simulated change in Las Animas Creek evapotranspiration and flow reduction is 18 ac-ft./yr. (0.025 cf.). Water-level monitoring in the alluvial aquifer has shown seasonal changes of more than 10 ft. (INTERA, 2012), which would make it difficult to identify a smaller effect of less than 1 ft. Detecting the effect would require water-balance measurements to three significant digits. This would be impossible, particularly when the largest stress on the alluvial system (irrigated agriculture) is unmetered and ongoing.* |
| NMDG&F Comment 7 | General Comment on JSAI PHC Report | Report findings re: limited hydraulic connection between SFG & alluvial aquifer | The Department is dubious that the report's findings of limited hydraulic connection between the SFG and the alluvial groundwater system provide sufficient security and mitigation to preclude impacts to wildlife habitats from drawdown of groundwater levels. The Department requests clarification of what contingencies, if any, would be in place if the hydraulic connectivity between the SFG and alluvial groundwater system proves to be greater than predicted, and results in adverse impacts to perennial flow and riparian habitat along the lower Animas Creek. |
| | **NMCC Response** | | *See NMCC response to MMD comment No. 1, above.* |
| NMED SWQB Comment 1 | PHC General Comment | PHC Report Model | The Probable Hydrologic Consequences of the Copper Flat Project, New Mexico "were evaluated using a numerical model developed from the USGS groundwater-flow modeling code MODFLOW. The model is well calibrated, reproduces measured data, and demonstrates an evaporative sink for the open pit lake, such ate the pit lake water ae not mixing with subsurface waters. |
| | **NMCC Response** | | *NMCC appreciates NMED's recognition of the modeling efforts of NMCC and its' consultants. We look forward to a positive working relationship with the Department as we proceed to permit approval and operation.* |
| NMED SWQB Comment 2 | PHC General Comment | Monitoring Plan | The SWQB urges demonstration that sufficient and robust monitoring plans are in place that assure the pit lake remains an evaporative sink under future climatic conditions to confirm model predictions and ultimately protect surface and ground waters. |
| | **NMCC Response** | | *See NMCC response to MMD comment No. 1, above.* |

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|---|---|---|---|
| NMED SWQB Comment 3 | PHC General Comment | Potential hydrologic consequences to perennial flows | The SWQB has concerns regarding the potential hydrologic consequences to perennial flows in Las Animas Creek and Percha Creek. Surface water in the Chihuahuan Desert, and the semi-arid southwestern United States in general, is a vital resource for numerous species including humans. The report indicates that, "effects on shallow groundwater (riparian) systems along Las Animas Creek and Percha Creek are projected to be minimal, with a maximum of less than 2 ft of groundwater-level change on Percha Creek, less than 1 ft of groundwater-level change on Animas, and non-measurable small changes in surface flow and riparian evapotranspiration." The SWQB is concerned with the "non-measurable small changes in surface flow." Non-measurable can be significant when one is talking about creeks that are less than a foot deep. Given the current low baseflow conditions in Las Animas Creek and Percha Creek, any reduction or drawdown in the shallow groundwater that feeds them would likely reduce surface flows and potentially eliminate surface waters and aquatic habitat in certain reaches that are currently wet, which would cause additional stress and impairment to the aquatic community. |
| | **NMCC Response** | | *See NMCC response to NMDG&F comment No.6, above. Also, note that the model simulated effects on Percha Creek occur on the alluvial system where there is no perennial streamflow, therefore no effect on streamflow. The effect on evapotranspiration is proportionally small and would not be measurable.* |
| NMED MECS General Comment 1 | PHC Comment | Report Emphasis | During the review, an emphasis was placed on the end of mining drawdown in the bedrock aquifer around the open pit, i.e., the cone of depression, the evaluation of the extent to which the open pit will form an evaporative sink in the future, and on the potential for discharges from the tailing and waste rock stockpiles. |
| | **NMCC Response** | | *No response to this comment is necessary from NMCC* |
| NMED MECS General Comment 2 | PHC Comment | Post-mining open pit hydrologic sink | MECS concurs with the conclusion by Copper Flat that the post-mining open pit will result in a perpetual evaporative sink and has confidence in the prediction. MECS will require monitoring of the water levels in wells surrounding the open pit during and following mining to ensure that the prediction is correct. |

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| | **NMCC Response** | | *NMCC appreciates MECS' concurrence and confidence in NMCC's analysis. Appendix E of NMCC's Discharge Plan application contains the proposed monitoring program required by NMED. In addition, NMCC has provided a proposed monitoring program per MMD reuest (see NMCC response to MMD comment no. 1).* |
| NMED MECS General Comment 3 | PHC Comment | Impacts to groundwater chemistry from infiltration | MECS concurs with Copper Flat that the impact to groundwater chemistry should be minimal, and that net-percolation from the tailing areas is not expected, however questions the interpretations of infiltration into the cover system, the properties of the cover materials and waste rock and ultimately the net-percolation from the waste rock storage areas. A detailed comment is included in the Specific Comments. |
| | **NMCC Response** | | *NMCC appreciates MECS' concurrence in NMCC's analysis with regard to the TSF. MECS' questions noted in this comment have been evaluated by NMCC and its consultants and offers responses as appropriate below.* |
| NMED MECS General Comment 4 | PHC Comment | Groundwater Model Predictions | MECS also reviewed the modeling and predictions regarding the water-level drawdown in the SFG aquifer as well as the evaluation of the discharge to the Ro Grande. Considering the overall conceptual model, the conventional mathematic modeling approach, the ability to recalibrate the model following the initiation of mining, and the long-term nature of the predictions, MECS concurs with the model and predictions to date, Since the prediction are extended out to a date exceeding the capability of our current understanding of the system, and past capabilities of a predictive model, it is recommended that a re-calibration and evaluation of the system occur at a regular interval as impacts in wells are observed following initiation of mining. |
| | **NMCC Response** | | *NMCC appreciates MECS' concurrence and confidence in NMCC's groundwater model analysis. NMCC has provided a monitoring plan in response to MMD comments (see NMCC Response to MMD Comment No. 1) which we believe will establish the basis for re-calibration and evaluation of the system per MECS' recommendation.* |
| NMED MECS Specific Comment 1 | PHC Comment | "tailing" vs "tailings" | Copper Flat should revise the documents with the correct spelling of the word "tailing". The words tailing and tailings are often misused, even within the industry. For example, a facility has tailings in their ponds if the milled ore was from multiple sources, facilities, ore types or operations. |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| | **NMCC Response** | | *"Tailings" is a commonly accepted term that has been utilized by the mining industry for many years. NMCC is unaware of the distinction made by the MECS and respectfully chooses to continue to use the term "tailings" in order to avoid confusion.* |
| NMED MECS Specific Comment 2 | PHC Comment | Surface infiltration vs net-percolation | MECS requests that Copper Flat clarify the language regarding the water balance to differentiate between surface infiltration and net-percolation. Water that infiltrates into the cover or waste material has the potential to evaporate, be transpired, remain in storage or percolate down past the influence of evaporation and transpiration (net-percolation). To predict the water and gas flux to and from the atmosphere, this distinction in both a conceptual and a physical model must be considered. |
| | **NMCC Response** | | *The probable hydrologic consequences presented in the PHC for operation and reclamation of the Waste Rock Stockpiles are related to the potential for infiltration through the cover, through the waste rock, and to groundwater. NMCC concurs with MECS' proposition that water that infiltrates into the cover or waste material has the potential to evaporate, be transpired, remain in storage or percolate down past the influence of evaporation and transpiration. That component of "surface infiltration" can be said to be "net percolation". The PHC was prepared with those concepts in mind and were considered in developing the Mine Operations and Reclamation Plan that was also submitted to NMED as a supplement to the Discharge Plan application. Section 3.3.2 of the PHC has been revised where appropriate to add clarity per NMED's comment.* |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| NMED MECS Specific Comment 3 | PHC Comment | Net-percolation through waste rock to groundwater | MECS agrees that the impact to groundwater chemistry is likely to be minimal in part due to precipitation patterns, the low permeability of the underlying andesite, and the geochemical characteristics of the waste rock. MECS disagrees with the conclusion that net-percolation to groundwater from the waste-rock storage areas is not expected. The evaluation presented is rudimentary at best and not appropriate for an evaluation of water and evaporative flux within a waste rock cover system and waste rock waste rock stockpile. In addition, the numbers are inconsistent with predictions from other mine sites with similar rainfall and evaporative regimes. Specifically, the evaluation results in precise number without an error evaluation and without any supporting science. The evaluation does not include waste or cover material property information other than a number for the field capacity of the waste and associated reference. The references document (JSAI, 2011) does not discuss or present the field capacity or have a discussion of the material properties of the waste rock. The evaluation dos not rely on the an industry standard Richards Equation based approach, not does it account for redistribution or preferential flow and is not able to describe water or gas flow in an unsaturated material. The evaluation does not couple gas and water flux and has no mechanism to evaluate actual evaporation based on the soil potential and humidity of the pore gas. While potentially insignificant in this semi-arid climate, the evaluation does not have a realistic mechanism of representing transpiration from plants.<br>The draft DP-1840 requires groundwater monitoring, implementation of a material handling plan to limit production of acid rock drainage, construction of seepage interceptor systems at the toe of the waste rock stockpile, and development of soil water characteristic curves for reclamation cover material. If necessary, based on the information acquired during initial phases of mining MECS may require a more rigorous quantitative evaluation of the potential for impacts to groundwater from the waste rock. |
| | **NMCC Response** | | *NMCC appreciates that NMED agrees that the impact to ground water chemistry is likely to be minimal in part due to precipitation patterns, the low permeability of the underlying andesite and geochemical characteristics of the waste rock. NMCC and is consultants have provided significant evidence to that effect in the many documents provided in support of its DP application. MECS' disagreement with the conclusion that net-percolation to ground water from the waste rock is not expected is misplaced considering the data that NMCC has provided previously in this regard as discussed in more detail below. Regarding the concern with the calculation of net percolation through the waste rock storage area (PHC report section 3.3.2;* |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| | **NMCC Response (Cont.)** | | *JSAI, 2017), MECS appears to differentiate its concern in this regard between the potential for net-percolation to reach ground water during the operations phase of the project, i.e., while the WSRP is not covered, and the post-closure phase, after reclamation. Clearly, NMCC's proposed placement of a three foot cover over the WRSP as required by the Copper Rules addresses MECS's regulatory concerns after reclamation. NMED appears to have an incorrect interpretation of the requirements of 20.6.7.21 with regard to a purported requirement of an aquifer evaluation. Subsection 20.6.7.21.B.(1)(d)(vii) of the regulation requires an aquifer evaluation per 20.6.7.B.(1) "unless the applicant or permittee demonstrates through material characterization or implementation of a material handling plan pursuant to subsection (A) the waste rock will not cause an exceedance of applicable standards". The standards are applied at the ground water source they are to protect, in this case, ground water in the andesite. NMCC has demonstrated with its considerable material characterization studies conducted by SRK and has provided a material handling plan as part of its DP application. NMCC has provided ample evidence that net percolation of water through the waste rock material will not result in the water quality standards being exceeded during the operations phase, thus providing the data needed to demonstrate compliance with the regulations. An aquifer evaluation is not required because the requirements of Subsection 20.6.7.A have been met. The PHC was not submitted to NMED for the purpose of meeting Subsection 20.6.7.21.B.(1)(d)(vii) of the Copper Rules. It was submitted to the MMD to complete the requirements of the Mining Act regulations. The PHC analysis is designed to meet the requirements of NMAC 19.10.6.602.(13)(g)(v), of the NM Mining Act regulations that require a PHC as part of its Baseline Data Report. The analysis and conclusions are based on numerous studies and referenced reports such as the Stage 1 Abatement (JSAI, 2013), NMED Discharge Permit Application (THEMAC, 2017), the Groundwater Model, (JSAI, 2014), the BLM Draft Environmental Impact Statement; BLM DEIS, 2015) and others, all referenced in NMCC's Discharge Plan (DP) Application and Mining Operation and Reclamation Plan (MORP submittals to NMED and MMD. As such, there has been an exhaustive analysis of the Copper Flat mine plan with many of the reports building on the next. Therefore, many of the answers to agency comments are embedded in other referenced reports. NMCC believes that references regarding such comments as "[T}he evaluation presented is rudimentary", the evaluation results in precise number without an error evaluation and without any supporting science",* |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| | **NMCC Response (Cont.)** | | *"[T]he evaluation does not rely on an industry standard Richards Equation based approach does not account for redistribution or preferential flow and is not able to describe water or gas flow in an unsaturated material", result from a lack of familiarity with the complete set of the many documents at have been submitted previously. The probable hydrologic consequences presented in the PHC for operation and reclamation of the Waste Rock Stockpile are related to infiltration through the cover, infiltration through the waste rock, and infiltration to groundwater. JSAI has revised Section 3.3.2 of the PHC to further discuss the rationale utilized to assess the potential for net infiltration through the WRSP material, to the andesite and whether or not the potential exists for net percolation to penetrate the andesite and impact ground water beneath the WRSP during the 12 year operation of the mine. NMCC acknowledges the requirements in the draft DP, including groundwater monitoring, implementation of its material handling plan, construction of the interceptor systems at the toe of the WRSP and development of soil/water characteristic curves for reclamation cover material, and is committed to meeting those requirements.* |
| NMED Additional Comment 1 | General | Additional Model runs | The updated model runs now assume two possible scenarios to pit infilling after mine closure. Scenario 1 is the unreclaimed fill scenario wherein the pit mine is allowed to re-fill naturally from area ground water seeps exposed during mining. Scenario 2 is amending the natural infilling with "good quality" ground water from supply wells used during mining. The latter scenario is predicted to reduce groundwater contact with oxidized pit wall minerals, thus reducing mobilization of metals and acid generating reactions. However, during a presentation of the updated and refined pit lake model, It appeared that part of the improvement to water quality under the reclaimed "rapid fill" scenario might be allotted to vegetative (or other) reclamation techniques to the pit void and haul road that would be under water in the refilled pit. It is unclear to the SWQB whether these terrestrial reclamation practices would enhance pit water if inundated by pit infilling, whether natural or rapid. A model run that only allows for terrestrial reclamation practices that improve water quality (above the predicted water line of the future pit lake) for both scenario 1 and 2 would be appropriate to make a valid comparison of the two possible closure plans. |

## Agency Review of Updated MORP

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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| | **NMCC Response** | | *MMD's comment no. 8, above, is similar to this NMED comment. As indicated in NMCC's response to MMD comment no. 8, the representations made by NMCC in its October 13, 2017 amendment to the MORP indicating the it does not propose to place reclamation materials below the waterline of the future pit lake is correct. The SRK Report has been corrected to reflect this, including a model run consistent with proposed MORP reclamation.* |
| NMED Additional Comment 2 | General | Monitoring | Groundwater chemistry and hydrologic monitoring of the aquifer after open-pit mining has been terminated should be conducted to confirm the geochemical simulation quantified by PHREEQC. Groundwater monitoring at Copper Flat, however, is essential under current and future conditions. Additional simulations using PHREEQC are warranted in the future during mining operations, especially if changes in water chemistry, mineralogy, groundwater flow regime, and climatic conditions take place and vary from predicted conditions. No geochemical model or simulations are entirely perfect and uncertainties exist, especially for predicting future aqueous compositions, mineralogical assemblages, and other water-rock inteactions occurring at mine sites. |
| | **NMCC Response** | | *NMCC has prepared a proposed monitoring plan for this purpose (see NMCC's response to MMD comment no. 1, above).* |
| NMED Additional Comment 3 | General SRK Report | | Weakness or experimental gaps in thermodynamic data (MINETEQV4), serving as the basis for calculating aqueous speciation, mineral-solution equilibrium, and adsorption, are adequately presented in the SRK Inc. report. This discussion is important to the reader because geochemical modeling contains varying uncertainties and multiple hypotheses can be tested by performing numerous simulations with different constraints placed on the "model system". |
| | **NMCC Response** | | *NMCC appreciates NMED's acknowledgement of the quality of the SRK Report.* |
| NMED Additional Comment 4 | General PHC Report | Rapid Fill proposal | The post mining, rapid-pit fill is as optimal remediation strategy to significantly decrease acid rock processes by neutralizing acidic conditions in the pit lake during filling and steady-state conditions anticipated to occur in the long-term (100 years after post-mining operations). Groundwater pumping from two water supply wells has a sufficiently high total carbonate alkalinity (average value of 111 mgCaCo3/L, Appendix E) to maintain circumneutral pH conditions in the future pit lake at Copper Flat. The average pH of the two groundwater samples is 8.03. Higher bicarbonate alkalinity values (259 mgCaCo3/L, 316 mg/L, of HCO3) are reported for the other water supply wells. |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| | **NMCC Response** | | *NMCC concurs with NMED's conclusion.* |
| NMED Additional Comment 5 | General PHC Report | Water Balance | NMED agrees with the previous revisions to the water balance calculation provided by John Shoemaker & Associates, Inc. (JSAI), as evapo-concentration is the primary process controlling solute concentrations that influence mineral equilibrium and adsorption processes at the site. The new water balance calculations provide by JSAI improved model calibration for PHREEQC simulations under existing pit-lake conditions. |
| | **NMCC Response** | | *NMCC appreciates NMED's concurrence and recognition of the improvements made.* |
| NMED Additional Comment 6 | Figure 6-18 PHC Report | Monitoring | Figure 6-18 presents a trilinear or Piper diagram for both existing measured pit lake chemistry and future chemistry of the larger pit like, suggesting that the future pit lake will be more uniform in major ion composition. This figure most likely assumes that the future pit lake is homogeneous in chemical composition in lateral and vertical dimensions, but it may change as a function of evapo-concentration of solutes under heterogeneous conditions. Monitoring of the future pit lake should confirm its major ion trace metal composition as functions of depth and surface location. |
| | **NMCC Response** | | *Section 5.6 of SRK's report discusses the potential for future pit lake stratification. The future pit lake is expected to be well mixed, oxygenated, and not acidic, although seasonal stratification may occur as suggested by Figure 6-18.* |
| NMED Additional Comment 7 | Table 4-3 PHC Report | Discrepancies in solute concentrations | Table 4-3 shows that mean concentrations of numerous measured solutes differ from those determined from PHREEQC simulations, however, they are generally within the range of measured solute concentrations. This suggests that the PHREEQC simulations are approximate for existing pit lake chemistry and model calibration is not perfect for antimony, arsenic, barium, boron, cadmium, chloride, fluoride, iron, lead, and molybdenum. A more detailed discussion need to be provided in the text explaining discrepancies in solute concentrations that are controlled by a combination of adsorption/desorption and mineral precipitation/dissolution processes. |
| | **NMCC Response** | | *The SRK Report has been revised at Section 4.6 to provide the discussion requested. Some of the limitations in thermodynamic database (which affect mineral precipitation and adsorption processes) are also discussed in Section 3.8, therefore, a cross-reference to this section to direct the reader to this discussion.* |

## Agency Review of Updated MORP

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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| NMED Additional Comment 8 | Humidity Cell Data SRK Report | Use of Maximum vs Average Values | Average solute concentrations obtained from humidity cell tests (HCT) were used as input to the PHREEQC simulations. Use of maximum values of solute concentrations, however, would provide the most conservative or worst-case scenarios of the modeled geochemical processes quantified by PHREEQC and would capture or reduce uncertainty in the simulations. Additional PHREEQC simulation using maximum solute concentrations obtained from HCT should be performed by SRK Inc to more accurately bound model uncertainties in the future (100 years post-mining activities). |
| | **NMCC Response** | | *The use of average solute release rates from the humidity cell test is supported by the calibration model for the existing pit lake (Section 4), which showed that the majority of parameters can be predicted with a good degree of accuracy when average release rates are used. Maximum solute release rates are typically only observed at the start of the humidity cell test during the initial flush (see Figure B-2 of SRK revised report) and are not sustained for a significant period of time. Therefore, using the maximum solute release rates would bias the predictions towards this initial flush, which is not representative of likely longer-term chemistry. Furthermore, the modeling effort was designed to provide the most likely scenario, rather than the upper and lower bound that are not at useful when evaluating potential impacts.* |
| NMED Additional Comment 9 | Figures 5-6 through 5-16 | Existing vs. Future concentrations | Suggested revision 2 also has relevance to Figures 5-6 through 5-16. These figures should be separate apart from each other, one set showing existing (measured) concentrations versus modeled concentrations and another set for post-closure conditions of the larger pit lake that will be present at Copper Flat. This is a scaling issue with the smaller existing pit lake and the much larger future pit lake that is part of the PHREEQC simulations. A more detailed geochemical discussion is warranted for Figures 5-6 through 5-16 evaluation mineral precipitation/dissolution (major cations and bicarbonate) and solute adsorption/desorption (arsenic and other oxyanions and cations). Time series plots for the existing pit lake show large variations in total dissolved solids (TDS) and major cations and anions, which support further refinement or calibration of existing and future conditions using PHREEQC. |
| | **NMCC Response** | | *Figures 5-6 to 5-17 and Figures 6-5 to 6-16 of the SRK report have been revised to show only predicted constituent concentrations in the context of the minimum, maximum, and average measured values in the existing pit lake. Section 5.7 has been revised to provide more detail regarding mineral precipitation/adsorption reactions.* |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| NMED Additional Comment 10 | SRK Report General | Sodium use to achieve zero percent charge balance error | Charge balance errors of zero were achieved for the different simulated aqueous solutions by stipulating that sodium was added to achieve perfect electroneutrality (zero percent charge balance error) by presence of excess anions such as chloride, sulfate, and total carbonate alkalinity. A discussion on this stipulation should be added to the report. Addition of sodium will influence mineral saturation index calculations by causing a positive bias in saturation indices values foe sodium-rich silicates, carbonates, and sulfates. |
| | **NMCC Response** | | *Section 5.5.3 of the SRK report has been revised to include the following in response to NMED's comment; "In order to maintain charge balance, the solutions were balanced by adjusting the concentration of a conservative ion (either chloride or sodium) which have a low potential to influence model outcome."* |
| NMED Additional Comment 11 | SRK Report General | Surface area value used for FeOOH | Surface complexation modeling using PHREEQC was performed by SRK, Inc., including the adsorbent, ferrihydrite (general formula of FeOOH) to quantify removal of major cations and anions and trace elements from solution. What specific surface area value of ferrihydrite was used during the PHREEQC simulations? The default surface area for ferrihydrite is 600m^2/g. If this surface area value was not used in the PHREEQC simulations, justification for the alternate value should be provided. |
| | **NMCC Response** | | *The pit lake simulations used the default surface area of 600 $m^2$/gram quoted by Dzombak and Morel (1990). However, the number of surface sited is based on an equilibrium definition (i.e., moles of ferrihydrite precipitated during the previous time step). The value of 64200 is calculated based on the surface area (600 $m^2$/g)multiplied by the molar mass of Fe(OH), (107 moles).* |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| NMED Additional Comment 12 | SRK Report Table 3-2 | Observed phases of minerals | Table 3-2 in the report provided a list of equilibrated phases included in the pit lake geochemical simulations. Observed phases included alunite, barite, brochantite, calcite, ferrihydrite, fluoride, gypsum, mirabilite, and NiCO3. Numerous other minerals were included in the PHREEQC simulations that did not reach equilibrium conditions because different solutions are undersaturated with respect to the phases. Additional PHREEQC simulations should be performed only using the observed phases. Many of the phases hypothesized to occur at Copper Flat have no influence on water chemistry because there is no mass of these minerals precipitated from solution, as shown in PHREEQC output. Precipitation of the additional minerals is negligible at Copper Flat. The additional minerals that are not observed at the site should to be removed from the input files and new PHREEQC simulation should to be conducted by SRK, Inc. |
| | **NMCC Response** | | *Any mineral phases that were not observed in the SRK Copper flat mineralogical studies were removed from the PHREEQC code and the models were re-run. Removal of these phases did not significantly affect the predicted chemistry. There were minor increases in predicted arsenic, cadmium, and lead concentrations, but these increases were not sufficient to change the overall conclusions of the model.* |
| NMED Additional Comment 13 | SRK Report General | Phosphorous and silica phases | Phosphorous-bearing and silica phases were included in the PHREEQC simulations. However, PO4 and silica were not analyzed in the water samples. Phosphorus-bearing and silica phases should not be included in the PHREQC simulations. |
| | **NMCC Response** | | *Phosphorous and silica-bearing phases have been removed from the PHREEQC simulation and the models have been re-run. Removal of these phases did not affect the predicted chemistry.* |
| NMED Additional Comment 14 | Figure 6-17 | Evolutions of observed and modeled compositions | A discussion on the geochemical evolution of observed and modeled compositions of the present and future pits, shown in Figure 6-17 in terms of pH and Cu + Cd + Co + Pb + Ni + Zn would be useful to the reader. |

| Agency Review of Updated MORP | | | |
|---|---|---|---|
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| **Item #** | **Section/Page (or general)** | **Topic** | **Comment** |
| | **NMCC Response** | | *Section 6.6 of the SRK report has been revised to include the following; "Ficklin metal concentrations are predicted to evolve and increase over time as a result of evaopconcentration effects. This evolution chemistry is similar to the trends observed in the existing pit lake; however, for the future reclaimed pit lake, water chemistry is predicted to remain in the 'near-neutral, low metal' classification for all model time steps."* |
| Additional MMD RFI May 2018 | | Other Permits ID & Schedule | MMD would like for NMCC to provide MMD evidence that all other applicable state and federal permits required to be obtained… have been or will be issued before the activities subject to those permits begin as required 19.10.6.606.B. NMAC |
| | **NMCC Response** | | *NMCC has provided herewith an updated list of federal and state permits/approvals that will be obtained for the Copper Flat Project. Please note that NMCC provided such a list in its July 18, 2012 PAP (see Section 3.7). Section 19.10.606.B.(2) NMAC requires that the Director find that NMCC has provided evidence that all other applicable state and federal permits required to be obtained either have or will be issued before activities subject to those permits begins. Section 19.10.606.A provides that the Director may issue a permit subject to conditions necessary to meet the requirements of the Act and 19.10 NMAC. As such, NMCC believes that the MMD has the authority to issue NMCC its mine permit conditioned upon obtaining the required permits. There is ample president for this action as state and federal agcncies commonly condition final approval based on obtaining all other required permits.* |