STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION

In the Matter of:	)	
PROPOSED AMENDMENT TO 20.6.2 NMAC (Copper Rule)	)	**No. WQCC 12-01(R)**

WRITTEN REBUTTAL TESTIMONY OF JAMES C. SCOTT

My name is James C. Scott, and I am a Principal Geotechnical Engineer with URS. I am presenting this written rebuttal testimony on behalf of Freeport-McMoRan Chino Mines Company, Freeport-McMoRan Tyrone Inc., and Freeport-McMoRan Cobre Mining Company (collectively, "Freeport") regarding the Petition to Adopt 20.6.7 NMAC and Request for Hearing filed by the New Mexico Environment Department ("NMED") on October 30, 2012, as modified by the Amended Petition filed on February 18, 2013, which includes the new rules for copper mines ("Proposed Rules"). My experience and qualifications are presented in my written direct testimony previously filed in this matter.

I. REBUTTAL TESTIMONY IN RESPONSE TO THE DEPARTMENT'S AMENDED PETITION DATED FEBRUARY 18, 2013

I have reviewed the revisions to the Proposed Rule language presented in the Department's Amended Petition dated February 18, 2013 and have no additional comments and testimony. Other witnesses on behalf of Freeport will present additional comments and testimony on some of the changes contained in NMED's Amended Petition.

II. REBUTTAL TESTIMONY IN RESPONSE TO WRITTEN DIRECT TESTIMONY OF MR. ADRIAN BROWN

I have reviewed the direct written testimony submitted by Mr. Adrian Brown. While I generally agree with Mr. Brown's testimony, I want to provide two comments regarding his direct testimony. First, on page 16 of his testimony, Mr. Brown discusses embankment failure and uses a calculation. It is my opinion that the calculation shown on page 16 should be revised to read FOS = Tan(35º) / 0.47 = 1.5 as Φ is the friction angle, not the slope angle. Second, Mr. Brown discussed seepage flow on page 26, Table 4; page 27, Table 5; and page 28, Table 6, and groundwater flow capacity on page 30, Table 7. Darcy's Law is a simple formula commonly used to estimate orders-of-magnitude of seepage from impoundments and seepage through liners. The actual seepage is a function of site-specific conditions including construction/deposition methods, internal geometry and zoning, permeability of the tailing, phreatic surface location, and foundation drainage conditions. As discussed on page 4 of my direct written testimony (p. 4), the New Mexico Office of State Engineer's ("NMOSE") design criteria include a seepage analysis and more accurately predicts seepage.

III. REBUTTAL TESTIMONY IN RESPONSE TO WRITTEN DIRECT TESTIMONY OF MS. CONNIE TRAVERS

I have reviewed the direct written testimony submitted by Ms. Connie Travers on behalf of the New Mexico Attorney General. On page 3 of her written direct testimony, Ms. Travers asserts that the Proposed Rules rely on interceptor systems capturing groundwater degraded by seepage from waste rock and tailing impoundments rather than preventing degradation. I disagree with this statement. As I discussed on page 16 of my direct written testimony, interceptor well systems, along with other discharge controls, have been designed and used successfully and safely at large conventional copper mine tailing impoundments for many years

in the southwestern United States. Indeed, interceptor well systems have been designed and used successfully at the Tyrone and Chino Mines.

On page 10 of her written direct testimony, Ms. Travers states that tailing impoundments would not have to be lined under the Proposed Rules, but would have seepage collection systems. She further asserts that although NMED can require liners if it determines standards would not be met at a monitoring well, there is no certainty that NMED would require liners in such a case. As discussed on page 16 of my written direct testimony, liners have not been required and interceptor well systems, along with other discharge controls, have been designed and used successfully and safely at large conventional copper mine tailing impoundments for many years in the southwestern United States, including at the Tyrone and Chino Mines. In my opinion, there is no valid technical basis or reason to require liner systems for tailing impoundments under the Proposed Rules. Furthermore, nothing in Ms. Travers' testimony indicates that she investigated industry practices, NMOSE's requirements, or considered the feasibility of requiring liner systems for copper tailing impoundments in recommending changes to the Proposed Rules. Such an investigation would have revealed that liner systems should not be required.

On page 15 of her testimony, Ms. Travers notes that new waste rock facilities and tailings impoundments are not required to have liners under the Proposed Rules. She further asserts that capturing contaminated ground water can be difficult and uncertain, so there is a significant risk that contaminated ground water will migrate beyond interceptor systems. As discussed in the June 2012 Technical Committee meetings in Santa Fe and Albuquerque regarding the Proposed Rules, there are no lined copper waste rock disposal facilities in the southwestern United States, as they are non-water impounding facilities, and as discussed above, there is a substantial history

with interceptor well systems that shows that they can be effectively operated and monitored to prevent migration of impacted ground water.

Ms. Travers next asserts that the Proposed Rules rely on capture of degraded water by interceptor wells rather than prevention on page 16 of her direct written testimony. In response to this statement, I note that the Proposed Rules identify and require many pollution prevention measures other than liners and interceptor wells, which her testimony does not recognize. Many of these discharge controls were discussed in the May 2012 Technical Committee meetings regarding the Proposed Rules in Albuquerque.

On page 16 of her direct written testimony, Ms. Travers asserts that the Proposed Rules do not require that site-specific conditions be considered in determining a variance, and site-specific review provides additional ground water protections. I disagree with Ms. Travers' assertion. The Proposed Rules required consideration of site-specific conditions by an engineer designing the facility, in evaluating and selecting monitoring well locations, and in designing seepage collection and interceptor well systems as required. As discussed in my written testimony on page 24, site-specific evaluations are best left to the design engineer, who must also comply with NMOSE regulations when designing tailing impoundments.

On page 16 of her direct written testimony, Ms. Travers asserts that allowing ground water to become contaminated above standards and then capturing the degraded water is less protective and poses a greater risk to ground water than preventing the degradation in the first place. As discussed on page 16 of my direct written testimony, this assertion does not consider the risk or threat to ground water posed by a lined tailing impoundment with a clogged or flow impeded drainage system, where the risk of more widespread impacts to ground water due to an uncontrolled release from a tailing impoundment that is no longer stable, compared to an engineered interceptor well system. Further, NMOSE has recognized this risk for many years.

NMOSE's 1989 Guidance Manual (Exhibit Scott – D-19) recommends that seepage of water from a tailing impoundment structure is desirable for stability. Stability of tailing dams is most sensitive to the phreatic surface location within the embankment as discussed on page 14 of my direct written testimony.

For all of the reasons discussed above, I disagree with the changes to the Proposed Rule regarding tailing impoundments suggested in Ms. Travers' direct written testimony and the exhibits presented by the Attorney General.

IV. REBUTTAL TESTIMONY IN RESPONSE TO WRITTEN DIRECT TESTIMONY OF MR. JAMES KUIPERS

I have reviewed the direct written testimony submitted by Mr. James Kuipers on behalf of the Gila Resources Information Project ("GRIP") and Turner Ranches. On page 3 of his written direct testimony, Mr. Kuipers states that pollution of groundwater above standards at some sites may be unavoidable, but the decision to do it and conditions necessary to limit and control it should be made on a site-specific basis and not through the Proposed Rules. In response, I note that this is a policy decision that is better made through the Proposed Rules than on an ad hoc basis through a variance procedure subject to personal preferences. The conditions necessary to limit and control seepage contamination are well understood and established based on modern industry practices. As discussed in the May 2012 Technical Committee meetings regarding the Proposed Rules, modern industry practices have been used successfully and safely at large conventional copper mine tailing impoundments for many years in the southwestern United States.

On pages 7 and 8 of his direct written testimony, Mr. Kuipers asserts that allowing pollution through the Proposed Rules would eliminate the incentive to develop new technologies, and suggests that engineering design for tailings should revert to the August 17th draft of the

Proposed Rules. In response to this direct written testimony, I note that the August 17th draft was not a consensus document, did not represent the view of all of the Technical Committee members, and was inconsistent with the presentations and recommendations given by Freeport's experts in 2012. No technical information or analysis was supplied by other Technical Committee members, particularly regarding the feasibility of lining large conventional copper tailing impoundments, which I discussed in my direct written testimony.

On page 8 of his direct written testimony, Mr. Kuipers states that Freeport's practice of designing and constructing unlined tailing impoundments does not recognize or represent current engineering design best practices, and require extensive and elaborate and constantly operated interception system. This statement is not true. Freeport utilizes state-of-the-practice design and construction in its tailing impoundments. As discussed in the May and June 2012 Technical Committee meetings regarding the Proposed Rules, the state-of-the-practice for large conventional copper mine tailing impoundments is they are unlined to enhance stability and safety. This has been recognized for many years by NMOSE, whose 1989 Guidance Manual (Exhibit Scott – D-19) recommends that seepage of water from a tailing impoundment structure is desirable for stability. Stability of tailing dams is most sensitive to the phreatic surface location within the embankment as discussed on page 14 of my written direct testimony.

Finally, on page 8 of his direct written testimony, Mr. Kuipers asserts that dry stack tailings piles placed inside an open pit surface drainage area may cause exceedances of standards, and all dry stack tailings materials that are potentially acid generating or contain deleterious materials should be evaluated for discharges regardless of location. In response, and as discussed in the May and June 2012 Technical Committee meetings regarding the Proposed Rules, filtered tailing ("dry stack") have not been used at copper mines in the southwestern United States largely due to their scale of operation. Most filtered operations generally have

tailing production rates under 10,000 tpd. The cost of filtered tailing generally appears to be attractive for operations under about 2,000 tpd. Typical production rates at large copper mines in the southwestern U.S. range from about 50,000 to 130,000 tpd.

For all of the reasons discussed above, I disagree with the changes to the Proposed Rule regarding tailing impoundments suggested in Mr. Kuiper's direct written testimony and the exhibits presented by GRIP and Turner Ranches.

V. REBUTTAL TESTIMONY IN RESPONSE TO WRITTEN DIRECT TESTIMONY OF MR. WILLIAM OLSON

I have reviewed the direct written testimony submitted by Mr. William Olson submitted on his own behalf. On page 23 of his written direct testimony, Mr. Olson states that it is feasible to build lined tailing impoundments that prevent water pollution. He further states that lining a tailing impoundment may be practical where a future mine site may not have water rights to implement large-scale interceptor well systems. I disagree with both of these statements.

All major copper tailing impoundments in the southwestern United States are unlined. Many use engineered seepage interceptor well systems along with other discharge controls. Aside from the issue of the scale of large conventional copper mine tailing impoundment operations (50,000 to 130,000 tpd production rates and impoundments 1,000 to over 3,000 acres in size), designing, constructing, and operating a tailing impoundment with a synthetic liner system poses a particular adverse issue in that a granular drainage system is required to remove the tailing deposition transportation water from the top of the liner to maintain a low or deep phreatic surface within the embankment which is essential for stability and safety of the impoundment. Fine particles contained in the tailing and deposition of sulfates tend to clog drainage systems. This raises the phreatic surface in the dam and reduces dam stability and safety, as set forth on page 16 of my written testimony. Further, NMOSE has long recognized

that seepage, rather than retention of water by a lining, is desirable for stability of tailing impoundments. *See* Exhibit Scott – D-19. Stability of tailing impoundments are most sensitive to the phreatic surface location within the embankment, as discussed on page 14 of my written direct testimony.

For all of the reasons discussed above, I disagree with the changes to the Proposed Rule regarding tailing impoundments suggested in Mr. Olson's direct written testimony.

VI. CONCLUSION

In conclusion, I urge the Water Quality Control Commission to adopt the Proposed Rules with some minor changes as suggested in Freeport's testimony. This concludes my written rebuttal testimony.

James C. Scott