STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF:	**)**	
	)	
PROPOSED AMENDMENT TO	**)**	**No. WQCC 12-01(R)**
PART 20.6.2 NMAC - COPPER RULE	**)**	
	)	

TESTIMONY OF JAMES R. KUIPERS, P.E.

Education and professional qualifications

1. My name is James Kuipers, and I have been asked to serve as an expert witness for Gila Resources Information Project (GRIP) and Turner Ranch Properties, LLC (TRP) in this proceeding. GRIP has been deeply involved with mining issues for many years, including issues regarding the prevention and abatement of water pollution associated with the copper mines located in Grant County, New Mexico. TRP owns the Ladder Ranch, which is adjacent to the Copper Flat Mine in Sierra County, New Mexico. My opinions are based on my education and experience, as well as by my extensive involvement as a stakeholder member in the technical and advisory committee processes in 2012 during which the rules were initially developed.

2. I have a B.S. in Mineral Process Engineering from Montana College of Mineral Science and Technology (1983). I am a Professional Engineer (PE Mining/Minerals) and am currently registered in the states of Montana and Colorado. I have more than 30 years of professional experience in the mining industry and mining environmental compliance. A full and current resume is attached as Attachment 1 to this report.

3. Upon graduation from college in 1983, I worked in a succession of jobs with increasing responsibility and providing wide exposure to the mining industry. I initially worked as a mill superintendent and head metallurgist in several small gold and custom mills, followed by a job as director of metallurgy at a high purity metals manufacturing facility, and project manager at a small

gold mine and mill. In 1986, I went to work as a shift foreman for a very large copper mining company in Arizona and later transferred to a new gold mine that the company was starting in Nevada, eventually becoming the mill superintendent. I was promoted to the corporate office, where I held the position of project engineer and manager as well as corporate senior metallurgist. In 1991, I moved to a new company, where I served as the senior metallurgist and later, project manager. In 1993, I went to work for a consulting and equipment manufacturing firm as the manager of their process engineering department and mining and environmental wastewater treatment program, until 1995.

4. Since 1996, I have been the principal of J Kuipers Engineering, reformed as Kuipers & Associates, LLC in 2003, with offices in Wisdom and Bozeman, Montana. Kuipers & Associates provides engineering consulting and other technical services to a variety of clients including local, state, federal and tribal government and non-government public interest organizations. Kuipers & Associates specializes in hardrock mine permitting, operations, reclamation and closure. We have a particular emphasis on mine site characterization, toxic release response planning including the use of source controls as well as wastewater management and treatment, and associated cost estimation and financial assurance. I am the principal consulting engineer.

5. I have authored various reports on mine and mineral processing site reclamation and closure, provided training on wastewater treatment design and cost estimation, and am currently under contract to the U.S. Environmental Protection Agency (EPA) assisting in the development of national guidance for mine and mineral processing site reclamation/closure and financial assurance requirements. I have also been involved as a contractor in 2006 and 2012 on behalf of the U.S. EPA and U.S. State Department under the Chile America Free Trade Act (CAFTA), providing training on mine and mineral processing site reclamation and closure and financial assurance to Chile's Ministries of Mines and

Environment. I am also currently assisting the Selkirk First Nation in the Yukon Territory, Canada in a similar capacity.

6. Open and underground mine workings, waste rock, leach piles and tailings at copper mines, by virtue of their geological and geochemical nature, have a high probability of containing metals and metalloids which are toxic and if not otherwise contained can pollute ground water above standards. Both the Chino and Tyrone Mines in New Mexico, the state's two largest copper mines, are copper porphyry deposits with significant acid generation potential and accompanying metals leaching potential which have been clearly demonstrated to impact ground water contaminant levels to above standards.

7. **Section 20.6.7.7 DEFINITIONS: B. (5) "Area of hydrologic containment".**[1] The area of hydrologic containment for open pits is a highly temporal and transient physical ground water feature that is affected by factors such as pit filling, which can take hundreds of years, and by such factors as pumping withdrawal rates both within the pit but also in surrounding aquifers. As proposed by the New Mexico Environment Department (NMED), the copper mining rule would establish two sets of requirements, one for inside the area of hydrologic containment and another for outside this area. Within this area, NMED would impose less stringent requirements that would allow pollution of groundwater above this commission's water quality standards at all existing and new copper mines. Our proposed changes would eliminate this dual system of regulation and thus eliminate the need to define the "area of hydrologic containment." Although pollution of groundwater above standards at some sites may be unavoidable, the decision to allow it and the conditions necessary to limit and control it should be made on a site-by-site basis and not by rule. Allowing pollution by rule would eliminate the incentive to develop new technologies to prevent pollution. I also assume for purposes of

[1] Attachment 2 to my testimony sets forth our recommended changes to NMED's proposed rule, which my testimony supports in part. The remaining recommended changes will be supported by other witnesses and by legal argument.

this testimony that the Water Quality Act (ACT) prohibits pollution of groundwater above this Commission's water quality standards at places of withdrawal of water for present or reasonably foreseeable future use (place of withdrawal) unless a variance is obtained.[2] Therefore, the primary purpose of my testimony is to identify for the Commission those portions of NMED's proposed rule that would allow groundwater pollution above water quality standards.

8. **Section 20.6.7.7 DEFINITIONS: B. (6) "As-built drawings"**. "As-built drawings" are customarily required to be signed by a qualified professional engineer registered in the state for which the drawings were certified.

9. **Section 20.6.7.7 DEFINITIONS: B. (47) "Process water"**. Process water can be described in a variety of ways including common terms of use such as that of infiltration and seepage being synonymous with "leachate" as contained in the proposed rule. For that reason the definition should include seepage and also should be qualified so as to not be limited to only those types of process water which are listed in the definition.

10. Process water such as leachate may also be transported to ground water and require interception in order to prevent additional spread of the contaminated water. In order to ensure that such ground water intercepted is recognized as being applicable as a discharge to these rules, it is recommended that intercepted ground water as well as any water that is mixed with process water be included in the definition, as contained in the original NMED staff draft of August 17, 2012.

11. **Section 20.6.7.17 GENERAL ENGINEERING AND SURVEYING REQUIREMENTS: A. and C. (1)(b); 20.6.7.18 GENERAL OPERATIONAL REQUIREMENTS: B. (2)**. The original NMED staff draft of August 17, 2012 contained the requirements for supporting information and other work products because they are required information if they are to be utilized for any intended purpose such as verification of required design features. It has been common experience when regulatory staff

[2] I understand that this is a legal position that will be supported by legal argument.

and their contractors have been required to utilize such documents, such as in the event of operator bankruptcy and site abandonment that such critical support documents are not included in the information typically supplied by the project proponent to the agency.

12. Although an engineer may be licensed in New Mexico, in order to exercise that certification the engineer must also be qualified in terms of education and/or experience. For example, an engineer qualified based on education and experience to certify foundational drawings on a proposed mine facility may not be qualified to certify drawings portraying foundation specifications and features for a heap leach or tailings facility. The technical working group considered this requirement and at one point proposed to require at least ten or more years of professional experience in the specific field being certified.

13. **Section 20.6.7.18 GENERAL OPERATIONAL REQUIREMENTS: A. (F)(5) Leak collection system inspection and maintenance (a)**. The provision in the original NMED staff draft of August 17, 2012 was based on current best practice which is to rely upon an automated leak collection system pump rather than manual determination and initiation of pumping procedures. While manual inspection and maintenance of automated systems are required, it is generally accepted that automated systems given present state-of-the-technology are the preferred method of reliably removing collection system fluids resulting from liner leakage. Leachate, which typically describes a process solution used to dissolve metals from ores, or seepage resulting from geochemical leaching of ores, should not be used to describe liner leakage.

14. **Section 20.6.7.20 REQUIREMENTS FOR LEACH STOCKPILE FACILITIES: B. (2)**. The existing leach stockpiles are unlined facilities which allow the sulfuric acid leach solution used to dissolve copper to mix with ground water before the solution is recovered or otherwise is transported away from the stockpile site by various ground water flow paths. Because they cause water pollution

above standards, such facilities should only be allowed to continue to operate if this commission has granted a variance from its water quality standards and imposed suitable conditions to limit, contain, and abate the pollution.

15. **Section 20.6.7.21 REQUIREMENTS FOR COPPER MINE WASTE ROCK STOCKPILES: A. (2)(f)**. Waste rock materials placed inside an open pit surface drainage area have the potential to cause exceedances of ground water standards. All waste rock materials having the potential to be acid generating or contain deleterious materials should be evaluated for discharges regardless of location. It is also important to understand that the sources of pollution at copper mine sites (such as ore, tailings and waste rock stockpiles) are essentially permanent in duration. Therefore, even though groundwater pollution may theoretically be contained through continuous pumping, it is doubtful that this pumping can be maintained for as long as the sources of pollution will exist. Also, the determination of the extent of hydrologic containment and of the pollution itself is subject to error and misjudgment, containment systems breakdown, and monitoring wells can be poorly located and thus fail to detect groundwater pollution. For all these reasons, regulations should be designed to prevent pollution in the first place rather than allow it.

16. The purpose of static and kinetic testing is both to determine acid generating potential and to estimate contaminant leaching potential. This principle is illustrated in Section 5.4 of the Global Acid Rock Drainage (GARD) Guide (2009) which says the results of static testing may indicate a potential for acid rock drainage (ARD) or metal leaching, while kinetic testing is commonly required to assess the relative rates of the various ARD and metal leaching reactions occurring, and to provide information on the evolution of ARD over time.

17. **Section 20.6.7.21 REQUIREMENTS FOR COPPER MINE WASTE ROCK STOCKPILES: B. Engineering Design Requirements**. Early in the process the technical committee

agreed that a high degree of specification should be sought in the rules in order to provide the proponent with the information necessary to meet the intent and requirements of the rules and minimize agency review time and any disagreements. The engineering design requirements included in the original NMED staff draft of August 17, 2012 and which we propose to re-instate in the rules was the product of those discussions and was an exemplary product of the collaboration process undertaken by the technical committee. It was primarily based on input from FMI's consultants and staff together with input from other stakeholders and represents the state-of-the-art in such regulations incorporating rules and guidance from other states and agencies including Arizona, Nevada and the Bureau of Land Management.

18. The new rule language proposed by the NMED reflects requirements which reflect practices by FMI which are the artifact of pre-modern mining operations and do not recognize or represent current engineering design best practices. These practices include the use of a liner system to collect drainage, particularly where it is predicted to occur and impact ground water as required by our proposed language. This is illustrated in the GARD Guide Section 6.6.6, which says that engineered barriers can be applied to either cover waste or to provide a bottom barrier or liner, each with their own unique performance requirements. From an ARD mitigation purpose, covers are typically designed to limit the ingress of water and oxygen into the underlying waste. Liner systems are typically designed to act as a barrier for contaminant flow from the overlying waste into the receiving environment.

19. **Section 20.6.7.22 REQUIREMENTS FOR COPPER CRUSHING, MILLING, CONCENTRATOR, SMELTING AND TAILINGS IMPOUNDMENT FACILITIES; A. (4) New tailings impoundments**. As per No. 18 above, the engineering design requirements for new tailings impoundments included in the original NMED staff draft of August 17, 2012 and which we propose to re-instate in the rules was an exemplary product of the collaboration process undertaken by the

technical committee and based on the state-of-art guidance for such facilities. The decision by NMED staff in their draft and in our proposal was intentionally to comply with the New Mexico Water Qualiy Act (WQA) and not allow a discharge of tailings process water into ground water and based on the knowledge that alternative designs exist consistent with GARD Guide Section 6.6.6, such as lined impoundments, which can be effectively utilized to comply with WQA requirements.

20. The new rule language proposed by the NMED reflects practices by FMI which are the artifact of pre-modern mining operations and do not recognize or represent current engineering design best practices. FMI's practices include the use of impoundment facilities with a high rate of seepage into ground water which requires an extensive and elaborate and constantly operated network of ground water wells and other devices which do not prevent seepage from contaminating upgradient groundwater and therefore are required to obtain a variance under the WQA.

21. **Section 20.6.7.22 REQUIREMENTS FOR COPPER CRUSHING, MILLING, CONCENTRATOR, SMELTING AND TAILINGS IMPOUNDMENT FACILITIES; A. (5) New dry stack tailing piles**. Dry stack tailings piles placed inside an open pit surface drainage area have the potential to cause exceedances of ground water standards as previously stated (see 6.). All dry stack tailings materials having the potential to be acid generating or contain deleterious materials should be evaluated for discharges regardless of location.

22. **Section 20.6.7.22 REQUIREMENTS FOR COPPER CRUSHING, MILLING, CONCENTRATOR, SMELTING AND TAILINGS IMPOUNDMENT FACILITIES; B. (2) Existing crushing, milling, concentrating, smelting or tailings impoundments**. Tailings materials because of their acid rock drainage potential and/or contaminant leaching potential can pollute ground water above standards. This is evidenced by current conditions at both the Chino and Tyrone tailings impoundments where in the past and to a more limited extent in the present the existing tailings

impoundments have caused exceedances of New Mexico groundwater standards. Because of this potential it is logical and consistent with presently available technological methods to not allow for a discharge to ground water unless a variance has been required.

23. **Section 20.6.7.23 REQUIREMENTS FOR NEW PIPELINES AND TANKS (1) (b)**. Pipelines and tanks, because they respectively convey or contain process water or toxic chemicals, could pollute ground water above standards.

24. **Section 20.6.7.24. REQUIREMENTS FOR OPEN PITS (A)**.Open pits, because they contain geological materials that may have acid rock drainage or contaminant leaching potential could pollute ground water above standards.

25. **Section 20.6.7.28 WATER QUALITY MONITORING REQUIREMENTS FOR ALL COPPER MINE FACILITIES: (2) Ground water monitoring – leach stockpiles, waste rock stockpiles, tailings impoundments**. Leach stockpiles, waste rock stockpiles and tailings impoundments, because they contain native or altered geological materials that may have acid rock drainage or contaminant leaching potential or contain process chemicals could pollute ground water above standards.

26. **20.6.7.29 GENERAL MONITORING REQUIREMENTS FOR ALL COPPER MINE FACILITIES: G. Interceptor well system monitoring and evaluation**. New tailings impoundment or waste rock stockpiles should be designed to prevent intentional discharges to ground water. NMED's proposed language is not necessary as part of the rule language, which should be designed to prevent pollution, and instead could be part of a variance or an abatement plan.

27. **20.6.7.33 CLOSURE REQUIREMENTS FOR COPPER MINE FACILITIES: C. Surface re-grading (3)(b)**. Waste rock and leach stockpile outslopes can have acid rock or contaminant leaching potential which could pollute ground water above standards. If these materials

are placed inside an open pit surface drainage area they have the potential to pollute ground water above standards.

28. **20.6.7.33 CLOSURE REQUIREMENTS FOR COPPER MINE FACILITIES: F. Cover system**. In order to be in compliance with the WQA requirement to prevent ground water pollution above standards at places of withdrawal of water, the rule language should be changed to "any" monitoring well location rather than a particular designated well location.

29. **20.6.7.35 POST-CLOSURE REQUIREMENTS: B. Water quality monitoring and reporting**. The original NMED staff draft of August 17, 2012 contained the requirements for facilities with discharges to process solution ponds or seepage interceptor systems following completion of reclamation activities, ground water monitoring associated with such facilities shall continue for a minimum of five years following cessation of active management of process solutions or seepage water. I am familiar with numerous instances of process solution ponds or seepage interceptor systems with discharges which could pollute ground water above standards. Many of those discharges have been ongoing for 20 years or more and are expected to discharge pollutants for 100 or more years in the future following reclamation. In some cases standards have been successfully achieved in short-term periods (1-3 years) and longer-term monitoring has shown those achievements to be only temporary. For that reason monitoring should be performed for a minimum of five-years after active management is ceased, assuming water standards are being met in the discharge stream.

References

The International Network for Acid Prevention (INAP), 2009. Global Acid Rock Drainage Guide (GARD Guide).http://www.gardguide.com/.

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