STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF PROPOSED AMENDMENTS
TO 20.6.2, THE COPPER MINE RULE,

No. WQCC 12-01(R)

New Mexico Environment Department,
Petitioner.

DIRECT TESTIMONY OF CONNIE TRAVERS

Introduction

Q: Please state your name, place of employment, position and responsibilities.

A: My name is Connie Travers, and I am a Principal at Stratus Consulting, Inc. ("Stratus Consulting") in Boulder, Colorado. In this position, I am responsible for scientific and technical analysis and management of a variety of projects that involve assessing and understanding the impacts of industrial operations and releases on surface and ground water resources.

Q: Please describe your educational background and general work experience.

A: I have a Bachelor of Science in Geology and a Master of Science in Applied Hydrogeology, both from Stanford University. My education and professional experience have been focused on understanding the movement of ground water in aquifers and the migration of contaminants through and in soil, rocks, ground water, and surface water.

I have assessed the ground water and surface water quality impacts of mining projects – for the mining industry, for state and federal agencies, and for tribes – for 25 years.

During and immediately after graduate school, I worked for Aqua Terra Consultants developing and testing computer models to simulate the flow of water and contaminants in the subsurface. After Aqua Terra Consultants, I worked as a hydrogeologist for PTI Environmental Services, which later became Exponent. During that time, I worked primarily for the mining industry on evaluations of the current and future effects of mining on ground water and surface water resources as part of the mine permitting process. I also worked on mine site characterization and remediation and on natural resource damage assessments related to the effects of mining operations on water quality.

I have worked at Stratus Consulting for the past 11 years. My mine site evaluations are conducted primarily for federal agencies, such as the United States Environmental Protection Agency ("EPA") and the United States Department of Justice, and for States, including New Mexico. On behalf of the New Mexico Office of Natural Resources Trustee ("ONRT"), I worked on the natural resource damage assessment for the Chino, Tyrone, and Cobre copper mines.

I have assessed the effects of mine operations on water quality, and ground water and surface water flows at more than 50 proposed, active, and abandoned mines. These projects have involved assessments of the impacts on water quantity and quality from mine operations, including dewatering/supply, and releases and migration of contaminants from mine facilities such as open pits, heap leach pads, tailings impoundments, and waste rock piles. My work has included developing and evaluating site conceptual models, evaluating the adequacy of hydrogeologic and water quality input parameters in models of pit lake water quality and other waters at mine sites, and conducting hydrogeochemical modeling at large mine sites in the western United States. My mining work has encompassed field characterization, numerical modeling, environmental impact studies, NRDA, and cost recovery. I have evaluated the water impacts of mining operations, including the assessment of the pre- and post-mine water balance, water quality, and impacts associated with pit lakes; the effects of tailings impoundments and waste rock storage facilities on receiving waters; and the impact of mine dewatering and discharges on ground water and surface water resources.

I co-authored a hard rock mining water quality prediction report and taught a multi-day course on this subject for the California Regional Water Quality Control Board and other state and federal agencies. In February 2013, I taught a workshop for the U.S. EPA on mine site hydrogeology and mine water management. I am experienced with collecting and evaluating the data and information necessary to characterize the hydrogeology of mines, and to understand and model the transport of contaminants from mining operations. I have conducted and managed hydrogeologic field investigations, which have included river water, soils, sediment, and ground water sampling; aquifer testing; stream flow measurements; monitoring well installation; and cone-penetrometer and Geoprobe work.

In addition, I have evaluated the potential impacts of climate change on water resources in the United States. I recently co-authored a study on the impacts of climate change on fisheries in the United States, including an assessment of the potential changes in stream flow and temperatures. I was the Principal Investigator on a recent report funded by the Water Research Foundation titled *Groundwater Sustainability under Climate Change*. Through my work on climate change and water resources, I have gained knowledge on the importance of ground water resources under a changing climate.

My resume is attached as AGO Exhibit 4.

Summary of Testimony

Q: Please summarize the testimony you will give.

A: In summary, my testimony will reflect the following:

- The Proposed Copper Mine Rule ("Proposed Rule"), 20.6.7 NMAC (Oct. 30, 2012), significantly decreases the protection of ground water resources at copper mine sites in the State of New Mexico.

- The Proposed Rule allows mining companies to degrade ground water quality, in excess of water quality standards, beneath and downgradient of mine facilities (including their inceptor systems) to a point or points of compliance, regardless of the potential for this ground water to be withdrawn and used now or in the future.

- The Proposed Rule does not provide sufficient requirements for establishing locations for points of compliance where ground water quality standards must be met.

- The Proposed Rule relies on interceptor systems capturing ground water that has been degraded by seepage from waste rock and tailings impoundments, rather than preventing ground water degradation in the first place.

- In complex hydrogeological environments, and in particular, the fractured rock systems that are typically present at mine sites, contaminated ground water can easily escape detection and capture.

- Remediation and/or hydraulic control of ground water contaminated by releases from mining is expensive. Because mine facilities can release acid, metals, and other constituents to ground water for hundreds to thousands of years, ground water remediation and control systems often must be managed for generations, essentially in perpetuity. Therefore, preventing ground water from becoming contaminated is more efficient than relying on cleanup after it becomes contaminated.

- The current regulatory framework for ground water protection in New Mexico does not allow ground water to be contaminated above water quality standards at a "place of withdrawal of ground water for current or reasonable foreseeable future use." However, the current framework does allow a company to apply for a variance during operations to allow degradation above standards of ground water quality. The variance process requires only a demonstration that a Water Quality Control Commission ("Commission") regulation imposes "an unreasonable burden" on a discharger, and variances are routinely granted, where such demonstration is provided. In addition, the variance application process allows for the review and consideration of hydrogeologic and other factors that are specific to each mine site, and thus provides appropriate protections for future ground water use. These protections are lost if ground water degradation is automatically allowed by the Proposed Rule, rather than permitted by individual variance.

- This same observation applies to ground water cleanup upon closure. If a company can show it is not technically feasible to clean up ground water to standards, it can apply for alternative abatement standards and make a site-specific showing for the need for those alternative standards and the protections it will put into place to mitigate contamination. A decision to allow groundwater to remain contaminated is thus based on a site-specific review of the conditions at a particular mine site, in contrast to the Proposed Rule, which allows groundwater to exceed standards upgradient of a point of compliance at all mine sites.

Background

Q: What materials have you reviewed to prepare your testimony?

A: In preparation, I have reviewed:

- New Mexico Environment Department's ("NMED's") Proposed Copper Mine Rule, 20.6.7 NMAC (Oct. 30, 2012)
- New Mexico Water Quality Act, NMSA 1978, §§ 74-6-1 *et seq.*
- Testimony from the 2007 hearing before the Commission in *In the Matter of Appeal of Supplemental Discharge Permit for Closure (DP 1341) for Phelps Dodge Tyrone, Inc.*, Nos. 03-12(A) and 03-13(A) (*"Tyrone"*), including the testimony of NMED witnesses Bill Olson, Clint Marshall, and Mary Ann Menetrey, and Tyrone witness John Shomaker
- Commission's Decision and Order on Remand in *Tyrone* (Feb. 9, 2007) ("Commission Decision") [AGO Ex. 1]
- Attorney General's Motion to Remand, and various exhibits including:
    - NMED's August 17, 2012 Supplemental Permitting Requirements for Copper Mine Facilities, 20.6.7 NMAC [AGO Ex. 5]
    - Freeport McMorRan, Inc.'s September 5, 2012 comments on the NMED August 17, 2012 Draft [AGO Ex. 6]
    - September 7, 2012 NMED 2nd Internal Discussion Draft, 20.6.7.24.A & -28.B NMAC [AGO Ex. 7]
    - September 7, 2012 email from B. Olson to D. Martin, NMED, Major Issues in 9/7/12 NMED 2nd Internal Discussion Draft [AGO Ex. 8]
    - September 13, 2012 NMED draft Copper Mine Rule issued for public comment [AGO Ex. 9]
    - Tyrone Settlement Agreement (Dec. 20, 2010) [AGO Ex. 10]
- Technical documents prepared for the natural resource damage assessment related to ground water conditions at the Tyrone, Chino, and Cobre copper mines, including the Final Ground Water Restoration Plan for the Chino, Cobre, and Tyrone Mine Facilities, prepared by the New Mexico Office of Natural Resources Trustee (Jan. 4, 2012) ("Ground Water Restoration Plan") [AGO Ex. 11 (excerpts)]
- Regulatory documents from states other than New Mexico related to compliance with ground water quality standards

Q: What is your familiarity with the copper mine sites in the Western United States, and in New Mexico in particular?

A: I worked on natural resource damage assessments that were conducted at the Tyrone, Chino, and Cobre mines on behalf of the New Mexico ONRT. I reviewed and analyzed ground water data for these mines, and developed conclusions about the extent of groundwater contaminated above standards. I also conducted site visits to all three mines and the surrounding areas. My firm, Stratus Consulting, provided the principal scientific and technical support to the New Mexico Trustee for those assessments.

I have also assessed the effects on ground water quality and quantity from other historic copper mining operations in the western United States, including at the Robinson District in Ely, Nevada, and at the Clark Fork River Superfund Complex at and near Butte, Montana. I conducted ground water assessments for environmental impact studies related to the re-initiation of copper mining in the Robinson District, as well as at the Phoenix Mine near Battle Mountain, Nevada, which produces a substantial amount of copper along with the gold it produces. I am currently assessing potential water quantity and quality effects from the proposed Pebble Mine, a copper-gold-molybdenum project in southwestern Alaska, and I previously evaluated the potential for water quality impacts from the gold-copper Prosperity Project in British Columbia.

Q: Have you worked on mine sites other than copper mine sites, and on other mine sites in New Mexico?

A: I have conducted hydrogeologic and water quality investigations at a large number of mines and mills that extract and process commodities other than copper and that have similar facilities and potential for degradation of water resources, including sites in New Mexico. For example, I evaluated surface water and ground water quality at the former Molycorp molybdenum mine (now called the Chevron Questa Mine) in Taos County, where mining operations have degraded surface water quality in the Red River and ground water quality at the mine site and beneath and downgradient of the tailings impoundment near the town of Questa.

Risk of Ground Water Contamination at Copper Mines

Q: Please discuss the risks of ground water contamination from mining activities at copper mine sites.

A: Open pit and underground copper mining activities pose a great risk of groundwater contamination. The largest copper mines in the United States and abroad, including in New Mexico, are open-pit, dump leach operations in which large piles of copper ore are leached using sulfuric acid solutions. Sulfuric acid is sprayed on the tops of the piles, the acidic solutions pull copper out of the ore, and the copper-rich solution is collected at the base or toes of the ore stockpiles. Many copper mines process copper using both dump leach and flotation operations, and the flotation operations produce wastes known as tailings, which are placed in impoundments. In either type of operation, rock with lower copper concentrations must be removed to access the ore, and this material becomes waste rock. Because copper ore today is

usually relatively low grade, large amounts of waste are produced relative to the amount of copper in the ore. Therefore, the waste facilities are usually quite large. At some point, after the ore stockpiles have been leached for a number of years, they become waste rock because the copper content has decreased, and they are no longer considered to be economic. All these facilities, including the open pits, underground mines, waste rock and ore stockpiles, and tailings materials remain on the mine site forever.

The primary contaminants of concern at copper mine sites are metals, such as copper, cadmium, lead, and zinc; acidity; sulfate; and total dissolved solids. These constituents derive from the weathering and dissolution of metal sulfides and other minerals and the use of sulfuric acid in copper processing. In addition, nitrate and ammonia are common contaminants of concern during and for a while after the mine stops operating, and these constituents derive from the use of blasting agents, such as ammonium nitrate – fuel oil, in the extraction of the ore.

Rain and snow fall on all surface mine facilities, and these waters will leach metals and other contaminants out of the waste rock, ore stockpiles, tailings, and the walls of the open pits. As I mentioned, sulfuric acid is applied to the tops of the ore stockpiles, and it infiltrates through the piles. Infiltrating water carries contaminants to the groundwater beneath these facilities, contaminating the underlying groundwater. In addition, mine facilities beneath the ground water table, such as underground mine tunnels, open pits, and wastes disposed below the water table, will be flooded after dewatering operations cease upon closure of the facilities. Sulfide mineral oxidation products in the geologic materials within these facilities can contaminate groundwater as it flows through these flooded facilities.

Q: Please explain the process known as "acid rock drainage" or "ARD" and metal leaching?

A: The primary way acid rock drainage is created is when minerals containing iron and sulfide, such as pyrite (fool's gold) and chalcopyrite (a copper iron sulfide), for example, are exposed to oxygen and water. Prior to mining, these minerals were buried beneath the ground surface, not exposed to oxygen. However, when the ore and waste rock are extracted, ground into smaller particles, and placed on the earth's surface, the mineral surfaces are exposed to oxygen and water, and the ARD process begins. Exposure of these minerals to oxygen and water causes the sulfide minerals to oxidize, and "secondary minerals" that are often white or blue and contain metals and sulfate are formed. These metal sulfate minerals dissolve easily in a rainstorm or when snow melts, and also release dissolved metals, sulfate, and acidity. The acidic water can leach metals from other minerals, because most minerals dissolve more readily in acidic water. Because these waters are acidic and metal-rich, the process is now referred to as "acid rock drainage/metal leaching" rather than just "acid rock drainage." It is also possible to leach metals and other contaminants, including arsenic and selenium, even if the waters are not acidic. The movement of these usually acidic and metal-rich waters from mine facilities can contaminate tailings pore water, ground water, and surface water at mine sites with metals and sulfate.

Q: Can ground water contamination result from leach piles, waste rock piles, and tailings impoundments at copper mines?

A: Yes. As I described above, the movement of acidic and metal-rich waters from mine facilities such as leach piles, waste rock piles, the open pit, and tailings impoundments can, and historically has, caused ground water contamination at copper mines.

Q: Has acid rock drainage and metal leaching caused ground water contamination at copper mines in New Mexico?

A: Yes. ARD and metal leaching has adversely affected ground water resources at the Tyrone, Chino, and Cobre mines.

Q: Have contaminants other than acidity and metals caused ground water contamination at copper mine sites in New Mexico?

A: Yes. Neutral to basic drainage of fluids from mine facilities have also impacted ground water at copper mine sites in New Mexico. Some of the tailings pore water has drained from the bottom of the tailings impoundments at Tyrone and Chino, loading sulfate and total dissolved solids to the ground water and degrading it. Metal concentrations are generally not as high as they are in areas affected by ARD/metal leaching because much of the sulfide content of the tailings has been removed. However, some sulfides remain in the tailings, and over time, they can oxidize and form acidic drainage on the surface of the impoundments or throughout the impoundments, depending on the type of closure measures used.

Q: Please describe the ground water contamination that has resulted at New Mexico copper mines.

A: Ground water quality has been severely degraded within the central mining areas at the Chino, Tyrone, and Cobre Mines. Leachate from the ore stockpiles, areas around the open pits, and waste rock has contaminated ground water beneath and downgradient of the facilities. The alluvial, regional, and bedrock aquifers are affected by releases from the mines. The New Mexico Office of Natural Resources Trustee ("ONRT") has engaged in a Natural Resource Damage Assessment and Restoration ("NRDAR") process, in cooperation with Freeport-McMoRan Copper & Gold Inc., at the Chino, Tyrone, and Cobre Mines. The NRDAR for the mines concluded that the Chino Mine had the largest areal extent of injured alluvial and regional ground water, at 13,935 acres; the Tyrone Mine had an injured areal extent of 6,280 acres; and the Cobre Mine had an areal extent of 528 acres [AGO Ex. 11]. *See* Figures 3.2, 3.3 and 3.4 of the Ground Water Restoration Plan [AGO Ex. 11]. One ground water plume at the Tyrone Mine has moved several miles offsite. C. Marshall Testimony (2007), pp. 10-11 [AGO Ex. 13]. Ground water along Whitewater Creek at the Chino Mine is contaminated for several miles downstream/downgradient of the mine (Figure 3.2 from the Ground Water Restoration Plan) [AGO Ex. 11].

One of the most detailed and informative discussions of the contamination caused by copper mining in New Mexico is found in the testimony of NMED hydrogeologist Clint Marshall, from the 2003 and 2007 *Tyrone* hearings. Rather than repeat his testimony, it is attached as AGO Exhibits 12 and 13, respectively. I have carefully reviewed Mr. Marshall's testimony, and it is consistent with my understanding and analysis of the extent of groundwater contamination at the Tyrone mine, which I developed while working on the NRDAR for the Tyrone, Chino, and Cobre mines. The ground water contamination from the copper mines in New Mexico is at high contaminant concentrations, is extensive and widespread at the mine sites, and has migrated off and away from the sites.

The Commission found in its Decision that some ground water under the central mining area at Tyrone exceeds ground water standards by 1,000 times for aluminum, cadmium, manganese, iron, and zinc, and by 10 times for total dissolved solids, sulfate, nickel, cobalt, and copper; that ground water along the north, east, south, and west perimeter of the mine site is degraded; and that ground water contamination has been discovered to be moving offsite and into the alluvial and regional aquifers.

Ground water quality under and adjacent to the open pits at the Tyrone and Chino mines has been degraded by in-pit leaching operations and the movement of rain and snowmelt over the walls of the pits and through the ore and waste rock piles. Ground water under and downgradient of leached ore, waste stockpiles, and tailings impoundments has been degraded at both mines. Similarly, plumes of contaminated ground water emanate from waste rock and open-pit areas at the Cobre Mine. *See* Ground Water Restoration Plan [AGO Ex. 11].

Proposed Copper Mine Rule

Q: What is your familiarity with the Proposed Copper Mine Rule that is the subject of this proceeding?

A: I have carefully read the Proposed Copper Mine Rule and considered its ramifications.

Q: What general engineering design requirements does the Proposed Copper Mine Rule propose for new and existing open pits, leach stockpiles, waste rock piles, and tailings impoundments?

A: I will consider each type of mine facility in order:

Open Pits

The Proposed Rule does not distinguish between *existing and new open pits*. During operation of an open pit, stormwater must be diverted away from the pit. 20.6.7.24.A(2) NMAC. Under the Proposed Rule, ground water quality standards of 20.6.2.3013 NMAC do not apply within the "area of hydrologic containment." 20.6.7.24.A(4) NMAC. Thus water quality standards can be exceeded in an area underlying or adjacent to the open pit where water drains into the open pit and is removed by evaporation and/or pumping. 20.6.7.7.B(5) NMAC (defining area of hydrologic containment).

Leach Stockpiles

New leach stockpiles would be subject to engineering design requirements for liner systems and solution collection and containment systems. 20.6.7.20.A(1) NMAC.

However, an alternate design may be proposed for *new leaching operations located "within an open pit surface drainage area"* if systems are designed to "maximize" capture of the seepage under site-specific conditions, and leachate will not migrate outside the open pit drainage area. 20.6.7.20.A(1)(f) NMAC. The "open pit surface drainage area" is the area in which stormwater drains into an open pit and cannot be diverted by gravity outside the pit perimeter, and the ground water is hydrologically contained by pumping or evaporation. 20.6.7.7.B(42) NMAC. Thus, if new leaching operations are located within the open pit surface drainage area, a liner would not be required and operations would be subject only to open pit capture systems.

Under the Proposed Rule, e*xisting leach stockpiles* would not be required to meet the engineering design requirements, including liner systems and solution collection and containment systems, that would be required for new leach stockpiles. Existing facilities "may continue to operate as previously permitted under a discharge permit subject to compliance with the contingency requirements of 20.6[.7].30 NMAC." 20.6.7.20.B(2) NMAC.

It is not clear, in the Proposed Rule, what is meant by allowing existing leach stockpiles that have caused ground water contamination – which is essentially all of them – to "continue to operate as previously permitted under a discharge permit." The Rule does not clarify whether the leach stockpiles can continue to contaminate ground water.

Waste Rock Piles

Under the Proposed Rule, liners would not be required for *new waste rock piles.* For *new waste rock piles located outside the open pit surface drainage area*, "interceptor wells or other measures to reduce, attenuate or contain the discharge of leachate that may cause ground water to exceed applicable standards" would be required. 20.6.7.21.B(1)(c) NMAC.

However, if NMED determines that waste rock piles will not cause an exceedance of water quality standards, the capture requirement does not apply. 20.6.7.21.B(1) NMAC.

If NMED determines that water quality standards at a designated monitoring well for new waste rock piles "would cause ground water to exceed applicable standards," NMED "may" (or may not) require additional controls, including a liner system. 20.6.7.21.B(1)(d) NMAC. Thus, even if standards will be exceeded, there is no certainty in the Proposed Rule that a liner or other types of engineering controls would be required for a new waste rock pile.

For *new waste rock piles located inside an open pit surface drainage area*, stormwater run-on must be diverted or contained, but there are no requirements for installing other pollution abatement or control measures. 20.6.7.21.B(2) NMAC.

Existing waste rock piles would not be required to meet the design and construction requirements for new waste rock facilities. Existing waste rock piles, like existing leach piles, "may continue to operate as previously permitted under a discharge permit." 20.6.7.21.C(2) NMAC. Again, the Proposed Rule is silent on whether ground water contamination can continue at sites in which the ground water has already been contaminated by waste rock seepage.

Tailings Impoundments

Under the Proposed Rule, *new tailings impoundments* would not be required to be lined. They must have seepage collection systems based on an evaluation to demonstrate that interceptor wells "will be able to efficiently capture seepage such that applicable standards will not be exceeded at monitoring well locations specified by 20.7.7.28 NMAC." 20.6.7.22.A(4)(a)(vi) NMAC.

As with new waste rock piles, if NMED determines that water quality standards at a designated monitoring well for new tailings impoundments "would cause ground water to exceed applicable standards," NMED "may" (or may not) require additional controls, including a liner system. 20.6.7.22.B(1)(d) NMAC. Thus, even if standards will be exceeded, there is no certainty in the Proposed Rule that a liner or any other type of control measures would be required for a new tailings impoundment.

Existing tailings impoundments would not be required to meet the engineering design requirements for new facilities. They may, as with leach piles and waste rock piles, continue to operate as previously permitted under a discharge permit. 20.6.7.22.B(2) NMAC.

Q: What does the Copper Mine Rule propose for establishing compliance with ground water quality standards?

A: The proposed Copper Mine Rule proposes the use of monitoring wells to establish compliance with ground water quality standards. *See* 20.6.7.28 NMAC.

For *new or expanding leach stockpiles, waste rock stockpiles, or tailings impoundments located outside of the open pit surface drainage area,* compliance is proposed to be determined at monitoring wells located "around and downgradient of the perimeter" of the facilities, including the area of the "leachate and solution capture and containment systems." 20.6.7.28.B(2) NMAC.

Monitoring of an *open pit* is proposed using wells "around the perimeter" of the pit to monitor water quality and the hydrologic gradient around the pit. 20.6.7.28.B(4) NMAC.

Q: What is meant by a "point of compliance" regulatory system for establishing compliance with ground water quality standards?

A: A point of compliance regulatory system for ground water establishes a point on the surface, below which ground water quality standards must be met. This point generally extends vertically downward into the subsurface and into the aquifer(s). Between this point and the potential source of contamination, water quality standards can be exceeded. At the point of compliance, water

quality standards must be met. Some form of monitoring must be installed at the designated point of compliance. In general, points of compliance can be established at a variety of locations, including a property boundary, a residential well, at a specified distance from a source of contamination, a spring, or at a point of groundwater discharge to a stream.

Q: Does the Proposed Rule create a "point of compliance" regulatory system to establish compliance with water quality standards for copper mines?

A: Yes, the Proposed Rule establishes a point of compliance system. Under the Proposed Rule, ground water quality standards must be met at designated monitoring wells. The Proposed Rule does not require that ground water quality standards be met beneath mine facilities or between the facilities and the monitoring well.

Q: Are the locations for establishing compliance sufficiently defined in the Proposed Rule?

A: The Proposed Rule contains uncertainty about how and where to establish compliance. The Proposed Rule requires that that ground water must meet applicable standards at a monitoring well located pursuant to 20.6.7.28 NMAC. With respect to determining the location of these monitoring wells, the Proposed Rule contains the following language:

> A permittee shall monitor ground water quality *around and downgradient of the perimeter* of each open pit, leach stockpile, waste rock stockpile, tailings impoundment, process water impoundment, and impacted stormwater impoundment. The department may require additional wells around the perimeter of mine units that are underlain by areas where ground water flow directions are uncertain, including fracture flow systems, and around copper mine units that have the potential to cause ground water mounding. The department may require additional monitoring wells at any other unit of a copper mine facility that has the potential to cause an exceedance of applicable standards as additional permit conditions in accordance with Subsection I of 20.6.7.10 NMAC. Monitoring wells shall be located pursuant to this Section to detect an exceedance(s) or a trend towards exceedance(s) of the ground water standards at the earliest possible occurrence, so that investigation of the extent of contamination and actions to address the source of contamination may be implemented as soon as possible.

20.6.7.28.B NMAC (emphasis added). In addition, the Proposed Rule states that:

> A permittee shall install a sufficient number of monitoring wells *around and downgradient of the perimeter* of each new leach stockpile and tailings impoundment located outside of the open pit surface drainage area, *including its leachate and solution capture and containment systems,* to adequately monitor ground water that may be impacted by water contaminants from those units. Each monitoring well shall be installed as close as practicable to the proposed leach stockpile, waste rock stockpile or tailings impoundment, *including its leachate and solution capture and containment systems,* that is to be monitored considering the slope of the land surface, hydrogeological conditions, geologic controls,

infrastructure, engineering design plans, depth to ground water, working distance and safety.

20.6.7.28.B(2) NMAC (emphasis added).

The Proposed Rule's requirements for monitoring well locations – that monitoring wells be located "as close as practicable" "around and downgradient of the perimeter" of the monitored mine facilities, which includes their respective "leachate and solution capture and containment systems" – potentially allows an extensive and undefined area under which ground water standards may be exceeded. Furthermore, no guidance is included regarding how the wells should be located or the frequency with which they should be sampled to detect a trend of increasing contaminant concentrations "at the earliest possible occurrence."

Taking the Tyrone Mine as an example, according to the Tyrone closure plan, the Tyrone mine site consists of approximately 9,000 acres. Of that acreage, approximately 2,000 acres comprise the open pits; approximately 2,800 acres comprise the leach piles and waste rock piles; and approximately 2,300 acres comprise the tailings impoundments. These mining facilities therefore total approximately 7,100 acres. Supp. Discharge Permit for Closure, DP-1341, Phelps Dodge Tyrone, Inc., Tyrone Mine Facility, pp. 1-2 (April 8, 2003). The leachate and solution capture and containment systems at these sites extend beyond the 7,100 acres of facilities. The result is that water quality may be exceeded under the vast majority of the mine site. A similar situation would apply to the Chino and Cobre mines as well.

Finally, there is no provision that requires consideration of the potential to adversely affect ground water users, such as requiring that compliance points be located upgradient of current or future drinking water sources, wellhead protection areas, or where ground water discharges to surface water. No maximum distance from mine facilities is identified in the Proposed Rule. Furthermore, the Proposed Rule does not provide guidance on the depth of well placement or how wells should be located in the case of multiple aquifers or hydrogeologic units. Determining appropriate locations and sampling frequencies for monitoring wells is critical to detecting and being able to effectively address an exceedance of ground water quality standards or a trend of increasing contaminant concentrations. In a point of compliance system, such as that in the Proposed Rule, it is essential that the compliance points be carefully located and the monitoring frequency and parameters be well defined so that downgradient ground water impacts can be prevented or quickly remediated.

Q: How do the Proposed Rule's well location criteria compare with those of other states?

A: Some states have criteria that are more protective than those of the Proposed Rule and similar to those required New Mexico's Water Quality Act. For example, Montana has non-degradation requirements for high quality ground water, but allows for the Montana Department of Environmental Quality to review and approve applications for a site-specific mixing zone where water quality standards can be exceeded. This mixing zone determination is site-specific and requires an assessment of the "biological, chemical and physical characteristics of the receiving water." *See* http://www.deq.mt.gov/wqinfo/nondeg/default.mcpx.

Some other states, such as Colorado, Idaho, and Arizona, use point-of-compliance regulatory approaches. Their regulations expressly identify the programs as "point of compliance" programs and specify how that point of compliance will be determined. For example, Arizona regulations specify not only the methods for determining the point on the ground surface below which water quality standards must be met, but also how the compliance point should be established in the aquifers.

While the Proposed Copper Mine Rule does not use the term "point of compliance," it does establish a point of compliance regulatory system. However, in comparison to other States with point of compliance systems, it does not provide adequate guidance for locating ground water monitoring wells that will be used to determine compliance with water quality standards.

Q: If ground water quality standards are exceeded as a result of mining operations, what does the Proposed Rule require for abatement, and do these requirements differ from current Commission regulation abatement requirements?

A: First, it is important to note again that contamination above water quality standards only violates the Proposed Rule if the standards are exceeded at the point of compliance monitoring wells that are located at some distance outside the open pits, leach piles, waste rock piles, and tailings impoundments and their associated capture systems, as discussed above. The Proposed Rule, therefore, allows contamination above water quality standards in ground water underlying the majority of any mine site, as discussed above.

Even if standards are exceeded at and *downgradient of* the point of compliance, the Proposed Rule does not require abatement of the contamination to water quality standards. Not requiring cleanup underneath a pollution source and up to a designated monitoring point, and not requiring cleanup downgradient of the monitoring point, differ significantly from the Commission's current regulatory requirements under the Abatement Regulations, which require cleanup of ground water pollution at "any place of withdrawal for present or foreseeable use" (see discussion below) to ground water quality standards. 20.6.2.4101.A(1), -4103(B) NMAC.

Under the Proposed Rule, *existing leaching facilities* may continue to operate as previously permitted under a discharge permit "subject to compliance with the contingency requirements of 20.6[.7].30 NMAC." 20.6.7.20.B(2) NMAC. The contingency requirements of 20.6.7.30 NMAC do not require that ground water contaminated above standards by leaching operations be cleaned up to water quality standards. The contingency requirements only provide that a corrective action plan be submitted that describes "any repairs made or proposed to address the cause of the exceedance or increase" in ground water contamination, and that the corrective action plan "shall propose source control measures and a schedule for implementation." 20.6.7.30.A(1) NMAC.

Thus, under the Proposed Rule, even if there are exceedances of water quality standards caused by existing leach stockpiles, there is no requirement that an abatement plan be prepared to ensure that standards are met, as is presently required by Commission regulations if there are ground water quality exceedances. 20.6.2.4101.A(1), -4103(B) NMAC. Under the Proposed Rule, NMED "may" (or may not) require an abatement plan if there are exceedances. 20.6.7.30.A(2)

NMAC. Not requiring cleanup to standards through an abatement plan if there are violations of water quality standards represents a significant change from the current regulatory requirements of the Commission.

There are no specific requirements in the Proposed Rule for abating ground water contamination if there are exceedances resulting from *new leaching operations* (inside or outside the open pit surface drainage area), and therefore the general provisions of 20.6.7.30.A NMAC would apply. These provisions do not require that ground water be cleaned up to standards through a required abatement plan, a change from current Commission regulatory requirements.

Similar to existing leach piles, under the Proposed Rule *existing waste rock piles* may continue to operate as previously permitted under a discharge permit "unless ground water monitoring of the stockpile pursuant to 20.6.7.28 NMAC requires implementation of corrective action under Subsection A of 20.6.7.30 NMAC." 20.6.7.21.C(2) NMAC. Again, abatement to water quality standards would not be required. Likewise, *new waste rock piles* would be subject to the general requirements of 20.6.7.30.A NMAC, and cleanup to standards is not required.

Exceedances of water quality standards resulting from *new or existing tailings impoundments* would be subject to the general requirements of 20.6.7.30.B NMAC, which do not require abatement to water quality standards.

Failure to require cleanup to standards through an abatement plan if standards are exceeded – outside the point of compliance wells – is a significant departure from current Commission abatement requirements.

Q: What does the Copper Mine Rule propose for closure of facilities?

A: At closure, the installation of a cover system would be required for the surfaces of waste rock piles, leach stockpiles, tailings impoundments, and other facilities "that have the potential to generate leachate and cause an exceedance of applicable standards at a designated monitoring well location . . . ." 20.6.7.33.F NMAC.

Closure requirements for open pits depend on whether the pit will be an evaporative sink, where ground water will only flow into the open pit upon closure and evaporate, or whether the pit will be a flow-through pit, where ground water can flow from the pit into downgradient ground water.

For open pits determined to be hydrologic evaporative sinks, the water quality standards of 20.6.2.3103 NMAC would not apply within the area of hydrologic containment. 20.6.7.33.D(1) NMAC. Thus, under the Proposed Rule, standards would not have to be met under open pits that are hydrologic evaporative sinks.

For flow-through pits, the Proposed Rule states, "After closure, if water within an open pit is predicted to flow from the open pit into ground water and the discharge from an open pit may cause an exceedance of applicable standards at a designated monitoring well location, then the open pit shall be considered a flow-through pit and the open pit water quality must meet ground

water standards of 20.6.2.31 03 NMAC *or be managed to mitigate exceedances of applicable standards outside the area of hydrologic containment.*" 20.6.7.33.D(2) NMAC (emphasis added). For flow-through pits, standards would not need to be met up to the point of compliance established for the pit. Outside the point of compliance, water quality would only need to be managed to mitigate exceedances, but not to meet standards, outside the area of hydrologic containment. Therefore, the Proposed Rule does not require that ground water quality standards be met at any point downgradient of flow-through pits.

Q: In your opinion, what provisions of the Proposed Rule do not represent best industry practice for protection of ground water?

A: First, under the Proposed Rule new waste rock and tailings facilities would be allowed to contaminate ground water above standards, and there is no requirement for liners or other mitigation measures. Rather, the requirements of the Proposed Rule rely on interceptor wells to capture and contain contaminated ground water. As I describe below, capturing contaminated ground water can be difficult and uncertain, especially given the challenges in characterizing contaminant migration in the fractured rock environments present at most mine sites. There is a significant risk that contaminated ground water will migrate beyond the interceptor systems.

Second, allowing ground water to become degraded beneath and downgradient of facilities, without consideration of site-specific factors that may make it difficult to intercept and detect contamination migrating offsite, is not best practice. The Proposed Rule allows ground water beneath leach piles, waste rock piles, and tailings impoundments, and up to an undefined distance downgradient of facilities and their capture systems but upgradient of a monitoring well, to be contaminated above ground water quality standards. Allowing such widespread contamination is not best practice.

Third, not requiring clean up to standards is not best practice. Ground water, once contaminated by releases from mine facilities, is likely to remain so for the foreseeable future unless ground water clean-up actions are taken. Without remediation/cleanup, ground water is less likely to be available for any beneficial future use. Furthermore, lack of stringent clean-up requirements results in less incentive to safeguard ground water quality in the first place.

In sum, the Proposed Rule allows ground water contamination above standards underneath the vast majority of copper mine sites in New Mexico. Best practice requires more protective pollution prevention measures and more stringent clean-up requirements.

Q: What is your familiarity with the regulatory protections currently in place at mine sites in New Mexico?

A: I am familiar with the Water Quality Act, which requires that ground water underneath a "place of withdrawal of water for present and reasonably foreseeable future use" must meet ground water quality standards. I am also familiar with the Commission's Decision, which defined site-specific considerations to be used to determine a place of withdrawal. I am also familiar with the Water Quality Act's provision for a variance and for the Commission Abatement Regulations allowing for alternative abatement standards.

Q: How does the Proposed Rule change the current regulatory protections in place in New Mexico?

A: Under the current regulatory protections, ground water within a "place of withdrawal of water for present or foreseeable future use" cannot be degraded above standards by mining activities and must meet ground water quality standards. Activities that will result in exceedances of water quality standards can occur during operations only after applying for and obtaining a variance. The variance approach begins with the premise that ground water should not become contaminated, and then allows for the consideration of site-specific conditions in determining where and how ground water quality standards can be exceeded.

The Proposed Rule no longer requires consideration of whether ground water beneath and downgradient of a mine site is a "place of withdrawal." The Proposed Rule allows ground water to exceed ground water quality standards beneath mine facilities and for a poorly defined distance downgradient of these facilities to a monitoring well (i.e., a point of compliance).

Furthermore, the Proposed Rule relies on capture of degraded ground water by interceptor wells, rather than prevention of the degradation in the first place. It does not require that site-specific conditions be considered in determining whether to issue a variance that would allow ground water quality standards to be exceeded.

Q: What are the increased risks to ground water as a result of this change at copper mines in New Mexico?

A: The Proposed Rule would allow ground water to become contaminated beneath and downgradient of mine facilities above standards by rule, rather than requiring a mine operator to meet standards or to apply for a variance. The current regulatory framework allows a permittee to apply for a. The application for a variance allows for a site-specific review of hydrogeologic and other conditions beneath and downgradient of mine facilities prior to issuing a variance. This site-specific review allows for consideration of factors specific to each mining site, and thus provides additional ground water protections and preservation of ground water quality for future uses. The protections are lost if ground water is allowed to be contaminated above standards by rule, rather than requiring an individual evaluation of ground water quality and the pollution prevention measures needed to avoid exceedances.

Allowing ground water to become contaminated above standards and then attempting to capture the degraded water is less protective and poses a greater risk to ground water quality than preventing the degradation in the first place. There are several reasons why the "point of compliance" system in the Proposed Rule increases the risk of ground water degradation:

1. Ground water monitoring is imperfect, because preferential flow paths and gradients cannot be completely characterized in complex hydrogeological systems. The fractured rock environments present at most mine sites are particularly challenging to monitor. An EPA report states, "Relative to most unconsolidated deposits, characterization of contaminant migration in fractured rock usually requires more information to provide a similar level of understanding."

The State-of-the Practice of Characterization and Remediation of Contaminated Ground Water at Fractured Rock Sites, p. 4 (EPA 2001) [AGO Ex. 14]. If monitoring wells are not situated to intersect preferential pathways such as fractures, contaminants may migrate beyond the monitoring network, escape detection, and continue to contaminate ground water farther downgradient.

2. Ground water capture by interceptor wells is imperfect, particularly in the fractured rock environments present at most mine sites. EPA, in *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems,* p. 3 (EPA 2008), states that "few sites, if any, begin the process with sufficient field data to evaluate and confirm hydraulic containment" (i.e., capture). In addition, EPA, in *Getting up to Speed: Ground Water Contamination,* p. C-2 (EPA 2013) states that "fractured rock presents a unique problem in locating and controlling contaminants because the fractures are generally randomly spaced and do not follow the contours of the land surface or the hydraulic gradient. Furthermore, in fractured rock environments, "The complexity of contaminant source conditions also make remediation more difficult." EPA 2001, p. 4.

Ground water capture systems have failed at the Chino and Tyrone Mines. Ore stockpiles at the mines are leached by applying a sulfuric acid solution to the top of the stockpiles. This solution percolates through the piles to form a concentrated-copper pregnant leach solution ("PLS"), which is collected at the bottom of the stockpiles for copper recovery. Ground Water Restoration Plan, pp. 2-11 [AGO Ex. 11]. Although the majority of the PLS from the unlined ore stockpiles at the Chino and Tyrone mines is captured, some PLS escaped capture and contaminated ground water in Oak Grove Wash at the Chino Mine and in the upper Mangas Wash and Deadman Canyon at the Tyrone Mine. *Id.* at pp. 3-4.

Even at relatively new mines, hydrogeological characterization techniques for designing ground water capture zones are not failsafe. At the Buckhorn Mountain Mine in Washington, ground water capture of mine-related contaminants failed within months of the initiation of mining in 2007, resulting in contamination of both ground water and surface water. *See* Notice of Penalty 9245, Buckhorn Mountain (July 16, 2012).

3. Contaminated ground water is expensive to control and clean up. Ground water cleanup at mine sites may cost tens of millions of dollars. *Costs of Remediation at Mine Sites,* § 2.2.1 (EPA 1997) [AGO Ex. 15]. In many cases, it may be technically infeasible to restore the ground water to pre-release conditions.

Many mine sites are required to control the migration of contaminated water for the foreseeable future. At the Tyrone mine site, dewatering of the open pits will be required in perpetuity to ensure that ground water downgradient of the pit is not contaminated further (see AGO Ex. 11, p. 2-14).

Even when ground water contamination is not allowed, contamination can still occur. For example, the Chino, Tyrone, and Cobre mines were not permitted to degrade ground water quality, and yet ground water contamination has occurred and still exists at and downgradient of the mine facilities today. Permitting the contamination of ground water beneath and

downgradient of mine facilities increases the likelihood of additional and long-term ground water degradation.

Q: What are the increased risks to ground water as a result of these changes at other discharge sites in New Mexico?

A: Adopting a "point of compliance" system at discharge sites increases the risks to ground water for the reasons described above, whether the site is a copper mine or other industrial site. Under such a system, discharges from other industrial facilities, such as impoundments for wastewater facilities, power plants, large-capacity septic tank leach fields, commercial land farms for treatment of contaminated soils, food processing plants, and power plants, would not be required to meet ground water quality standards beneath or adjacent to the facilities, or between the facilities and a downgradient point of compliance. Ground water in large areas beneath, adjacent to, and downgradient of these facilities would be allowed to exceed standards, regardless of current or future ground water use. The Proposed Rule thus sets a precedent for allowing widespread ground water contamination at industrial facilities throughout New Mexico.

Place of Withdrawal

Q: What is your familiarity with Section 74-6-5(E)(3) in the Water Quality Act, which prohibits the issuance of a discharge permit for a discharge that would result in an exceedance of ground water quality standards at a "place of withdrawal of water for present and reasonably foreseeable future use?"

A: I've read Section 74-6-5(E)(3) in the Water Quality Act. This section states:

The constituent agency shall deny any application for a permit or deny the certification of a federal water quality permit if . . . the discharge would cause or contribute to water contaminant levels in excess of any state or federal standard. Determination of the discharge's effect on ground water shall be measured at any place of withdrawal of water for present or reasonably foreseeable future use.

Q: Are you familiar with the Water Quality Control Commission's criteria for determining "place of withdrawal?"

A: Yes.

Q: What are those criteria?

A: The Commission determined seven criteria that are appropriate to consider in determining whether a location is a "place of withdrawal for present or reasonably foreseeable future use of water." These are site hydrology and geology, the quality of ground water prior to any discharge from a facility, past and current land use in the vicinity of a facility, future land use in the vicinity of a facility, past and current water use in the vicinity of the facility, potential future water use and potential future water demand in the vicinity of the facility, and population trends in the vicinity of the facility.

Q: Do you have an opinion as to whether portions of the Tyrone Mine site or Chino Mine site are places that have a present or reasonably foreseeable future use for water?

A: Yes. Based on information I've reviewed, my opinion is that portions of the Tyrone Mine site and the Chino Mine site are places that have a present or reasonably foreseeable future use for water.

Q: What is the basis of your opinion?

A: I considered the criteria cited by the Commission in conjunction with site-specific information for the Tyrone, Chino, and Cobre mine sites.

I considered the hydrology and geology at the mine sites, and whether aquifer testing and actual pumping rates of ground water within of alluvial and regional aquifers at the Tyrone and Chino sites indicate that these aquifers have sufficiently high hydraulic conductivities that allow them to supply ground water to users. The Commission found that a "place of withdrawal of water" refers to any area where the hydraulic conductivity of the underlying aquifer is at least 0.05 ft/day and is capable of producing water in sufficient amounts to support beneficial use. Comm'n Decision, FOF ¶ 92 [AGO Ex. 1]. Dr. John Shomaker, a consulting hydrogeologist for Phelps Dodge Tyrone, Inc., testified at the *Tyrone* hearing in 2007 that the hydraulic conductivity data for the aquifer at the Tyrone Mine is high enough to support domestic wells, and in some areas higher-capacity wells. J. Shomaker Testimony (2007), pp. 1586-87.

I also considered whether the ground water was of good quality prior to any discharge from the mines. Available evidence indicates that ground water quality at the mine sites absent the mine-caused contamination would be of good quality. Upgradient ground water quality does not exceed ground water standards and is not saline, and could be put to beneficial use. As part of the NRDAR for the Tyrone, Chino and Cobre Mines, an evaluation of baseline (i.e., conditions that would have been present absent the release of hazardous substances from mine operations) ground water conditions at the mine site was undertaken through a review of existing ground water data in alluvial and regional ground water aquifers. Concentrations of sulfate, the parameter used to measure ground water injury at the sites, and metals were lower than relevant water quality standards at the sites. Thus the NRDAR concluded that ground water at the mine sites was potable prior to discharge from the facility. Ground Water Restoration Plan [AGO Ex. 11]. Mr. Marshall, at NMED, also testified at the *Tyrone* hearing in 2007 that prior to open pit mining, "ground water quality in the vicinity of the Tyrone Mine was of good to excellent quality." C. Marshall Testimony (2007), p. 9 [AGO Ex. 13].

I also considered past and current land and ground water use in the vicinity of the Tyrone, Chino and Cobre mine sites to determine whether they are places of withdrawal on the sites. The mining land use requires withdrawal of ground water for processing, and for dewatering of the pits for mining. The land use around the Tyrone and Chino mines is ranching-related, agricultural, and residential. With limited surface water resources, mining, ranching, agricultural and residential uses in this region of New Mexico require withdrawal of ground water. There are two drinking water wells on the Tyrone Mine site, the Fortuna Wells, which are clearly places of

withdrawal for past and current use. In addition, there is increasing interest in future withdrawal of ground water in the vicinity of the mines, for drinking water and other purposes. *See* C. Marshall Testimony (2007), pp. 12-15 [AGO Ex. 13].

Finally, I considered the findings of the Commission in its 2009 Decision. The Commission found that there were many places of withdrawal at the Tyrone mine site. The Commission identified the following areas as places of withdrawal for present or reasonably foreseeable future use: two drinking water wells on the mine site, the Fortuna Wells; six parcels within the mine site not owned by Tyrone or affiliates; the north side of the mine around the Mangas Valley Tailings Impoundment; the area west and to the east of the 1A Tailings Impoundment; an area immediately south of the 1A Tailings Impoundment; an area to the southeast of the 3A Stockpile and to the east of the 3B Waste Rock Pile; open areas around the pits; the area on the east side of the mine south of the 5A Waste Rock Pile; an area south of the Gettysburg Pit; areas on the southwest corner of the mine; an area to the west of the Gettysburg Pit, along the 1C Stockpile; areas on the southeast side of the mine along and within Oak Grove Draw; an area on the east side of the mine to the southeast of the No. 1 Stockpile; areas in the southeast corner of the mine, around the reclaimed Burro Mountain Tailings; and areas on the west side of the mine in Deadman Canyon. Comm'n Decision, COL ¶¶ 46-49, FOF ¶ 125 [AGO Ex. 1].

Alternative Approach

Q: Based on your experience and knowledge of New Mexico's protection of ground water, do you have a recommendation for the Commission on an alternative approach for the Copper Mine Rule?

A: Yes I do.

Q: What is that approach?

A:

- Based on the site-specific conditions and the seven criteria identified by the Commission, determine whether part or all of the copper mine sites are places of withdrawal for present or reasonably foreseeable future uses of water.

- Require compliance with water quality standards within the places of withdrawal. Provide for mining companies to obtain variances for ground water to exceed standards in certain circumstances.

- Require abatement of ground water exceeding water quality standards at places of withdrawal.

- Allow mining companies to request alternative abatement standards upon closure if standards cannot be met because of the demonstrated technical infeasibility of meeting those standards.

Q: Why do you recommend this approach?

A: This approach provides better protection for ground water, which is a valuable resource in arid New Mexico, yet it does not impose overly burdensome restrictions on the copper mining industry in the State. The State's ground water resources are likely to become even more valuable in the face of climate change and increasing population. This approach requires that water quality standards be met, but allows exceptions after consideration of the specific conditions at each site. It does not allow, by rule, the degradation of ground water beneath and downgradient of copper mine facilities. It requires that the present and foreseeable future use of ground water be considered before allowing mine operations to contaminate waters of the State above ground water quality standards.

This approach is also consistent with my understanding of how the regulatory system in New Mexico has worked in the past and currently works; the Commission's 2009 Decision; the Tyrone Settlement; and the August 17 and September 7, 2012 NMED draft Copper Mine Rules.

Q: AGO Exhibit 2 are amendments proposed by the Attorney General to NMED's October 30, 2012 Proposed Copper Mine Rule. Are you familiar with those amendments?

A: Yes, I have reviewed them.

Q: What basis did the Attorney General use for his proposed amendments?

A: The September 7, 2012 NMED internal draft copper mine rule [AGO Ex. 7].

Q: How do the Attorney General's proposed amendments differ from NMED's Proposed Rule in the treatment of leach stockpiles, in Section 20.6.7.18 NMAC of his proposed amendments?

A: For existing leach stockpiles, the Attorney General proposes to require the mining company to obtain a variance from the Commission if discharges from the stockpile are causing exceedances of ground water quality standards. This requirement differs from NMED's Proposed Rule, which would allow leaching operations that are contaminating ground water above standards to continue to operate without a variance. A variance will allow for a site-specific analysis of the leach stockpile and of ways to most effectively mitigate contamination, while still allowing the leach stockpile to operate. This is better practice, and allows for an appropriate balance between environmental protection and development of the copper resource.

Q: How do the Attorney General's proposed amendments differ from NMED's Proposed Rule in the treatment of waste rock stockpiles, in Section 20.6.7.19 NMAC of his proposed amendments?

A: Both proposals require a material characterization plan to determine the potential for ground water contamination above standards.

They differ in that, under the Attorney General's proposed amendments, if a new waste rock pile may cause exceedances of standards, a liner system or its equivalent is required. NMED's Proposed Rule would rely upon an interceptor system to contain ground water contamination, rather than a liner or equivalent system to prevent ground water contamination. As previously stated, given the possibility that containment of contamination will not be successful, and because of the potential expense to clean it up, the best practice is to prevent contamination that would require cleanup in the first place.

As to existing waste rock piles, the Attorney General proposes to allow them to continue to function if the mine can show that the waste rock will not result in exceedances of standards, or if the mine obtains a variance from the Commission. Again, requiring an operator to obtain a variance allows for site-specific mitigation measures to be implemented that would minimize the threat of ground water contamination, while allowing the existing operations to go forward. In contrast, NMED's proposal would allow an existing waste rock pile to continue to operate and cause exceedance(s) of standards without a variance.

Q: How do the Attorney General's proposed amendments differ from NMED's Proposed Rule in the treatment of tailings impoundments, in Section 20.6.7.20 NMAC of his proposed amendments?

A: Under the Attorney General's proposed amendments, new tailings impoundments are required to be lined, or equivalent containment must be accomplished. Discharges from tailings impoundments in New Mexico, as discussed, have routinely resulted in ground water contamination above standards, and therefore, the discharge should be contained to prevent such contamination. If an operator can show that its tailings impoundments will not result in exceedances of standards, the operator may apply for a variance from the liner or equivalent requirement.

Under the Attorney General's proposal, existing, unlined tailings impoundments may continue to operate if they are not causing exceedances of standards or if a variance is obtained. Under NMED's proposal, existing tailings impoundments would be allowed to continue to operate without those protections. Again, the variance process allows for a site-specific analysis that should result in the application of mitigation measures, while still allowing the existing tailings impoundment to operate. This is better practice.

Q: How do the Attorney General's proposed amendments differ from NMED's Proposed Rule in the treatment of open pits, in Section 20.6.7.22 NMAC of his proposed amendments?

A: Under NMED's proposal, open pit operations are exempt from requirements to meet ground water quality standards. The Attorney General proposes that standards would still apply. Again, however, an operator may obtain a variance to operate, based on a site-specific analysis and implementation of measures to minimize ground water pollution. This is better practice – it better protects the ground water resources while allowing mining to continue.

Q: What does the Attorney General recommend in his proposed amendments with regard to the concept of "area of hydrologic containment" found in NMED's Proposed Rule?

A: The Attorney General proposes to not include that concept, which was added after the September 7, 2012 draft of the copper mine rule, as unnecessary in light of his other proposed amendments. The "area of hydrologic containment" was used in NMED's version as the area under which ground water could be contaminated above standards by rule. Because the Attorney General's proposal does not allow water quality violations by rule, that concept is not necessary.

The Attorney General proposes to not include that concept because it would be unnecessary in light of his other proposed amendments. The "area of hydrologic containment" concept, which was added after the September 7, 2012 copper mine rule draft, was used in NMED's version to delineate an area under which ground water could be contaminated above standards by rule. Because the Attorney General's proposal does not allow water quality violations by rule, use of the concept is not necessary.

Q: How do the Attorney General's proposed amendments differ from NMED's Proposed Rule in the treatment of establishing a monitoring system and point of compliance regulatory framework, in Section 20.6.7.25 NMAC of his proposed amendments?

A: The Attorney General proposes that monitoring wells not be used as "points of compliance" for determining compliance with ground water quality standards. NMED's proposal would allow the monitoring well network to surround, at some undefined distance, the pollution sources and their capture/interceptor systems, and that is where compliance with standards would be determined. The Attorney General, consistent with the rest of my testimony, proposes to do away with that approach.

The Attorney General also proposes language to ensure that monitoring wells are located "as close as practicable" to new and existing leach stockpiles, waste rock piles, tailings, and open pits to ensure the earliest possible detection of ground water contamination.

Q: What does the Attorney General propose for the variance process in Sections 20.6.7.28 and -29 NMAC of his proposed amendments?

A: The Attorney General proposes a variance process that requires the petitioner to provide relevant information, including the reasons why compliance with the Copper Mine Rule would impose an unreasonable burden. If the petitioner wants allowance to exceed standards, the information required would include how water pollution will be minimized to the extent practicable, and how water pollution at the discharge site will be fully contained onsite and abated to meet applicable standards.

The Attorney General also proposes to include notice and hearing provisions, all of which were in the September 7, 2012 draft copper mine rule.

As I have testified, requiring a site-specific analysis in order to obtain a variance, in which an operator must minimize water pollution if standards will be exceeded, is better practice than allowing exceedances by rule without these limits and protections. Ground water would thus be better protected, while still allowing mining companies to operate.

This ends my direct testimony, which is true and accurate to the best of my knowledge.

Connie Travers

2/22/13
Date