**STATE OF NEW MEXICO**
**BEFORE THE WATER QUALITY CONTROL COMMISSION**

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

## WRITTEN TESTIMONY OF MICHAEL GRASS

## I. BACKGROUND AND EXPERIENCE

My name is Michael Grass. I earned two degrees, B.S. (1994) and M.S. (1997), in Geological Engineering, both from the Mackay School of Mines at the University of Nevada, Reno. I am a registered professional engineer licensed in Arizona and Utah and a registered professional geologist in Arizona. I am employed as an Associate/Senior Consultant by Golder Associates in its Tucson, Arizona office. Golder Associates is a worldwide engineering and technical consulting firm with extensive expertise and staff devoted to mining projects. My curriculum vitae is attached as Exhibit Grass-1.

My most relevant experience includes project management of geotechnical, geological, hydrological and hydraulic evaluation and design for regional mining and civil engineering projects. I have been the senior engineer for copper leach stockpile design and construction projects, including construction level design of a 600-foot high geomembrane lined leach facility at Safford, Arizona, which was a model project for the proposed rule provisions on leach stockpiles. I also have experience as project manager and engineer for new, expansion, and upgraded copper leach facility projects at Morenci, Sierrita, and Miami in Arizona and in

Mexico. Additional copper mine experience includes work on waste rock stockpiles at the Chino Mine in New Mexico, work on storm water and seepage controls at the Tyrone Mine in New Mexico, and the Miami and Safford Mines in Arizona, slope stability analysis, geotechnical investigations and geologic evaluations for open pits in Arizona and Mexico and a conceptual level siting study for a proposed new tailings facility in Arizona.

I am testifying on behalf of Freeport-McMoRan regarding Proposed Copper Mine Rules published by the New Mexico Environment Department on October 30, 2012 (Proposed Rule). My written testimony incorporates the text of the parts of the Proposed Rule for reference.

## II. INTRODUCTION

I am providing this direct written testimony on behalf of Freeport-McMoRan regarding the Environment Department's Proposed Copper Mine Rule. My written testimony incorporates the language of the Proposed Rule from Attachment 1 to the Environment Department's Petition in this matter, dated October 30, 2012. This language is incorporated into my testimony for ease of reference, and so that if any changes to the Proposed Rule are considered by the Commission, the record is clear regarding the exact language to which my testimony applies. My direct written testimony focuses on the engineering design and operational requirements for process water and impacted storm water impoundments, leach stockpiles, and waste rock stockpiles. I was involved in the development of the Proposed Rule as part of the Technical Committee process and also presented at and attended some Advisory Committee meetings. I attended and participated in the Technical Committee meetings through June 2012 covering the topics of leach stockpiles, surface impoundments, tailings impoundments and the first meeting on closure. I gave presentations to the Technical Committee on leach facilities and impoundments and also presented to the Advisory Committee on those topics. A copy of my presentation to the Advisory Committee on leach stockpiles is attached as Exhibit Grass-2.

## III. DISCUSSION OF PROPOSED RULE

The first part of the Proposed Rule addressed by my testimony is found in section 20.6.7.11 of the Proposed Rule, Subsection N, which reads:

> **N. Engineering design, construction and surveying.** Pursuant to 20.6.7.17 NMAC, 20.6.7.18 NMAC, 20.6.7.20 NMAC, 20.6.7.21 NMAC, 20.6.7.22 NMAC, 20.6.7.23 NMAC and 20.6.7.26 NMAC an application shall include:
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> (1) plans and specifications for proposed new or modified tailings facilities, leach stockpiles waste rock stockpiles, and process water and impacted stormwater impoundments and associated liners;
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> (2) plans and specifications for proposed new or modified tanks, pipelines, truck and equipment wash facilities and other containment systems; and
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> (3) a stormwater management plan.

I draw attention to this subsection to comment on the varying level of detail that may be present in written plans and specifications at various points in the design, permitting and construction process. I note that Subsection N quoted above applies once a written permit application is submitted. Prior to the submission of an application for a new copper mine facility, the Proposed Rule, Section 20.6.7.10, Subsection A, requires a pre-application meeting. At such a meeting, a permit applicant and consultant might present some preliminary plans and drawings for discussion to get the Department's feedback on whether proposed designs would meet the regulatory requirements. That feedback would be used as a basis to prepare more detailed plans and specifications for inclusion in a permit application, as required by Subsection N above. The plans and specifications submitted under Subsection N would have to contain sufficient detail for the Department to confirm that all of the requirements of the rule would be satisfied and also would have to meet the requirements for an engineer to sign and seal the plans and specifications, as discussed below. The plans and specifications submitted under Subsection N, however, likely would not be the final, detailed plans and specifications used for construction.

Per standard engineering practice, plans and specifications are not issued for construction until after the regulatory agency has reviewed and approved the submitted plans and specifications. The Proposed Rule in this regard appears to be consistent with typically engineering practices and the procedures used in other states. I believe that the procedure specified in the Proposed Rule goes beyond the existing requirements of the Commission's rules, as I understand that discharge permits have been issued in the past on the basis of permit applications that have not included plans and specifications signed and sealed by an engineer.

The next section of the Proposed Rule on which I will testify is the General Engineering and Surveying Requirements, section 20.6.7.17. This section is quoted below, with my testimony interspersed within the text.

> **20.6.7.17 GENERAL ENGINEERING AND SURVEYING REQUIREMENTS:**
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> **A. Practice of engineering.** All plans, designs, drawings, reports and specifications required by the copper mine rule that require the practice of engineering shall bear the seal and signature of a licensed New Mexico professional engineer pursuant to the New Mexico Engineering and Surveying Practice Act, NMSA 1978, Sections 61-23-1 through 61-23-33, and the rules promulgated under that authority.
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> **B. Practice of surveying.** All plans, drawings and reports required by the copper mine rule that require the practice of surveying shall bear the seal and signature of a licensed New Mexico professional surveyor pursuant to the New Mexico Engineering and Surveying Practice Act, NMSA 1978, Sections 61-23-1 through 61-23-33, and the rules promulgated under that authority.

The first two subsections A and B state some general requirements regarding the practice of engineering and the practice of surveying, both of which I understand are intended to call out requirements of existing New Mexico laws. Subsection C of the Proposed Rule identifies some requirements for engineering plans and specifications to be included in permit applications, as applicable to the facilities addressed in the application.

> **C. Engineering plans and specifications requirements.** The following engineering plans and specifications and associated requirements shall be submitted to the department for approval with an application for a new, renewed or modified discharge permit, as applicable.

(1) **Liner system plans and specifications.** An applicant or permittee proposing or required to construct a new or improve an existing liner system required by the copper mine rule or an existing discharge permit, including the repair, modification or replacement of a liner system, shall include the following elements in all liner system plans and specifications submitted to the department.

(a) **Construction plans and specifications.** Detailed and complete construction plans and specifications and supporting design calculations developed pursuant to this section and 20.6.7.18 and 20.6.7. 20 through 20.6.7.26 NMAC shall be submitted to the department.

(b) **Liner system CQA/CQC.** The construction and installation of all liner systems and the repair, modification or replacement of a liner system shall be conducted in accordance with a construction quality assurance/construction quality control (CQA/CQC) plan. A CQA/CQC plan shall be included as part of the design plans and specifications. The CQA/CQC plan shall specify the observations and tests to be used to ensure that construction of the liner system meets all design criteria, plans and specifications. All liner system testing and evaluation reports for liner construction and installation, including modifications and replacements shall be signed and sealed by a licensed New Mexico professional engineer with experience in liner system construction and installation. The CQA/CQC plan shall include the following elements.

(i) The identity of persons responsible for overseeing the CQA/CQC program. The person responsible for overseeing the CQA/CQC plan shall be a licensed New Mexico professional engineer with experience in liner system construction and installation;

(ii) An inspection protocol;

(iii) Identification of field and laboratory testing equipment and facilities proposed to be used, and calibration methods;

(iv) The procedures for observing and testing the liner, subgrade, liner bedding, and other liner system construction material;

(v) A protocol for verification of any manufacturers' quality control testing and procedures;

(vi) The procedures for reviewing inspection test results and laboratory and field sampling test results;

(vii) The actions to be taken to replace or repair liner material, subgrade, liner bedding, or other liner system construction materials should deficiencies be identified;

(viii) The procedures for seaming synthetic liners;

(ix) The reporting procedures for all inspections and test data; and

(x) The submission of a CQA/CQC report.

Paragraph (1) of subsection C identifies the elements to be included in plans and specifications for liner systems. Liner systems are specified as part of the design of certain facilities including process water and impacted stormwater impoundments and leach stockpiles, and can be required by the Department as needed to address site-specific conditions for tailings impoundments and waste rock stockpiles. The term "liner system" is defined in section 20.6.7.7(34) of the Proposed Rule as follows:

(34) "Liner system" means an engineered system required by the copper mine rule for the containment, management or storage of process water, leach stockpile material, waste rock, tailings or other materials that have the potential to generate water contaminants including all constructed elements of the system and may include the subgrade, liner bedding, leak detection

> systems, synthetic liners, earthen liners, overliners, solution collection systems, anchor trenches, and berms, or other system elements, as applicable.

This definition includes all of the elements that might be included as part of an engineered liner system, although not all of these elements will be included in every liner system. The Proposed Rule, as discussed below, requires different elements for liner systems designed for particular types of facilities. I would note that liner systems are designed and intended to contain water or solutions as opposed to solid materials. For example, a liner system underlying a leach stockpile is intended to contain the process solutions and not the rock material. This paragraph also uses the acronyms "CQA" and "CQC", which also are defined:

> (10) "Construction quality assurance" or "CQA" means a planned system of activities necessary to ensure that standards and procedures are adhered to and that construction and installation meet design criteria, plans and specifications. A CQA includes inspections, verifications, audits, evaluations of material and workmanship necessary to determine and document the quality of the constructed impoundment or structure, and corrective actions when necessary.
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> (11) "Construction quality control" or "CQC" means a planned system of operational techniques and activities used to preserve the quality of materials and ensure construction to specifications. Elements of a CQC include inspections, testing, data collection, data analysis and appropriate corrective actions.

These definitions are complete in defining the elements of CQA and CQC plans. In practice, CQA and CQC include essentially the same elements, except that CQA is typically performed by a project owner or an engineer retained by the project owner, and involves verification on parts of facilities following installation or construction to verify that design criteria, plans and specifications have been met, while CQC is typically developed by the construction contractor to plan for and conduct the installation or construction work. It makes sense to use separate definitions because the plan documents may be different. I believe these definitions are complete, are consistent with good engineering practices, and consistent with guidance on CQA and CQC published by the U.S. Environmental Protection Agency as well as existing Environment Department permit requirements and practices. See Exhibit Grass-3.

> (c) **Management of process water, solids and sludge or impacted stormwater during liner system improvement.** An applicant or permittee proposing or required to improve copper mine facility operational units that requires the use of a liner system, including re-lining or replacement of an existing liner system, shall submit a plan for managing process water, solids and sludges, or impacted stormwater during preparation and construction of the improvement. The plan shall be submitted as part of the design plans and specifications. The plan shall include the following minimum elements.
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> (i) A plan for handling and disposal of process water, solids and sludges and impacted stormwater discharges during improvement to the impoundment;
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> (ii) A plan for removal and disposal of process water, solids and sludges or impacted stormwater within the liner system prior to beginning improvement to the liner system;
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> (iii) A plan and schedule for implementation of the project; and
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> (iv) If the plan proposes a temporary location for the discharge of process water, solids and sludge, or impacted stormwater not authorized by the effective discharge permit, the applicant or permittee shall request temporary permission to discharge from the department pursuant to Subsection B of Section 20.6.2.3106 NMAC.

Subparagraph (c) of this paragraph requires a plan describing how process water, solids, sludges, and impacted stormwater will be handled if they need to be removed or otherwise handled during repair or replacement of a liner. My understanding is that this plan requirement is intended to ensure proper handling of these materials and also to avoid the need for separate discharge permit changes, or allow temporary approval, to accommodate the handling of these materials, since a separate permitting process could delay needed repairs. These requirements appear to be reasonable, and I understand it is consistent with existing permit conditions and Environment Department practices. This also is a convenient time to discuss the definitions of certain waters as defined in the Proposed Rule, stormwater, impacted stormwater, and process water. These definitions are found in section 20.6.7.7(29), (50) and (54):

> (54) "Stormwater" means all direct precipitation and runoff generated within a copper mine facility from a storm event.

> (29) "Impacted stormwater" means direct precipitation and runoff that comes into contact with water contaminants within a copper mine facility which causes the stormwater to exceed the one or more of the standards of 20.6.2.3103 NMAC and includes overflow from a primary process solution impoundment or other collection facility resulting from a precipitation event.

(50) "Process water" means any water containing water contaminants in excess of the standards of 20.6.2.3103 NMAC that is generated, managed or used within a copper mine facility including raffinate; PLS; leachate collected from waste rock stockpiles, leach stockpiles, and tailings impoundments; tailings decant water; pit dewatering water; intercepted ground water, laboratory or other waste discharges containing water contaminants; and domestic wastes mixed with process water.

As you can see, "stormwater" is very broadly defined to include all direct precipitation and runoff generated within a copper mine. "Impacted stormwater" means stormwater that has come into contact with water contaminants so that the stormwater exceeds numerical ground water quality standards. Some copper mine facilities, particularly leach facilities, are designed with systems intended to contain leach solutions under normal operating conditions, including during smaller precipitation events. These systems, however, may require separate impoundments to contain overflows from larger, more infrequent precipitation events. Overflows of a mixture of stormwater and diluted process water also qualify as "impacted stormwater." "Impacted stormwater" is subject to certain requirements, particularly engineering design requirements for impoundments that hold such water. The definition of "process water" includes the types of waters and solutions typically used in or generated by copper mining processes.

(d) **Dam safety.** An applicant or permittee proposing or required to construct a tailings facility or impoundment shall submit documentation of compliance with the requirements of the dam safety bureau of the state engineer pursuant to Section 72-5-32 NMSA 1978, and rules promulgated under that authority, unless exempt by law from such requirements.

I understand that subparagraph (d) above is intended to draw attention to existing laws and regulations regarding certain tailings facilities and impoundments that may be subject to the jurisdiction of the State Engineer.

(2) **Tank, pipeline, sump or other containment system plans and specifications.** An applicant or permittee proposing or required to construct a new tank, pipeline, sump or other containment system for the management of tailings, process water or other water contaminants shall submit detailed and complete construction plans and specifications and supporting design calculations developed pursuant to this section and 20.6.7.23 NMAC. The construction plans and specifications for an improvement(s) or replacement of an existing tank, pipeline, sump or other containment systems shall address the management of solids, waste, process water or other water contaminants generated during preparation and construction of the improvements or replacement. This requirement does not apply to portable or temporary tanks,

pipelines, sumps, or other containment systems that are subject to periodic relocation during mining operations.

Paragraph (2) as quoted above requires the submission of plans and specifications for tanks, pipelines and sumps used to convey or contain tailings and process water, except for portable systems subject to periodic relocation. I understand that the systems subject to periodic relocation typically include pipelines for distribution of leach solutions within leach stockpile systems, although other portable systems can exist, such as portable pumps and associated pipelines used temporarily to evacuate water from impoundments and tanks. Leach solution distribution systems typically are permitted as part of the leach system itself. I understand that the Proposed Rule requirements for these plans and specifications may go beyond the requirements for permit applications under the existing rules. In other copper producing states, including Arizona and Nevada, plans and specifications for tanks, pipelines and sumps are not required, and these systems typically are not considered to be discharging facilities and are not subject to most, if any, permitting requirements.

(4) **Impacted stormwater management plans and specifications.** An applicant shall submit stormwater management plans and specifications to limit run-on of stormwater and manage impacted stormwater in a manner which prevents water pollution that may cause an exceedance of the applicable standards. The plans and specifications shall be submitted with an application for a new or renewed discharge permit, or as applicable with an application for a modified discharge permit, and shall include the following information.

(a) A scaled map of the copper mine facility showing:

(i) the property boundaries of the copper mine facility and the mining areas;

(ii) all existing and proposed structures;

(iii) existing and proposed final ground surface contours outside of the open surface drainage area at appropriate vertical intervals; and

(iv) existing and proposed stormwater containment and conveyance structures, including construction materials, size, type, slope, capacity and inlet and invert elevation (or minimum and maximum slopes) of the structures, as applicable.

(b) A description of existing surface water drainage conditions.

(c) A description of the proposed post-development surface water drainage conditions.

(d) Supplemental information supporting the stormwater management plan including the following information:

(i) hydrologic and hydraulic calculations for design storm events;

(ii) hydraulic calculations demonstrating the capacity of existing and proposed stormwater impoundments;

(iii) hydraulic calculations demonstrating the capacity of existing and proposed conveyance channels to divert stormwater or contain and transport runoff to stormwater impoundment(s); and

(iv) a list of tools and references used to develop the hydrologic and hydraulic calculations such as computer software, documents, circulars, and manuals.

(e) A plan to manage impacted stormwater, and to divert run-on of non-impacted stormwater where practicable. The plan shall include, as necessary, design, construction, and installation of run-on, run-off, and stormwater diversion structures, collection of impacted stormwater, and a description of existing surface water drainage conditions. The plan shall consider:

(i) the amount, intensity, duration and frequency of precipitation;

(ii) watershed characteristics including the size, topography, soils and vegetation of the watershed; and

(iii) runoff characteristics including the peak rate, volumes and time distribution of runoff events.

In addition to the stormwater plans required by this section, stormwater pollution prevention plans for copper mines typically are required for compliance with stormwater discharge permits under the federal Clean Water Act. There is some overlap and duplication of requirements. However, from an engineering standpoint, the detailed requirements of this paragraph are consistent with the information that an experienced engineer would develop to plan facilities to convey, contain and manage stormwater at a copper mine and should provide the Department with the information needed to evaluate stormwater management facilities and practices as it relates to protection of ground water quality.

(5) **Flow metering plans.** An applicant or permittee proposing or required to install a flow meter(s) pursuant to the copper mine rule shall submit a flow metering plan to support the selection of the proposed device along with information or construction plans and specifications, as appropriate, detailing the installation or construction of each device. This information or construction plans and specifications proposed by the applicant or permittee shall be submitted to the department with the application for a new discharge permit or a renewed or modified discharge permit if a new flow meter is proposed.

My understanding is that flow metering plans are required under the Proposed Rule for flow meters needed to measure discharge volumes at particular locations relevant to compliance with discharge limits contained in discharge permits. I further understand that this paragraph is intended to ensure that the flow meters required for purposes of the Proposed Rule are properly selected and installed. Most other jurisdictions with which I am familiar do not require plans and specifications for flow meters, but may require reporting of information on how particular measurements were made.

**D. New impoundment engineering design requirements.** At a minimum, construction of a new impoundment or replacement of an existing impoundment shall be in accordance with the applicable liner, design, and construction requirements of this Subsection. These requirements do not apply to tailing impoundments that are subject to the specific engineering design requirements of Paragraph 4 of Subsection A of 20.6.7.22 NMAC.

(1) **General design and construction requirements.**

(a) The outside slopes of an impoundment shall be a maximum of two (horizontal) to one (vertical) and shall meet a minimum static factor of safety of 1.3 with water impounded to the maximum capacity design level, except where an impoundment is bounded by rock walls or is below the surrounding surface grade.

(b) The dikes of an impoundment shall be designed to allow for access for maintenance unless otherwise approved by the department.

(c) Liners shall be installed with sufficient slack in the liner material to accommodate expansion and contraction due to temperature changes. Folds in the liner material shall not be present in the completed liner except to the extent necessary to provide slack.

(d) Liners shall be anchored in an anchor trench. The trench shall be of a size and setback distance sufficient for the size of the impoundment.

(e) Liner panels shall be oriented such that all sidewall seams are vertical.

(f) Any opening in the liner through which a pipe or other fixture protrudes shall be sealed in accordance with the liner manufacturer's requirements. Liner penetrations shall be detailed in the construction plans and as-built drawings.

(g) All liners shall be installed by an individual that has the necessary training and experience as required by the liner manufacturer.

(h) Liner manufacturer's installation and field seaming guidelines shall be followed.

(i) All liner seams shall be field tested by the installer and verification of the adequacy of the seams shall be submitted to the department along with the as-built drawings.

(j) Concrete slabs installed on top of a liner for operational purposes shall be completed in accordance with manufacturer and installer recommendations to ensure liner integrity.

The preceding paragraph (1) lists some typical, minimum design requirements for impoundments. These requirements do not apply to tailings impoundments, but would apply to lined process water and impacted stormwater impoundments. "Impoundment" is defined in the Proposed Rule, section 20.6.7.7(30) as follows:

(30) "Impoundment" means any structure designed and used for storage or containment of mine process water, or impacted stormwater, or used for solids settling, excluding a tailings impoundment. A process water or stormwater transfer sump or a tank, below-grade tank, drum or pit bottom is not an impoundment.

This definition also excludes tailings impoundments, which are addressed in detail in a separate section of the Proposed Rule. The requirements in paragraph (1) above are standard engineering requirements for the design of an impoundment and liner installation. The 2:1 maximum slope for an impoundment berm is an appropriate minimum, although the rule language indicates that this limit does not apply if part of an impoundment boundary is a natural feature, such as a rock wall, rather than an earthen berm. The factor of safety of 1:3 also is consistent with standard requirements and good engineering practices. Most of the impoundments that will be governed by this provision are not under the jurisdiction of the State Engineer and would be classified as low hazard dams. If an impoundment is subject to State Engineer jurisdiction, then the additional requirements of the State Engineer would apply, as indicated in paragraph (1), subparagraph (d) above. The liner installation guidance in subparagraphs (b) through (j) are typical requirements and would be addressed in the CQA/CQA plans discussed above. See Exhibit Grass-3.

> (2) I**mpoundment capacity.** Impoundments shall meet the following design capacities. Capacity requirements may be satisfied by a single impoundment or by the collective capacity of multiple interconnected impoundments and any interconnected tanks.
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> (a) **Capacity requirements for impoundments that contain leach solutions.** Process water systems that impound leach solutions shall be designed for adequate overflow capacity for upset conditions. Any impoundment that collects leach solutions and is routinely at capacity shall be designed to maintain a minimum of two feet of freeboard during normal operating conditions while conveying the maximum design process flows. These impoundment systems shall be designed with overflow capacity for upset conditions such as power outages, pump or conveyance disruptions and significant precipitation events. The appropriate overflow capacity design shall consider system redundancies such as backup power systems and pumps. The overflow capacity shall be designed to contain the maximum design flows for the collection system for the maximum period of time that is required for maintenance activities or restoration to normal operating conditions while maintaining two feet of freeboard. If the collection system receives direct precipitation runoff with little or no flow attenuation in the upgradient leach stockpile collection system, the overflow capacity shall be sized to contain the runoff from a 100 year, 24 hour storm event in addition to the upset condition capacity. For process water impoundments located within the open pit surface water drainage area, the open pit bottom may be utilized for a portion of the permitted impoundment capacity. Impoundments constructed on a leach stockpile such that any overflow would discharge to and be contained by the approved leach stockpile system are exempt from this capacity requirement.
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> (b) **Other process water impoundment capacity requirements.** Process water impoundments intended to manage or dispose of process water, other than leach solutions, shall be designed for adequate overflow capacity for upset conditions. Any impoundment that collects such process water and is routinely at capacity shall be designed to maintain a minimum of two feet of freeboard during normal operating conditions while conveying the maximum design process flows. These impoundment systems shall be designed with overflow capacity for upset conditions such as power outages, pump or conveyance disruptions and significant precipitation events. The appropriate overflow capacity design shall consider system redundancies such as backup power systems and pumps. The overflow capacity shall be designed to contain the maximum design flows for the collection system for the maximum period of time that is required for maintenance activities or restoration to normal operating conditions while maintaining two feet of freeboard. For process water impoundments located within the open pit surface water drainage area of an existing copper mine facility, the open pit bottom may be utilized for a portion of the

permitted impoundment capacity. Impoundments constructed on a leach stockpile such that any overflow would discharge to and be contained by the approved leach stockpile system are exempt from this capacity requirement.

(c) **Combination process water/impacted stormwater impoundment capacity requirements.** Impoundments, other than impoundments for the containment of leach solutions, intended to dispose of a combination of process water and impacted stormwater shall be designed to contain, at a minimum, the volume described in Subparagraph (b) of this Paragraph and the volume of stormwater runoff and direct precipitation generated from the receiving surface area resulting from a 100 year, 24 hour storm event while preserving two feet of freeboard. For combination process water/impacted stormwater impoundments located within the open pit surface water drainage area of an existing copper mine facility, the open pit bottom may be utilized for a portion of the impoundment capacity.

(d) **Evaporative impacted stormwater impoundment design requirements.** Impoundments intended to manage or dispose of impacted stormwater by evaporation shall be designed to contain, at a minimum, the volume of stormwater runoff and direct precipitation generated from the receiving surface area resulting from a 100 year, 24 hour storm event while preserving two feet of freeboard. For impoundments located within the open pit surface water drainage area of an existing copper mine facility, the open pit bottom may be utilized for a portion of the impoundment capacity.

(e) **Other impacted stormwater impoundment design requirements.** Other impacted stormwater impoundment systems shall be designed to prevent overflow resulting from a 100-year, 24-hour return interval storm event while maintaining two feet of freeboard and may use interconnected impoundments, gravity flow conveyances and pumping systems designed to remove water from individual impoundments at rates to prevent overflow during the design storm event. The appropriate overflow capacity design shall consider system redundancies such as backup power systems and pumps. For impacted stormwater impoundments located within the open pit surface water drainage area, the open pit bottom may be utilized for a portion of the permitted impoundment capacity.

Another important definition, “freeboard,” found in 20.6.7.7(27) is important to understand the preceding text.

(27) "Freeboard" means the vertical distance between the elevation at the lowest point of the top inside edge of the impoundment and the design high water elevation of the water level in the impoundment.

The concept of “freeboard” is intended to ensure that an impoundment is not filled beyond a point where it could be overtopped by wave action. The two foot freeboard requirement is standard and based on a very conservative calculation of maximum wave heights for a very large impoundment (approximately one mile across).

The specific capacity requirements for the different types of impoundments are generally the same, with slight adjustments depending primarily on whether the particular type of impoundment receives precipitation runoff and the dynamics of that precipitation runoff for different types of facilities. Subparagraph (a) applies to impoundments that contain leach solutions. Copper leaching operations typically have a high flow volume and require large volume pumping systems to maintain the recirculating flows of leach solutions. Consequently, one of the impoundment capacity requirements is sufficient capacity to convey maximum design process flows. Design capacity must consider upset conditions, particularly power outages and breakdowns that might disrupt pumping and/or pipeline systems as well as larger precipitation events. Power outages can be addressed in part through backup power supplies, and the extent of backup power supplies will be considered under the Proposed Rule. Similarly, the availability of replacement pumps and ready availability to repair pipelines and equipment affects the length of time for restoration of a pumping system and, therefore, the required containment capacity. An engineer would consider all of these factors and identify a reasonable maximum time for an upset condition and would then identify containment capacity appropriate for that time period and the maximum design flow rate. Significant precipitation events also are addressed in the language. Runoff volumes from a large precipitation event can be quite high, depending on the drainage area of the leach operation. However, much of the runoff may not report to an impoundment quickly, but may be absorbed into the leach stockpile, in which case the runoff might report over a matter of days. The requirement in the Proposed Rule is for sufficient capacity to contain the volume of runoff that would result from a 100-year, 24-hour storm event, in addition to the upset capacity and allows for any attenuation provided by the leach facility to be considered as part of this capacity (this could be a consideration for mature, existing leach facilities that may be evaluated under this rule). This containment requirement exceeds the federal Clean Water Act requirement to contain a 10-year, 24-hour storm event and is consistent with the containment requirements established in other copper mine states.

For a large leach stockpile, the required containment capacity typically would be achieved through a combination of a process water impoundment designed to contain the maximum design process flow rate with some excess, plus a separate impacted stormwater impoundment that would contain overflows from the primary impoundment due to larger upset or precipitation events. The impacted stormwater impoundment typically would be designed to hold water for a relatively short period of time. The Proposed Rule allows an open pit bottom to provide a portion of the overflow capacity for a leach system within an Open Pit Surface Drainage Area, where any overflow would report to the pit bottom. Also, if an impoundment is constructed on top of a leach stockpile, overflow capacity may be provided by containment within the leach stockpile system itself.

Subparagraph (b) applies to process water impoundments other than those used to contain leach solutions. The impoundments covered by subparagraph (b) are not designed to contain stormwater runoff, and in that function are different from those covered by subparagraph (c). The requirements for impoundments covered by subparagraph (b) address capacity to address foreseeable upset conditions, but they do not need to have extra capacity for precipitation events. Upset conditions for impoundments covered by subsection (b) are addressed in a manner very similar to that described for subparagraph (a). Impoundments covered by subparagraph (c) also must have capacity to contain the 100-year, 24-hour storm event.

Subparagraph (d) applies to impoundments intended to contain impacted stormwater and dispose of it by evaporation. Such impoundments typically would not be designed with pumping systems, so upsets are not a concern. These impoundments must be designed to contain runoff from the 100-year 24-hour storm event. Finally, subsection (e) applies to impacted stormwater impoundments designed so they do not contain process water, but only impacted stormwater, differentiating them from impoundments covered by subparagraphs (a) through (c). However, they may be designed with pumping systems to remove impacted stormwater, differentiating them from subparagraph (d). Containment capacity for such impoundments must consider primarily stormwater runoff capacity as well as pumping and conveyance systems used for these and related impoundments.

The impoundment capacity requirements of the Proposed Rule, as discussed above, cover the range of different types of impoundments that would be found at copper mines. In my experience and opinion, these are appropriate requirements consistent with good engineering practice.

> (f) **Conveyance design requirement.** Open channel conveyance structures intended to transport stormwater to an impoundment shall be designed to convey, at a minimum, the peak flow from a 100-year, 24 hour storm event while preserving adequate freeboard, but not less than six inches of freeboard. Conveyances shall be designed to minimize ponding and infiltration of stormwater.

Subparagraph (f) addresses the design capacity of open channels used to convey stormwater to an impoundment. This requirement is intended to avoid flows overtopping and spilling from a conveyance. The requirement to contain peak flows from a 100-year, 24-hour storm event is consistent with good engineering practice and designs required in other states. Because ditches and other conveyances typically are much narrower than an impoundment, a six-inch freeboard requirement is imposed, primarily to address turbulent flows. The requirement to minimize ponding and infiltration of stormwater would be achieved by maintaining sufficient slope in the conveyance and is appropriate to protect ground water.

> (g) **Solids settling.** An impoundment designed and used for solids settling shall not be used to satisfy the impoundment capacity requirements of this Paragraph.

Solids settling ponds typically are used upgradient of an impoundment to capture solids and reduce settled solids in the downstream impoundments. Because settling ponds may fill with sediments until they are removed, their capacity is not counted toward fulfilling the other impoundment capacity requirements.

(3) **Process water and impacted stormwater long-term storage impoundments.** Process water, and impacted stormwater impoundments that store impacted stormwater for longer than thirty days shall meet the following design and construction requirements, except that process water and impacted stormwater long-term impoundments located within an open pit surface drainage area of an existing copper mine facility may be designed and constructed in accordance with the requirements of Paragraph (4) of this Subsection.

(a) **Liner system.** At a minimum, impoundments subject to this Paragraph shall be designed and constructed as an engineered liner system consisting of a suitable subgrade and liner bedding overlain by a secondary synthetic liner which is overlain by a leak collection system overlain by a primary synthetic liner, unless an alternate design is approved by the department pursuant to Subparagraph (e) of this Paragraph. The liner system shall be installed in accordance with a department approved CQA/CQC plan pursuant to Paragraph (2) of Subsection C of 20.6.7.17 NMAC

(b) **Liner system sub-grade and bedding.** The liner system shall be placed upon a stable sub-grade. The sub-grade shall be free of sharp rocks, vegetation and stubble to a depth of at least six inches below the liner. Liners shall be placed on a liner bedding of sand or fine soil. The surface in contact with the liner shall be smooth to allow for good contact between liner bedding. The liner bedding surface shall be sufficiently dry during liner installation such that free or excess water will not hinder the welding of seams. The liner installer shall provide the owner or permittee with a sub-grade and liner bedding acceptance certificate prior to installing the liner indicating acceptance of the earthwork.

(c) **Liner type.** The primary and secondary synthetic liners for the impoundment shall provide the same or greater level of containment, including permeability, as a 60 mil HDPE geomembrane liner system. The liner system's tensile strength, tear and puncture resistance and resistance to degradation by ultraviolet light shall be compatible with design loads, exposure and conditions.

(d) **Leak collection system.** A leak collection system shall be constructed between the primary and secondary synthetic liners for the purpose of collecting and rapidly removing fluids from leaks that may occur in the primary liner so that minimal hydraulic head is maintained on the secondary liner. The leak collection system shall consist of a drainage layer, fluid collection pipes and a fluid removal system to prevent hydraulic head transference from the primary liner to the secondary liner and shall meet the following requirements.

(i) The drainage layer shall be constructed of granular soil materials or geosynthetic drainage net (geonet) with a design slope of at least two percent. Drainage material shall have a coefficient of permeability of $1x10^{-2}$ centimeters/second or greater.

(ii) Perforated fluid collection pipes shall be installed to transmit fluid from the drainage layer to a fluid collection sump(s). Collection pipe material, diameter, wall thickness, and slot size and distribution shall be sufficient to prevent deflection, buckling, collapse or other failure. Collection pipes shall be installed with slopes equivalent to the slope of the drainage layer. Collection pipe systems shall be designed to allow for cleaning of all collection pipes with standard pipe cleaning equipment.

(iii) A fluid removal system shall be installed to remove fluid from the leak collection system. The fluid removal system shall consist of a sump(s), a dedicated pump(s), an automated pump activation system that activates the pump(s) when a specific fluid level is reached in a sump(s), a totalizing flow meter to measure to measure the volume of leachate pumped from the system, and an automated alarm system that provides warning of pump failure. Alternately a gravity drain system may be utilized where practicable and approved by the department.

(e) An applicant or permittee may propose for department approval an alternative design for process water and impacted stormwater long-term storage impoundments

> that provides the same or greater level of containment as a double synthetically lined system with leak collection.

Paragraph (3) of this section establishes the specific design requirements for process water and impacted stormwater impoundments that are designed for continual or long-term water storage of more than 30 days and which are located outside of the open pit surface drainage area. These impoundments require a double-synthetic liner system with a leak collection system. The design specified in the Proposed Rule is consistent with the standard design specified by the U.S. Environmental Protection Agency regulations for impoundments used to contain hazardous waste. This is a proven and standard design.

Impacted stormwater impoundments designed to hold water for 30 days or less are addressed by paragraph (4) below. The 30-day period is consistent with copper mine facility requirements in Arizona and Nevada. The basis for the single-liner design required for such ponds is discussed below.

The design for a fluid collection system specified in subparagraph (d)(ii) above appears to assume that granular material, such as gravel, would be used with collection pipes placed in this layer. More modern designs use a geonet layer between the two synthetic liners, in which case collection pipes are not necessary or feasible. Geonet systems generally perform better, and this language might be adjusted to account for the use of geonet systems, although they likely could be approved under subparagraph (e). Automated pump systems as specified in subparagraph (d)(iii) typically are not required in other jurisdictions, and I also would note that a typographical error, the repeated "to measure," should be corrected in this subparagraph. I agree that subparagraph (e), which would allow the Department to approve an alternative design that provides the same or greater containment as the specified design without the need for a variance, is appropriate, and allows for improved technologies that may be developed. I understand that an alternative design that does not achieve the same or greater level of containment still would require a variance.

> (4) **Impacted stormwater impoundments.** Impacted stormwater impoundments that store impacted stormwater for less than thirty days shall meet the following design and construction requirements; except that any such impoundments located within an open pit surface drainage area at an existing copper mine facility may be designed and constructed in accordance with the requirements of Paragraph (5) of this Subsection.
>
> (a) **Liner system.** At a minimum, an impacted stormwater impoundment subject to this Paragraph shall be shall constructed as an engineered liner system consisting of a compacted subbase overlain by a synthetic liner. The liner system shall be installed in accordance with a department approved CQA/CQC plan pursuant to Paragraph (2) of Subsection C of 20.6.7.17 NMAC
>
> (b) **Liner system subgrade and liner bedding.** The liner system shall be prepared and placed upon a stable subgrade. The top surface of the subgrade shall be smooth and free of sharp rocks or any other material that could penetrate the overlying liner bedding or synthetic liner. Liner bedding shall be placed atop the subgrade and shall consist of a minimum of six inches of sand or fine soil to allow for good contact between liner and liner bedding. The liner bedding surface shall be sufficiently dry during liner installation such that free or excess water will not hinder the welding of seams. The liner installer shall provide the owner or permittee with a sub-grade and liner bedding acceptance certificate prior to installing the liner indicating acceptance of the earthwork.
>
> (c) **Liner type.** Synthetic liners for an impacted stormwater impoundment shall provide the same or greater level of containment, including permeability, as a 60 mil HDPE geomembrane liner system. The liner system's tensile strength, tear and puncture resistance and resistance to degradation by ultraviolet light shall be compatible with design loads, exposure and conditions.
>
> (d) **Wind protection.** Liner systems for impacted stormwater impoundments shall be designed and constructed with a weighting system to secure the liner and limit liner damage during periods of extreme wind events when the impoundment is empty.
>
> (e) **Alternate design.** An applicant or permittee may propose for department approval an alternative design for an impacted stormwater impoundment that provides the same or greater level of containment as the liner system described in Subparagraphs (a) through (d) of this Paragraph.

The design requirements specified in paragraph (4) apply to an impoundment designed to contain impacted stormwater for less than 30 days. This might apply to a large overflow impoundment used to collect runoff from a leach system resulting from a large storm event. Typically, the water collected in such an overflow impoundment would be pumped back into the leach system as makeup water over the 30-day period. The single-synthetic liner requirement for these impoundments is consistent with designs used in other copper-producing states such as Arizona and Nevada and reflects the limited time that water is anticipated to be present in the impoundment as well as the ability to inspect and repair a liner while the impoundment normally is empty. This approach is consistent with good engineering practice and is expected to be protective of ground water quality. An impacted stormwater impoundment located inside an open pit surface drainage area does not require a liner, since any water leaking from the impoundment would report to the open pit bottom. For such an impoundment, an engineer would consider lining primarily from an economic perspective, *i.e.*, to avoid the need to pump water from the pit bottom, rather than from an environmental perspective.

> (5) **Non-impacted stormwater impoundments.** Impoundments that store non-impacted stormwater and are not located over disturbed areas where the water has the potential to infiltrate and produce a leachate that may cause an exceedance of the applicable standards do not require a liner system.

Paragraph (5) would apply to a stormwater impoundment that collects stormwater of good quality and that does not exceed standards. An example would be an impoundment to capture stormwater runon before it enters a copper mine. Such an impoundment should be exempt from regulation under the existing discharge permit rules, and would not pose any threat of ground water contamination unless it is located on top of mined materials that might produce leachate if the impoundment is allowed to discharge, in which case the Proposed Rule may require a liner system as appropriate.

> (6) **Separation between impoundments and ground water.** Impoundments that require a liner pursuant to this Subsection shall not be constructed in a location where the vertical distance between the seasonal high ground water level and the finished grade of the floor of the impoundment is less than or equal to four feet unless the applicant or permittee submits an engineering evaluation from a licensed New Mexico professional engineer that demonstrates that the impoundment design will not be affected by shallow ground water conditions.

The purpose of paragraph (6), as I understand it, is to prevent the location of an impoundment and liner system in a location where underlying groundwater would cause the liner system to "float." I would interpret "affected" as used in the last full line to mean a condition that would cause a liner system to "float" or otherwise fail.

> (7) **Spillways.** Impacted stormwater impoundments shall have spillways to safely discharge the peak runoff of a 25-year, 24-hour precipitation event, or an event with a 90-percent

> chance of not being exceeded for the design life of the impoundment. Impoundments intended as primary containment for process water shall not be designed with a spillway that empties onto the ground surface.

> (53) "Spillway" means a structure used for controlled releases from a stormwater impoundment, in a manner that protects the structural integrity of the impoundment.

The spillway design requirement in paragraph (7) is appropriate and consistent with good engineering practice, recognizing that dams subject to State Engineer jurisdiction may be subject to additional or different requirements. The purpose of a spillway is to protect the integrity of an impoundment in the event of an unanticipated overflow event. That last sentence would address a process water impoundment that might overflow, in which case a spillway might be used, but the overflow would report to a lined conveyance and/or impoundment.

**20.6.7.20 REQUIREMENTS FOR LEACH STOCKPILE FACILITIES:**

Section 20.6.7.20 of the Proposed Rule address the specific requirements for leach stockpiles. Leach stockpiles are used as part of a copper recovery process where an acidic solution is placed on top of stockpiled ore and allowed to percolate through the ore to dissolve and to transport dissolved copper in solution. The solution reports to the base of the stockpile where it is collected and sent to a SX-EW plant to produce pure copper cathodes. The copper containing solution collected at the base of the leach stockpile is called PLS. After copper is removed in the solution extraction portion of the SX-EW plant, the barren solution, or raffinate, is recirculated back to the top of the leach stockpile. The Proposed Rule defines “leach stockpile” in section 20.6.7.7(33) as follows:

> (33) “Leach stockpile” means stockpiles of ore and all other rock piles associated with mining disturbances that have been leached, are currently being leached or have been placed in a pile for the purpose of being leached.

All of the existing leach stockpile at New Mexico copper mines are unlined or partially lined. The Proposed Rule establishes standard design requirements including a liner system for new leach stockpiles located outside of an open pit surface drainage area. The requirements in the Proposed Rule are as follows:

> **A. Engineering design requirements.** At a minimum, the following requirements shall be met in designing leach stockpiles at copper mine facilities unless the applicant or permittee can demonstrate that an alternate design will provide an equal or greater level of containment.
>
> (1) **New leach stockpiles.** New leach stockpiles shall meet the following requirements.
>
> (a) **Liner system.** A new leach stockpile shall be placed on an engineered liner system consisting of a subgrade and compacted earthen liner overlain by a synthetic liner which is overlain by a solution collection system designed to transmit process fluids out of the leach stockpile. The liner system shall be approved by the department prior to installation and shall be installed in accordance with a department approved CQA/CQC plan pursuant to Paragraph (1) of Subsection C of 20.6.7.17 NMAC
>
> (b) **Liner system subgrade and earthen liner.** A liner system earthen liner shall be prepared and placed upon a stable subgrade. The prepared earthen liner shall consist of a minimum of 12 inches of soil that has a minimum re-compacted in-place coefficient of permeability of $1x10^{-6}$ cm/sec. The top surface of the earthen liner shall be smooth and free of sharp rocks or any other material that could penetrate the overlying synthetic liner.
>
> (c) **Liner type.** A synthetic liner for a leach stockpile shall provide the same or greater level of containment, including permeability, as a 60 mil HDPE geomembrane liner system. The liner system's tensile strength, tear and puncture resistance and resistance to degradation by ultraviolet light shall be compatible with design loads, exposures and conditions. A licensed New Mexico professional engineer with experience in liner system construction and installation shall identify the basis for the geomembrane composition and specific liner based upon:
>
> (i) the type, slope and stability of the subgrade;
>
> (ii) the overliner protection and provisions for hydraulic relief within the liner system;
>
> (iii) the load and the means of applying the load on the liner system;
>
> (iv) the compatibility of the liner material with process solutions applied to the leach stockpile and temperature extremes of the location at which it will be installed; and
>
> (v) the liner's ability to remain functional for five years after the operational life of the leach stockpile.
>
> (d) **Solution collection system.** A solution collection system shall be constructed in an overliner protection and drainage system. The solution collection system shall be designed to remain functional for five years after the operational life of the leach stockpile. The overliner protection shall be designed and constructed to protect the synthetic liner from damage during loading and minimize the potential for penetration of the synthetic liner. A sloped collection system shall be designed that will transmit fluids out of the drainage layer of the leach stockpile. The collection system shall be designed to maintain a hydraulic head of less than the thickness of the drainage layer but the drainage layer shall not exceed five feet in thickness. Any penetration of the liner by the collection system through which a pipe or other fixture protrudes shall be constructed in accordance with the liner manufacturer's requirements. Liner penetrations shall be detailed in the construction plans and as-built drawings.
>
> (e) **Solution containment facilities.** PLS flows exiting the leach stockpile shall be collected, contained and conveyed to a process water impoundment(s) or tank(s) using pipelines or lined conveyance systems.
>
> (f) **Alternate design.** An applicant may propose and the department may approve an alternative design for a leach stockpile located within an open pit surface drainage area provided that the stockpile and solution capture systems are designed to maximum leach solution

> capture considering the site-specific conditions of the open pit, underlying geology and hydrology, and leach solutions will not migrate outside of the open pit surface drainage area.

The design requirement specified in the Proposed Rule, as stated above, is consistent with a design used for a new facility at the Safford, Arizona mine and is a design I helped with. I also gave a presentation on this design to the Advisory Committee, which is provided as Exhibit Grass-2. This design is consistent with new copper leach facility requirements in Arizona and Nevada. The design requires a single synthetic liner of at least 60 mil thickness, with a protective layer on top intended to prevent rock punctures, a solution collection system on top of the liner designed to maintain a low hydraulic head on the liner, and a prepared base. Double liner systems rarely are feasible for copper leach facilities because of the pressure from the overlying stockpile that would collapse a leak collection system between two synthetic liners, although such a system might be employed in certain site-specific instances.

> 2) **Solution extraction/electrowinning (SX/EW) facilities.** All SX/EW facilities shall be designed to contain all associated process fluids within impermeable vessels with secondary containment or process water impoundments meeting the requirements of Subsection D of 20.6.7.17 NMAC. All pipeline and tank systems associated with the SX/EW facilities shall be designed and operated pursuant to 20.6.7.23 NMAC.

SX-EW facilities typically utilize either impoundments meeting the process water impoundment requirements or tanks to contain solutions. Pipeline and tank systems must be designed and constructed with materials suitable for the strong acidic solutions. The Proposed Rule requirement is consistent with good engineering practice for design and construction of SX-EW facilities.

> **B. Construction.**
> (1) **New leach stockpile and SX/EW facilities.** Construction of a new leach stockpile or SX/EW facility, including expansion of an existing leach stockpile beyond its ground surface footprint on the effective date of the copper mine rule, shall be performed in accordance with the applicable engineering requirements of Subsection A of 20.6.7.20 and 20.6.7.17 NMAC.

The construction requirements for these facilities would incorporate the CQA/CQC plan and other engineering requirements in section 17 of the Proposed Rule.

(2) **Existing leach stockpiles.** A leach stockpile system, including its associated solution collection or containment system, at a copper mine facility in existence on the effective date of the copper mine rule is not required to meet the design and construction requirements of Subsection A of 20.6.7.20 NMAC and may continue to operate as previously permitted under a discharge permit subject to compliance with the contingency requirements of 20.6.30 NMAC. A permit issued for such an existing leach stockpile system after the effective date of the copper mine rule may include the conditions of the existing discharge permit, which shall not be considered to be additional conditions.

As discussed above, existing leach stockpiles have been permitted under the Water Quality Act, constructed and operated without liner systems. It is not practicable to require removal of millions of tons of leach material so that the existing systems can be replaced with lined systems. Consequently, this provision allows existing leach stockpiles to continue to operate as currently permitted by the Department. These existing leach stockpiles still would be subject to existing permit conditions, which typically address solution collection systems, monitoring, and contingency actions, including abatement plans.

**C. Operational requirements.**

(1) **Leach stockpile operating requirements.** A permittee operating a leach stockpile shall operate the stockpile pursuant to the following requirements.

(a) The stockpile shall remain within the area identified in the discharge permit.

(b) The perimeter of the stockpile and the solution collection system shall be inspected monthly.

(c) Any evidence of instability in the stockpile that could potentially result in a slope failure or an unauthorized discharge shall be reported to the department as soon as possible, but not later than 24 hours after discovery.

(d) Any leaks or spills of PLS or leach solutions outside the leach stockpile or containment system shall be recorded and reported pursuant to 20.6.2.1203 NMAC.

(e) If seeps occur, they shall be monitored on a monthly basis and an estimate of the seep flow rate shall be made. Monthly records of the seep inspections and flow rates shall be maintained and included in the site monitoring reports.

(f) Leach solution application rates shall not exceed the maximum rates approved in the discharge permit.

(g) The daily leach solution application and PLS collection rate shall be determined using flow meters installed in accordance with this Section and Paragraph (5) of Subsection C of 20.6.7.17 NMAC.

(h) The daily rate and monthly volume of leach solution applied and PLS collected shall be recorded, maintained, and included in the site monitoring reports.

(2) **Solution extraction/electrowinning (SX/EW) facilities.** The following operation requirements apply to an SX/EW facility.

(a) All solution management and extraction operations shall be contained within pipeline and tank systems designed and operated pursuant to 20.6.7.23 NMAC or process water impoundments meeting the requirements of Subsection D of 20.6.7.17 NMAC.

(b) Sludge and spent electrolyte from the SX/EW facility shall be either placed upon the leach stockpile for leaching or disposed of at an approved facility.

The operational requirements for leach stockpiles are consistent with current requirements of discharge permits issued by the Department and are consistent with good engineering practices. The provisions regarding evidence of instability and seeps are important to ensure that steps are taken to maintain the integrity of a leach stockpile.

The next portion of the Proposed Rule that I will address covers the engineering and design requirements for new waste rock stockpiles in section 20.6.7.21, subsection B. This reads as follows:

**20.6.7.21 REQUIREMENTS FOR COPPER MINE WASTE ROCK STOCKPILES**

**B. Engineering design requirements for new waste rock stockpiles.** The following requirements shall be met in designing engineered structures for waste rock stockpiles at copper mine facilities that may generate water contaminants or acid mine drainage that may cause an exceedance of applicable standards, as determined through implementation of a material characterization and handling plan pursuant to Subsection A of 20.6.7.21 NMAC.

(1) **New waste rock stockpiles located outside an open pit surface drainage area.** New waste rock stockpiles located outside an open pit surface drainage area shall meet the following requirements unless the department determines that deposition of waste rock, in accordance with an approved material handling plan prepared pursuant to Paragraph (2) of Subsection A of this Section, will not cause an exceedance of applicable standards.

(a) Stormwater run-on shall be diverted or contained to minimize contact between precipitation run-on and the stockpiled material. The permittee shall prepare an engineering plan to limit the contact of run-on and stormwater with any materials that have the potential to generate water contaminants. The plan shall include, as necessary, design, construction, and installation of run-on, run-off, and stormwater diversion structures, collection of stormwater containing water contaminants, and a description of existing surface water drainage conditions. The plan shall consider:

(i) the amount, intensity, duration and frequency of precipitation;

(ii) watershed characteristics including the area, topography, geomorphology, soils and vegetation of the watershed; and

(iii) runoff characteristics including the peak rate, volumes and time distribution of runoff events.

(b) Drainage from the base of the waste rock stockpile shall be collected by headwalls keyed to bedrock, where applicable, and contained in impoundments located outside the open pit surface drainage area to be lined consistent with the requirements for containment of impacted stormwater.

(c) Interceptor wells or other measures to reduce, attenuate or contain the discharge of leachate that may cause ground water to exceed applicable standards shall be installed and operated where applicable.

(d) If the permittee or the department determines that, with the measures described in Paragraphs (a) through (c) of this Subsection, discharges of leachate from a stockpile located outside of the open pit surface drainage area would cause ground water to exceed applicable standards at a monitoring well located pursuant to 20.6.7.28 NMAC, the permittee may propose, or the department may require as an additional condition in accordance with Subsection I of 20.6.7.10 NMAC, additional controls, including but not limited to, a liner system.

(2) **New waste rock stockpiles located inside an open pit surface drainage area.** Stormwater run-on shall be diverted or contained to minimize contact between stormwater run-on and the stockpiled material.

The Proposed Rule requirements for waste rock stockpiles are consistent with and, overall, are more specific than requirements in other copper producing states. A copy of a presentation I gave on this topic to the Technical Committee is provided as Exhibit Grass-4. To my knowledge, the Department has never required lined waste rock stockpiles under a discharge permit issued under the Water Quality Act. Waste rock stockpiles are rarely, if ever, constructed with liner systems. Similarly, ground water interceptor systems are rarely needed for waste rock stockpiles. The engineering design requirements need to be read in conjunction with the material characterization and material handling plan requirements, addressed by other witnesses that are at the core of protecting ground water quality with respect to waste rock. The engineering design requirements focus on managing storm water runon, runoff, and infiltration and also managing any drainage. I would suggest one change, eliminating the requirement for collection using a headwall keyed to bedrock, although the rule language further specifies that this applies only "where applicable." In most instances, it would be preferable to capture drainage or seepage in a lined impoundment. The engineering design requirements in the Proposed Rule are, in my opinion, consistent with good engineering practice and experience with the design of waste rock stockpiles to protect ground water quality.

Next, I will discuss several subsections regarding contingency actions required in response to unplanned events, particularly those involving the capacity of impoundments. These provisions specify reporting to the Department, corrective action plans regarding actions to be taken, and Department response to those plans. Generally, the contingency sections allow for the repair of existing facilities to restore their intended function. Only if repairs are not feasible do the contingency sections require modification or replacement of facilities. These provisions are found in section 20.6.7.30 of the Proposed Rule, subsections E, F and G, which read as follows:

> **E. Insufficient impoundment capacity.** If a survey or capacity calculations indicate an existing impoundment or impoundment system is not capable of meeting the capacity requirements in Subsection D of 20.6.7.17 NMAC, within 90 days of the effective date of the discharge permit the permittee shall submit a corrective action plan for department approval. The plan may include, but is not limited to, proposals for constructing an additional impoundment, reducing the discharge volume, removing accumulated solids, or changing process water or impacted stormwater management practices. The corrective action plan shall include a schedule for implementation. The schedule shall propose completion within one year from the submittal date of the initial corrective action plan. Within 30 days of the date of postal notice of the department's approval of the corrective action plan, the permittee shall initiate implementation of the plan. Should the corrective action plan include removal of accumulated solids, solids shall be removed from the impoundment in a manner that is protective of the impoundment liner. The plan shall include the method of removal, and locations and methods for storage and disposal of the solids.
>
> **F. Inability to preserve required freeboard.** If a minimum of two feet of freeboard cannot be preserved in the process water or impacted stormwater impoundment, the permittee shall submit a corrective action plan to the department for approval. The corrective action plan shall be submitted within 30 days of the date of discovery of the initial exceedance of the freeboard requirement. The plan may include, but is not limited to, proposals for constructing an additional impoundment, reducing the maximum daily discharge volume, or changing process water or impacted stormwater management practices. The corrective action plan shall include actions to be immediately implemented to regain and maintain a minimum of two feet of freeboard until permanent corrective actions have been completed. The corrective action plan shall include a schedule for implementation. The schedule shall propose completion within one year from the submittal date of the initial corrective action plan. Within 30 days of the date of postal notice of the department's approval of the corrective action plan, the permittee shall initiate implementation of the plan.
>
> **G. Impoundment - structural integrity compromised.** Within 24 hours of discovery, a permittee shall report to the department any damage to the berms or the liner of an impoundment or any condition that may compromise the structural integrity of the impoundment. Within 15 days of discovery, the permittee shall submit to the department a corrective action plan describing any actions taken or proposed to be taken to repair the damage or condition. Within 30 days of receipt, the department shall approve or disapprove the proposed corrective action plan. Repairs to the impoundment liner or berms shall be completed pursuant to 20.6.7.17 NMAC. The corrective action plan shall include a schedule for implementation. Within 30 days of the date of postal notice of the department's approval of the corrective action plan, the permittee shall initiate implementation of the plan.

Subsections E and F address different circumstances, in subsection E the discovery that an impoundment no longer has sufficient capacity compared to its design capacity, and in subsection F the inability to maintain the required freeboard. Loss of impoundment capacity may occur, for example, from the accumulation of sediment or solids in an impoundment. Again, the subsection allows for a range of actions such as adding pond capacity, restoring capacity by removing solids, or changing other aspects of the facility that relate to the necessary impoundment capacity.  The contingency plan process calls for submission of a corrective action plan and Department review and response to the plan, similar to the process specified in section 20.6.2.1203 of the Commission's existing rules and which is currently specified in discharge permit conditions for contingency actions in general.

Under subsection E, if the plan is for removal of solids, the plan must describe how that will be accomplished in a manner that maintains the impoundment liner.  These are reasonable steps to take, in my experience.

Subsection G focuses on the discovery of conditions relating to an impoundment's berms or liners that could compromise the structural integrity of the impoundment.  Examples would be major erosion of an impoundment berm or discovery of a hole or fissure that could expand and threaten structural integrity.  Again, the same corrective action process as used in the preceding subsections is specified in this subsection.

Next, I will address the requirements of section 20.6.7.30, Subsection I of the proposed rule.  This contingency provision addresses the response to discovery of evidence that a leach stockpile, tailings impoundment or waste rock stockpile slope is unstable, and reads as follows:

> **I. Leach stockpiles, tailings impoundment or waste rock stockpiles – unstable slopes.** Within 24 hours of discovery, a permittee shall report to the department any evidence of instability of the slope of a leach stockpile or tailings impoundment or any condition that may compromise the structural integrity of the leach stockpile, tailings impoundment or waste rock stockpile.  Within 15 days of discovery, the permittee shall submit to the department a corrective action plan describing any actions taken or proposed to be taken to repair the damage or condition.  Within 30 days of receipt, the department shall respond to the proposed corrective action plan.  Repairs to the slopes shall be completed consistent with the requirements of 20.6.7.20 NMAC, 20.6.7.21 NMAC, 20.6.7.22 NMAC, and 20.6.7.33 NMAC, as applicable.  The corrective action plan shall include a schedule for implementation.  Within 30 days of the date of postal notice of the department's approval of the corrective action plan, the permittee shall initiate implementation of the plan.

This subsection specifies a logical sequence of events and is consistent with regulatory requirements employed in other jurisdictions and in current New Mexico discharge permits.  The subsection requires rapid reporting to the Department, submission of a corrective action plan describing actions already taken and future actions to correct the observed conditions. Importantly, the permittee is not required to wait for Department approval to take action, but the Department has an opportunity to review the actions taken and proposed actions. It follows the same process used in the other contingency sections for Department review and action regarding the correction action plan.

This concludes my written direct testimony.

________________________________
Michael J. Grass, P.E.

Importantly, the permittee is not required to wait for Department approval to take action, but the Department has an opportunity to review the actions taken and proposed actions. It follows the same process used in the other contingency sections for Department review and action regarding the correction action plan.

This concludes my written direct testimony.

Michael J. Grass, P.E.