



## **CONTACT INFORMATION**

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## How will the area be reclaimed?

Yarnell Mining Company, through its parent company Bema Gold Corporation, has a strong record of successfully returning mined land to its natural state.

*“You and your company have shown responsibility to the citizens of Idaho with your commitment to the environment. You are to be commended for your efforts.”*

*The Honorable Alan Lance,  
Attorney General, State of Idaho  
December 1996*

Disturbed areas will be regraded and revegetated, and all buildings will be removed. Once the mine has been closed and reclaimed, Yarnell Mining Company will continue to monitor the site to ensure the success of vegetation growth, soil stabilization and protection of groundwater and surface water quality.

## Why is this good for Yavapai County and Arizona?

The economic impacts of the mine will be significant. It will employ about 90 workers with an average salary of \$35,000 including benefits. Salaries and benefits will generate more than \$3 million each year. Another \$3.5 million will be paid annually for products and services, and a total of \$12 million will be spent on capital costs during the six-year mine life. Preliminary estimates indicate that over \$700,000 will be paid each year in taxes to the state, county and a variety of school and special districts. Yarnell Mining Company's commitment to innovative and responsible mining and reclamation remains its primary goal at the Yarnell Mine. Above all else, we believe—and have proven—that mining and a healthy environment can coexist.

## Need any more information?

The Yarnell Mining Company staff is available to answer your questions concerning the gold mine proposal. If you need more information, or would like a representative to speak to your local organization, feel free to call us at (520) 427-3353.

## The Champagne Story

Most of the Yarnell Mining Company's employees were involved in the highly successful development, mining and reclamation of Bema's Champagne Mine, a gold and silver mine in Idaho. Similar in scope and design to the proposed Yarnell Mine, the Champagne Mine impacted about 137 acres, and 3.6 million tons of ore were placed on the leach pad and processed over a five-year period.

The Champagne Mine was the first major gold property in the State of Idaho to be completely reclaimed. The company returned all disturbances associated with its haul roads to as near the original contour as possible. Slopes on the leach pad were reduced and the Champagne drainage was re-established around the leach pad.

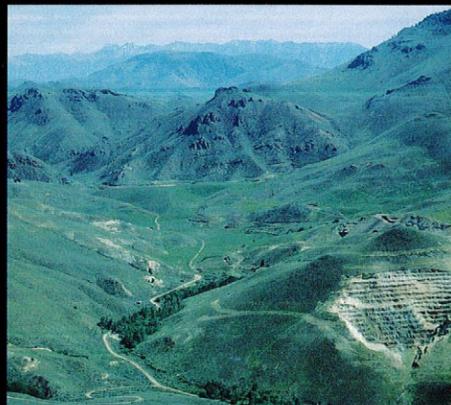
The reclamation, completed in 1995, was so successful that Bema won the reclamation award from federal and Idaho state agencies in the category of "Excellence in Reclamation—Hard Rock Mines Over 75 Acres." The Idaho State Land Board stated that Bema "has set the standard for the reclamation of all future disseminated gold properties that will be developed in the State of Idaho."



Champagne site



Partial Reclamation



Reclamation

YARNELL MINING COMPANY



A SUBSIDIARY OF BEMA GOLD (U.S.) INC.

## The Yarnell Gold Project Yavapai County, Arizona

*Yarnell Mining Company is part of a new generation of mining companies committed to technical innovation and environmental responsibility. The Company is a U.S. subsidiary of Bema Gold Corporation, a Canadian-based mining company formed in 1988. Bema has a history of successful mining operations around the world and a strong record for reclaiming projects to high standards once the mining is complete.*

## A Century of Mining Tradition

Rich in history as well as gold, Harrison Yarnell first established the mining claims at the site (near Yarnell, Arizona) in the late 1800s. The Yarnell deposit was mined in the early 1900s by traditional underground methods and later, between 1942 and the early 1980s, by open-pit techniques. After 1983, several companies explored the site and in 1991, Yarnell Mining Company – through its parent company, Bema Gold Corporation – acquired the mining claims. After several years of extensive exploration and development work, and with today's highly-advanced mining and reclamation techniques, Yarnell Mining Company determined that re-opening the mine is both environmentally and economically a sound move.

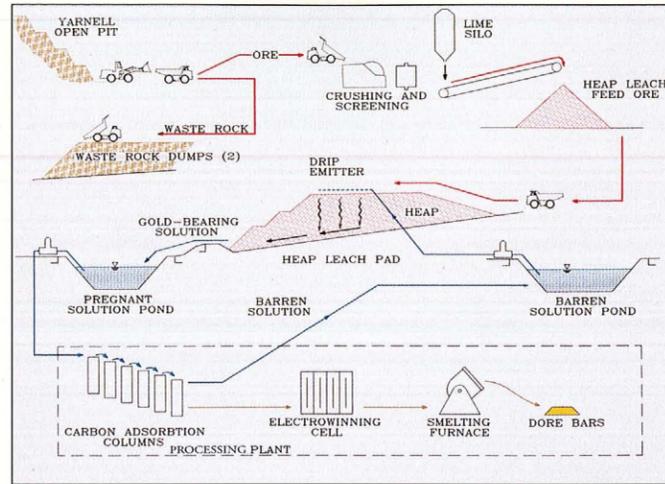
## The Yarnell Proposal

The Yarnell Mining Company proposes to mine its gold deposit using conventional open-pit mining methods. Blasting will be done twice each week to loosen the ore. It will be hauled to an area next to the mine pit for crushing, then to an on-site heap leach facility for processing. The mine facilities—including the mine pit, crushing area, leach pad and ponds, processing plant, waste rock placement areas and offices—will comprise approximately 180 acres. About 70 acres is private land controlled by Yarnell Mining Company and the remaining acreage is public land administered by the U.S. Bureau of Land Management (BLM). The water supply facilities—including the well sites and pipeline corridor—will encompass approximately 20 acres, consisting of private, state trust, and BLM land.

The Yarnell Mine will have a mine-life of approximately six years from the start of construction through the completion of ore extraction. Once extraction is complete, an active reclamation program will begin.

## How Does the Heap Leach Process Work?

After the ore has been mined and crushed at the Yarnell Mine, the gold will be recovered from the ore through a "heap leach process." This method is used all over the world as a safe and effective way to remove gold. The ore is placed on a synthetic-lined leach pad, and irrigated with dilute sodium cyanide solution which percolates through the ore. The gold dissolves out of the ore and into the solution. The gold-bearing solution is then collected in lined ponds to await final processing. At the on-site processing plant, the solution is pumped through large columns where gold adsorbs onto carbon particles.



Heap leach schematic

The gold is recovered from the solution by electroplating onto steel mesh cathodes. The cathodes are then smelted into "doré bars," the final saleable product.

The Yarnell Mine heap leach method will be a "closed-loop" system, where all leach solutions are fully contained within a lined leach pad and collection ponds, so there is no contact with soil or groundwater. The solution collection ponds are double-lined, and both the leach pad and the collection ponds have leak detection systems between the liners which will be inspected daily.



Pouring a doré bar

To protect surface water, diversion channels will divert storm water runoff from upstream areas around the mine site and solutions within the heap leach facility will be contained. The heap leach system is designed to meet strict Arizona Department of Environmental Quality (ADEQ) and BLM guidelines. These guidelines require Yarnell Mining Company to use the Best Available Demonstrated Control Technology (BADCT), which specifies the best known methods of protecting the environment.

## Protecting the Environment

Starting a project like this is a long, exacting process involving numerous federal, state and local governmental regulatory agencies such as the U.S. Bureau of Land

Management, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the Arizona Department of Environmental Quality, the Arizona State Land Department, the Arizona State Mine Inspector and Yavapai County, among others.

Every aspect of the proposed mining project, from exploration and pre-mine development, to actual mining and final reclamation, must be planned and documented by



Solution collection ponds will be double-lined

Yarnell Mining Company. It then requires approval from the appropriate regulatory agency. State and federal agencies continue to monitor and regulate the mine during operation and through final closure.

For example, the Company will obtain an air quality permit from ADEQ to operate the facility. Steps will be taken to reduce dust and emissions, including the use of dry dust scrubbers and/or water sprays to control dust from the ore crusher, and water or suppressants to wet down haul roads.

ADEQ also issues an Aquifer Protection Permit, where the Company details how the process solution will be contained and what groundwater protection controls have been instituted.

The mine will use about 144,000 gallons of water each day for operation and during reclamation. Environmental tests have been conducted and will continue to ensure that water withdrawal from groundwater supply wells does

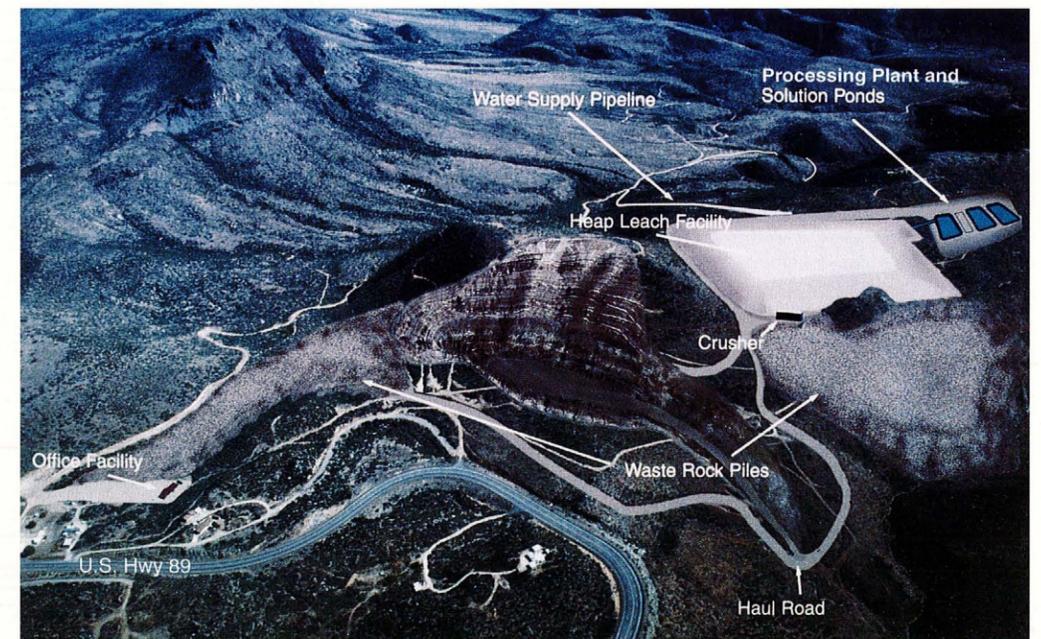
not affect existing users or cause environmental impacts. All water exploration efforts have been directed away from community water sources.

Yarnell Mining Company assumes responsibility for the reclamation of surface disturbances that are attributable to the mining operation, and the elimination of potential surface and groundwater degradation. Reclamation and closure responsibilities are consistent with the Arizona Mined Land Reclamation Act, the Federal Mining and Mineral Policy Act of 1970 and National Materials and Minerals Policy Research and Development Act of 1980. According to these guidelines, the full projected costs for closure will be bonded.

To protect birds and other wildlife, the leach pad and ponds will be fenced, and the ponds will be covered with special netting.

Since part of the operation would be on federal land, the BLM will prepare an Environmental Impact Statement, which serves as a comprehensive review of social, economic, cultural and environmental aspects of the project. It also includes a review to determine if the project is in compliance with the Endangered Species Act. It looks at possible alternatives and analyzes various ways that potential adverse impacts can be addressed.

The public also plays a major role during the permitting process through submission of written comments and oral statements at public meetings sponsored by the regulatory agencies, as well as many informal opportunities to ask questions and discuss the project.



Aerial of site with proposed mine facilities outlined

mws  
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Yarnell Mining  
File-

**YARNELL MINING COMPANY**  
A SUBSIDIARY OF BEMA GOLD (U.S.) INC.

**MEMORANDUM**

**TO:** Please see correspondence list below

**FROM:** Mark Montoya, Project Manager

**DATE:** February 3, 1998

**SUBJECT:** Yarnell Gold Project, Yavapai County, Arizona;  
Aquifer Protection Permit and Air Quality Permit

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Enclosed for your review and comment, please find draft copies of the Aquifer Protection Permit and the Air Quality Permit for the subject project. The Arizona Department of Environmental Quality (ADEQ) will be conducting a public meeting and hearing concerning these two permits on March 2, 1998 at the Wickenburg Community Center in Wickenburg, Arizona, 9:00 a.m. until 7:00 p.m.. Written comments must be submitted to ADEQ by March 7, 1998.

Please do not hesitate to call me at (520) 427-3353 if you have any questions or need additional copies of the enclosed permits.

Enclosure

cc: Connie Stone, Bureau of Land Management, Phoenix Field Office  
Laura Gentile, U.S. Environmental Protection Agency, Region IX  
✓Mason Coggin, State of Arizona, Department of Mines and Mineral Resources  
Douglas Martin, Arizona State Mine Inspector  
Phillip De Dycker, P.M. De Dycker & Associates  
David Randall, Air Sciences Inc.  
Dalva Moellenberg, Gallagher & Kennedy, P.A.

**YARNELL MINING COMPANY**

February 19, 1998

Mr. Mason Coggin, Director  
Arizona Dept. of Mines & Mineral Resources  
1502 West Washington  
Phoenix, Arizona 85007

**RE: Yarnell Gold Project - Yavapai County, Arizona**

Dear Mason:

Enclosed is some material regarding the Yarnell Mining Company's proposed gold mine project. Your support has been important to our success thus far, and as we move into our permit approval process your help will be even more critical.

As you may know, The Yarnell Mining Company is part of an international corporation that has extensive experience in gold extraction and mine reclamation. Bema Gold Corporation has achieved wide recognition for its use of state-of-the art extraction technology and its commitment to reclaiming the land once the extraction process is completed. In the brochure there is a good summary of an Idaho project, similar to the one we are proposing near Yarnell.

The Yarnell Mining Company has been working on this project since 1994. If all the regulatory approvals are received, we expect to begin construction by the fall of this year.

The mine will employ about 90 people during full-scale production and will operate for six years. Salaries and benefits will generate more than \$3 million each year. Another \$3.5 million will be paid annually for products and services, and a total of \$12 million will be spent on capital costs during the life of the mine.

We are now in the final stages of permitting the mine. A number of activities are occurring this spring, and we want to make you aware of them so you can demonstrate your support to the government agencies involved.

The Arizona Department of Environmental Quality (ADEQ) has announced its intent to approve both the Aquifer Protection Permit and the Air Quality Protection Permit. The ADEQ will conduct a public meeting and formal hearing concerning these two permits on March 2, 1998. We would welcome and encourage your attendance and supportive comments at this time. They will be held at the:

Wickenburg Community Center  
155 N. Tegner Street  
9:00 a.m. to 7:00 p.m.  
(Open-House Format)

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**STATE OF ARIZONA  
AQUIFER PROTECTION PERMIT NO. P-101015**

**1.0 AUTHORIZATION**

**AUTHORIZATION TO DISCHARGE POLLUTANTS IN A MANNER SUCH THAT CURRENT AND REASONABLY FORESEEABLE FUTURE USES OF THE AQUIFER ARE PROTECTED**

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Articles 1, 2, and 3; Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Article 1; A.A.C. Title 18, Chapter 11, Article 4 and amendments thereto; and the conditions set forth in this permit;

**Facility Name:** Yarnell Project

**Owner:**

Yarnell Mining Company  
P.O. Box 1182  
Yarnell, AZ 85362

**Operator:**

Yarnell Mining Company  
P.O. Box 1182  
Yarnell, AZ 85362

is authorized to operate the Yarnell Project, located near the town of Yarnell, Arizona in Yavapai County. It occupies portions of Sections 14, 15, 22, and 23 of Township 10N, Range 5W of the Gila and Salt River baseline and meridian.

**Latitude**            34° 12' 26" North  
**Longitude**        112° 44' 59" West

This permit shall become effective on the date of the Water Quality Division Director's signature and shall be valid for the life of the facility (operational, closure, and post-closure periods) provided that the facility is constructed, operated, and maintained pursuant to all the conditions of this permit according to the design and operational information documented or referenced in Sections 1, 2, 3, 4, 5, 6, and 7 of this permit, and such that Aquifer Water Quality Standards are not violated at the applicable point of compliance.

  
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**Ed Sadler**  
**Director, Water Quality Division**  
**Arizona Department of Environmental Quality**  
Signed this 15 day of June, 1998

## 2.0 SPECIFIC CONDITIONS

### 2.1 Facility Description

The Yarnell Project will be an open pit gold mine and hydrometallurgical precious metal leaching facility. The proposed location of the facility is in the Weaver Mountains of Yavapai County, Arizona, approximately one mile south of the community of Yarnell, Arizona. The facility, occupies approximately 200 acres. The mining operation will consist of an open pit mine and ore crushing operation, a lined heap leach pad, pregnant solution pond, barren solution pond, ADR (adsorption, desorption, refining) process plant, cyanide tank, stormwater conveyance channels, process solution ditches and process pipelines, according to the design and operational plans approved by the Arizona Department of Environmental Quality (ADEQ), Water Permits Section (WPS), Mining Unit. The operations are capable of processing in excess of 1.2 million tons of ore per year.

The permittee will mine and leach low-grade gold ore that will be placed on a composite-lined heap leach pad to be constructed in three phases. Phases 1, 2, and 3 will consist of approximately 15, 12, and 9 acres respectively. The heap leach pad has been designed to accommodate approximately seven million tons of ore. Approximately 1.2 million tons of ore will be placed per year for a period of six years. The ore will be stacked on the leach pad in 20 foot lifts to a height not to exceed 220 feet. Each lift will be leached for approximately 100 days with a dilute solution of sodium cyanide. The pregnant (gold-bearing) solution will be collected by a network of perforated piping overlying the synthetic liner. The piping will transport all solution from the leach pad to the pregnant solution pond. The gold will be recovered by pumping the solution through a series of activated carbon columns. The carbon will be periodically stripped of its gold content and the loaded eluate pumped to the electrowinning cells. Barren solution from the processing plant will flow to a mixing tank where fresh sodium cyanide and caustic soda will be added as required. The cathodes will be melted and the molten bullion cast into doré bars for shipment to a refinery.

### 2.2 Permitted Activities

The permittee is authorized to operate a hydrometallurgical precious metal recovery facility as described in Section 2.1. The unpermitted disposal and burial of municipal solid waste, nonhazardous solid waste and special waste are prohibited at the Yarnell Project pursuant to A.R.S. Title 49, Chapter 4, Articles 1 and 9 and shall be in accordance with all federal, state, and county regulations.

#### 2.2.1 Solution Ponds

Three ponds shall be constructed to collect and store process solution and stormwater runoff from the heap leach pad. The total capacity, less freeboard, of the three ponds is approximately 9.3 million gallons (3.1 million gallons each). The ponds are designed for two feet of freeboard which is equivalent to an additional 1.7 million gallons bringing the total pond capacity to 11 million gallons. The criteria for sizing are summarized below:

1. Containment of precipitation on the heap leach pad from a 100-year, 24-hour storm event, totaling 5.4 million gallons. The area of stormwater runoff consists of the solution ponds, the 36-acre heap leach pad, two acres for the lined channels between the solution ponds, and the lined area in the ADR plant area.
2. Operating volume in the pregnant and barren ponds totaling 2 million gallons (1 million gallons per pond).
3. Emergency heap leach pad draindown totaling 1.7 million gallons.

Facility	Latitude	Longitude
Barren Pond	34° 11' 49" North	112° 44' 13" West
Pregnant Solution Pond	34° 11' 51" North	112° 44' 18" West
Stormwater / Emergency Overflow Pond	34° 11' 50" North	112° 44' 15" West

2.2.2 Heap Leach Process

The cyanide heap leach process shall be utilized as described in the APP application dated December, 1995 (*Application*), and supplemental documents. Heap leaching shall be restricted to the 36-acre heap leach pad, associated solution collection and transport ditches, pregnant solution pond, barren solution pond, stormwater/emergency overflow pond, and process plant as specified in the *Application* and supplemental documents.

Facility	Latitude	Longitude
Heap Leach Pad	112° 44' 59" North	34° 12' 26" West

2.2.3 Assay Laboratory

The permittee is authorized to dispose of inorganic liquid waste from the laboratory into the barren solution pond. Discharging organic waste from the assay laboratory to any on-site impoundment or area is prohibited. Organic solvents used in the assay laboratory shall be disposed of as hazardous waste. The volumes and location of organic waste disposal from this facility shall be recorded in a log book, as described in Section 2.4.8.2, and maintained at the site during operation.

2.3 Application of Facility BADCT (Best Available Demonstrated Control Technology)

The Yarnell Project heap leach facility and the process ponds are designed and shall be constructed to meet prescriptive design criteria as outlined in the *Final Draft, Arizona Mining BADCT Guidance Manual* (August, 1996). Operational inspection parameters for the permitted facilities are listed on Table 4.1.

2.3.1 Solution Ponds

Two solution storage ponds (pregnant and barren) shall be constructed with a primary and secondary liner of 60-mil high density polyethylene (HDPE). An HDPE geonet shall be placed between the two HDPE liners as a leak detection layer. The secondary HDPE liner shall be installed on top of a minimum of 6-inch thick liner bedding material consisting of clay-amended local soil. The liner bedding soil shall be placed in one lift over a prepared subgrade, and shall be compacted to provide a maximum permeability of  $1 \times 10^{-6}$  cm/sec.

In the event of a leak in the primary liner, solution shall be collected in the leak detection layer and transported by gravity to a sump. The sump shall contain at a minimum, a 10-inch diameter leak detection pipe designed to allow pumping of collected solution at a rate consistent with the flow capacity of the leak detection system. The leak detection monitoring points and parameters are listed on Table 4.2

The two solution storage ponds and the stormwater/emergency overflow pond are designed to provide the containment needed for runoff from a 100-year, 24-hour storm event, solution accumulation resulting from a 24-hour power outage, a working volume equivalent to nine feet of solution in the pregnant and barren solution ponds, and an additional two feet of freeboard. During operation, the pregnant and barren solution ponds shall maintain a minimum of two feet of freeboard. All freeboard measurements shall consist of the vertical distance between the fluid surface and the lowest point on the berm of the pond.

2.3.2 Heap Leach Pad

Leached ore generated by heap leach processing shall not be removed from the heap leach pad, except for further pilot scale testing for metallurgical purposes or reclamation. The permittee shall notify the ADEQ, Aquifer Protection Permit Program before removal. Other removal or transfer of leached ore shall require a major modification to the permit pursuant to A.A.C. R18-9-113 and R18-9-121.C.

The proposed heap leach pad liner shall be constructed as a composite liner system consisting of a 60-mil

HDPE geomembrane material overlying a bedding material consisting of clay-amended local soil. The liner bedding shall be placed in two 6-inch lifts over a prepared subgrade and shall be compacted in place to provide a maximum permeability of  $1 \times 10^{-6}$  cm/sec. A minimum thickness of 18 inches of 3/4-inch minus ore shall be placed on the HDPE liner in order to protect the geomembrane from puncture.

A leak detection system shall consist of drainage pipe bedded in a sand-filled drainage channel constructed between the HDPE liner and liner bedding layer. The leak detection system layout is structured to divide the entire leach pad into 11 separate areas for monitoring, with the leak detection system located along the downgradient sides of each monitoring area. The 11 leak detection drains shall convey leakage in separate pipes to three sumps located along the south side of the heap leach pad. The leak detection monitoring points and parameters are listed on Tables 4.3 and 4.4

A subsurface drain system for shallow localized groundwater shall be constructed prior to the heap leach pad subgrade placement. The subsurface drain shall consist of drain pipe enclosed in drain gravel and filter fabric. The subsurface drain system shall convey collected shallow groundwater to a sump located on the downgradient side of the solution pond area.

### 2.3.3 Stormwater / Emergency Overflow Pond

One stormwater / emergency overflow pond shall be constructed with a primary liner of 60-mil HDPE. The HDPE liner shall be installed on top of a minimum 6-inch thick liner bedding material constructed in the same manner as the solution storage ponds.

During operation, the stormwater / emergency overflow pond shall maintain a minimum of two feet of freeboard. Freeboard measurement shall consist of the vertical distance between the fluid surface and the lowest point on the berm of the pond.

## 2.4 Operational Requirements

### 2.4.1 Monitoring Requirements

All monitoring required in this permit shall continue for the duration of the permit, regardless of the discharge or operational status of the facility. A log book of the monitoring requirements shall be kept at the facility during operation and retained for ten years from the date of each inspection. In addition to the monitoring requirements described in Section 6.6, the log book shall contain all of the following information: name of inspector, date and shift inspection was conducted, condition of applicable facility components, any damage or malfunction, and the repair(s) performed, static water level in monitor well prior to sampling, sampling method, purging volume, indicator parameters including: field conductance (umhos/cm), field temperature ( $^{\circ}$ C), and field pH (standard units), date of analysis, preservation and transportation procedures, and the name of the analytical facility. In addition, copies of laboratory analysis forms and chain of custody forms shall be maintained on site at the permitted facility. Upon request, all log books, the laboratory analysis forms, and chain of custody forms shall be made immediately available for review by ADEQ personnel.

### 2.4.2 Solution Pond Leak Detection Monitoring System

A leak detection / collection system shall be incorporated into the design of the pregnant and barren solution ponds. This system shall be monitored and inspected according to the terms and frequencies listed on Tables 4.1 and 4.2. Any liquids detected shall be pumped out and returned to the process ponds. If the leakage rate for an impoundment exceeds 0.6 gallons per minute (gpm) or 1,000 gallons per acre per day (gpad), the permittee shall implement the contingency plan under Section 2.4.12.2 or Section 2.4.12.3 of this permit.

### 2.4.3 Heap Leach Pad Leak Detection Monitoring System

The leak detection system shall be monitored in accordance with Tables 4.1, 4.3, and 4.4. Any liquids detected shall be pumped out and disposed of within the process ponds. If the leakage rate exceeds 15 gpd for any one of the leak detection monitoring areas 2 through 11, or 0.5 gpd for leak detection monitoring area 1, the permittee shall implement the contingency plan under Section 2.4.12.4 or Section 2.4.12.5 of this permit.

### 2.4.4 Heap Leach Pad Underdrain System Fluid Monitoring

Monitoring shall commence upon completion of the Phase 1 heap leach pad and underdrain system. If present, fluids discharged from the underdrain system shall be monitored according to the terms and frequencies specified on Tables 4.1, 4.5, 4.6, 4.8, 4.11, and 4.14 of this permit.

### 2.4.5 Groundwater and Surface Water Monitoring

#### 2.4.5.1 Groundwater Sampling Protocol

Static water levels shall be measured and recorded before sampling any monitoring wells. Monitoring wells shall be purged of at least three borehole volumes (as calculated using the static water level) or until indicator parameters (pH, temperature, conductivity) are stable, whichever represents the greater volume. If evacuation results in the well going dry, the well shall be allowed to recover to eighty percent of the original borehole volume, or for 24 hours, whichever is shorter, before sampling. If after 24 hours there is not sufficient water for sampling, the well shall be recorded as "dry" for the monitoring event. An explanation for reduced pumping volumes, a record of the volume pumped, and modified sampling procedures shall be recorded in a log book, as described in Section 2.4.8.2, and maintained at the site.

As an alternative method for sampling, the permittee may conduct the sampling using the low-flow purging method as described in the Arizona Water Resources Research Center *Field Manual for Water Quality Sampling* (March, 1995). The well must be purged until indicator parameters, which shall include dissolved oxygen, turbidity, pH, temperature, and conductivity, stabilize.

All sampling procedures, preservation techniques and holding times shall be consistent with the most recent ADEQ Quality Assurance Project Plan (QAPP). Parameters designated as "dissolved" on Tables 4.7 through 4.12 require field-filtered samples. Trip blanks, equipment blanks, and duplicate samples shall be obtained as stated in the QAPP and chain of custody shall be followed.

#### 2.4.5.2 Point of Compliance

Monitor well YMC-3 shall be established as the point of compliance well and used to monitor both hazardous and nonhazardous substances as listed on Table 4.5.

#### 2.4.5.3 Underdrain System Sump

The permittee shall monitor the heap leach pad underdrain system sump. Fluids discharged from the underdrain system shall be considered groundwater and therefore, the AWQS or AQLs shall apply as discharge limitations (DL). Water flow rates into the underdrain system sump shall also be recorded daily in a log book, as described in Section 2.4.8.2, and maintained on site.

#### 2.4.5.4 Surface Water Monitoring Points

The permittee shall sample Cottonwood Spring and Fool's Gulch Spring for the parameters and frequencies listed on Tables 4.6, 4.9, 4.12, and 4.15, or when water is present.

The applicable water quality standards for both springs shall be either the Surface Water Quality Standards (SWQS) for aquatic and wildlife [warm water fishery] and fish consumption or the Aquifer Water Quality Standards (AWQS), whichever is most stringent, or AQLs as established by Section 2.5.5.6.2. Surface water flow rates from both springs shall be recorded quarterly in a log book.

#### 2.4.5.5 Surface Water Sampling Protocol

For each parameter on Tables 4.6, 4.9, 4.12, and 4.15 designated as dissolved, the surface water samples shall include a field-filtered sample in addition to an unfiltered sample.

All surface water sampling procedures, preservation techniques, and holding times shall be consistent with the most recent ADEQ QAPP. Trip blanks, equipment blanks and duplicate samples shall be obtained as stated in the QAPP and chain of custody shall be followed.

#### 2.4.5.6 Ambient Water Monitoring

The permittee collected eight quarterly samples of groundwater from POC well YMC-3 from April, 1995 through December, 1996, for the parameters listed on Table 4.6. These eight quarterly analyses were used to establish ambient groundwater quality data for evaluating any long-term changes in water quality. Until the mine is constructed and operations begin, no further groundwater monitoring at YMC-3 is required. However, the self monitoring report forms must still be submitted pursuant to Section 2.4.8.

The permittee has submitted the ambient groundwater monitoring data for POC well YMC-3 in tabulated format, along with copies of all laboratory analytical reports, the Quality Assurance/Quality Control procedures used in collection and analysis of the samples, and a report which includes the statistical calculation of the ALs and AQLs.

##### 2.4.5.6.1 Alert Levels

ALs shall be established as the upper prediction interval for each parameter sampled during the ambient monitoring period. For pH, the ALs shall be established as both the upper and lower prediction intervals. Other methods used to calculate ALs must first be approved by ADEQ Aquifer Protection Program.

##### 2.4.5.6.2 Aquifer Quality Limits

For each of the monitored analytes for which an AWQS has been adopted, and for those analytes which may have a numeric standard adopted by rule at a future time, the AQL shall be established as follows:

1. If the DL or calculated AL is less than the AWQS, then the AQL shall be set equal to the AWQS.
2. If the DL or calculated AL is greater than the AWQS, then the AQL shall be set equal to the DL or AL.

#### 2.4.5.7 Ambient Underdrain System Sump Monitoring

Within 24 months following the construction of Phase I of the heap leach facility, the permittee shall obtain a maximum of 12 monthly analyses of water samples for the underdrain system for the parameters listed on Table 4.6. Within 60 days of the completion of the ambient water quality monitoring of the underdrain system, the permittee shall submit the analytical data to the ADEQ Aquifer Protection Permit Program. This data shall be used to establish ambient water quality data. DLs shall be set equal to AWQS unless any of the required parameters, listed on Table 4.6, exceed AWQS. If any parameter exceeds an AWQS, then the DL shall be calculated based on the ambient data. Methods used to calculate DLs must be approved by ADEQ Aquifer Protection Permit Program.

#### 2.4.5.8 Ambient Surface Water Monitoring

Within 24 months of the effective date of this permit, the permittee shall obtain a maximum of 12 monthly analyses of water samples from Cottonwood Spring and Fool's Gulch Spring for the parameters listed on Table 4.6. These analyses shall establish ambient water quality data for evaluating any long-term changes in water quality. Within 60 days of the completion of the ambient water quality monitoring for the springs, the permittee shall submit all analytical data and calculations necessary to establish ALs and AQLs for each spring pursuant to Section 2.4.5.6.1 and Section 2.4.5.6.2. This data shall be submitted to the ADEQ Aquifer Protection Permit Program and shall be placed on Tables 4.9 and 4.12.

#### 2.4.5.9 Compliance Water Monitoring

Within 30 days of the initiation of mining operations, the permittee shall begin monitoring at the POC well, YMC-3 for the parameters listed on Table 4.7. Monitoring shall continue at the POC on a quarterly basis. In addition, once every two years from the date of issuance of this permit, monitor well YMC-3 shall be monitored for the parameters listed on Table 4.10.

After completion of the ambient water monitoring requirements for the underdrain system and the two springs, the permittee shall monitor the underdrain system and the two springs for the parameters listed on Tables 4.8 and 4.9 respectively. The permittee shall collect a sample of the first noted spring flow each quarter, but not more than one sample per quarter. If no water is present for an entire quarter in the springs or the underdrain system, the permittee shall report "Dry" on the Self-Monitoring Report Forms. In addition, once every two years, the underdrain system and the springs shall be monitored for the parameters listed on Tables 4.11 and 4.12, respectively.

If compliance monitoring indicates that an AL, DL, or AQL has been exceeded, the permittee shall follow the requirements of the contingency plan provided in Section 2.4.12.1

#### 2.4.6 Construction Monitoring

A Quality Assurance Engineer (QAE) shall be responsible for all quality assurance procedures. The QAE shall be a third party Arizona-registered Professional Engineer. The QAE shall be responsible for reporting and certifying that all liner installation and testing are performed to approved specifications in the *Responses to ADEQ Comments on Technical Issues Associated with the Aquifer Protection permit Application for the Yarnell Project* dated June 27, 1997.

##### 2.4.6.1 Heap Leach Pad and Solution Pond Liner Bedding Material Preparation and Testing

The liner bedding layer for the heap leach liner shall be constructed in two 6-inch lifts to a minimum depth of 12 inches. The liner bedding layer for the solution ponds shall be constructed in one lift to a minimum depth of 6 inches. Following the installation of the first lift of the heap leach pad liner bedding layer and surface impoundment liner bedding layer, a professional engineer registered in the state of Arizona shall verify that soil samples of the first lift meet the following specifications:

1. Greater than 30% by weight passing the No. 200 sieve.
2. A minimum plasticity index of 10% to 30%.

After installation of the first lift, the professional engineer shall verify that the compacted liner bedding material meets the following specifications based on verification sampling:

1. A maximum hydraulic conductivity of  $10^{-6}$  cm/sec.
2. Compaction to 95% of maximum dry density from the standard Proctor test.

Verification sampling for the first lift must be completed and the specifications met prior to construction of the second lift. Verification sampling of the liner bedding material applies to Phases I, II, and III of the Heap Leach Pad construction. Verification testing shall be conducted at the following frequencies:

1. Phase I: Three to five verification samples taken from noncontiguous areas.
2. Phases II and III: Two verification samples taken from noncontiguous areas. Results of all subgrade and verification sampling shall be submitted to the ADEQ Aquifer Protection Permit Program.

#### 2.4.6.2 Geomembrane Liner Testing

1. Visual examination of the panels upon delivery to the site, with documentation of the manufacturer's mark number and receipt of mill certification data.
2. Physical examination of the panels upon unfolding and spreading, with checking of nominal widths and examination for material flows or defects.
3. Each panel shall be pressure tested by air pressure testing of the air channel between parallel seams. The minimum air channel test pressure shall be 30 pounds per square inch (psi), with a maximum pressure drop of 3 psi over a 5-minute period.
4. Each sample cut from the seamed material shall be shear and peel tested at a frequency of one sample every 500 linear feet. The shear (or bonded seam strength) test shall be conducted according to ASTM D-3083 and ASTM D-638, and have a shear strength of 120 lb/inch width of seam. The peel (or peel adhesion) test shall be conducted according to ASTM D-413 and ASTM D-638, and have a minimum peel strength of 70 lb/inch width of seam. Failure for both tests shall be in a ductile manner and observed at the film bond to be acceptable.
5. Each type of test shall be performed on five replicate specimens from each material sample (equivalent to five shear tests and five peel tests per material sample). The test results shall be reported individually, with four out of five tests meeting strength requirements being acceptable.
6. In the event of a failed test (less than four of five tests meeting strength requirements), additional samples shall be collected at 50-foot intervals along the seam on either side of the failed sample location, with additional sampling and testing conducted until tested seam conditions are acceptable. The seam in the failed test area between the acceptable test locations shall be extrusion welded and tested.
7. Conformance testing shall be conducted every 100,000 ft<sup>2</sup> of liner or each lot, whichever is less, with results available prior to installation. Conformance testing shall include thickness-ASTM D-751, compound density-ASTM D-1505, carbon black content-ASTM D-1603, and melt index-ASTM D-1238.

#### 2.4.6.3 Heap Leach Underdrain System

Construction shall proceed according to the requirements in Section 2.4.6.

### 2.4.7 Operational Monitoring

#### 2.4.7.1 Heap Leach Pad

The heap leach pad shall be inspected for the items listed on Table 4.1 on a daily basis and the results recorded in a log book, as described in Section 2.4.8.2. The log book of these inspections shall be retained for ten years from the date of each inspection, available for review by ADEQ personnel.

Any damage to the heap leach pad identified during an inspection shall be recorded in the log book. If damage is identified during inspection that could contribute to a discharge, proper repair procedures shall

be performed. All repair or modification procedures and material(s) used shall be documented in the log book. If no damage to the heap leach pad is identified during the inspection, the permittee shall indicate in the log book that the required inspection occurred during the day.

#### 2.4.7.2 Underdrain System

The heap leach pad underdrain system sump shall be inspected on a daily basis for the items listed on Table 4.1 and this information shall be recorded in a log book, as described in Section 2.4.8.2. Any damage to the underdrain system sump shall be repaired and recorded in the log book.

#### 2.4.7.3 Solution Ponds

The solution ponds shall be inspected weekly and after storms for evidence of overtopping, sudden drops in liquid level, and deterioration of dikes or other containment as specified on Table 4.1. All daily inspections, notations of damage, and repairs shall be reported in the log book described in Section 2.4.8.2.

#### 2.4.7.4 Waste Rock Monitoring

Waste rock at the Yarnell Project that lies within 0 to 20 feet of either side of the ore zone shall be sampled and analyzed on a quarterly basis for the duration of the project. Each quarterly waste rock sample shall be collected as a composite of blended mine waste from blast hole cuttings collected during that quarter, and shall be analyzed for leachability (EPA method 1312 Synthetic Precipitation Leaching Procedure, SPLP) and acid generating potential using the Acid-Base Accounting method (Sobek Modified Acid Base Accounting Test). Results of the waste rock characterization shall be submitted to the Aquifer Protection Permit Program for review to determine if any ALs as stated on Table 4.16 have been exceeded. If it is determined that an AL has been exceeded, the permittee shall follow the requirements of the contingency plan in Section 2.4.12.6.

### 2.4.8 Reporting Requirements

#### 2.4.8.1 Self Monitoring Reports

1. The permittee shall complete the Self-Monitoring Report Form, provided by ADEQ, to reflect monitoring requirements of this permit and submit them to the ADEQ Aquifer Protection Permit Compliance.
2. Tables 4.7 through 4.12 list the parameters to be monitored and the frequency for reporting results for groundwater, springs, and the underdrain system monitoring. Monitoring methods shall be recorded on the Self-Monitoring Report Forms, along with any deviations from the methods and frequencies prescribed in this permit.
3. The permittee shall complete the Self-Monitoring Report Form to the extent that the information reported may be entered on the form. If no information is required during a quarter, the permittee shall enter "did not sample" on the Self-Monitoring Report Form and submit the report to ADEQ. The results of all monitoring required shall be submitted in such format as to allow direct comparison with the limitations and requirements of the permit. Reports are due 30 days after the end of the sample period.
4. The Self-Monitoring Report Form shall include: documentation of sampling date and time, name of sampler(s), static water level in monitor well prior to sampling, analytical methods, method detection limits, date of analysis, and the name of the analytical facility.

#### 2.4.8.2 Facility Inspection Records

All individual facilities shall be inspected for the items listed on Table 4.1 at the specified frequencies.

A log book of these inspections shall be retained for ten years from the date of each inspection, available for review by ADEQ personnel. The information in the log book shall include: name of inspector, date and shift inspection was conducted, condition of facility components, any damage or malfunction, and the repair(s) performed.

If damage is identified during inspection that could contribute to a discharge, proper repair procedures shall be performed. All repair or modification procedures and material(s) used shall be documented in the log book. If no damage to the facility is identified during the inspection, the permittee shall indicate in the log book that the required inspection occurred.

#### 2.4.9 Reporting Location

Signed copies of all reports required herein, *except* for those required in Section 2.4.5.7, Section 2.4.5.8, Section 2.4.7.4, and Section 3.1, shall be submitted to:

Arizona Department of Environmental Quality  
Aquifer Protection Permit Compliance  
3033 North Central Avenue  
Phoenix, Arizona 85012  
Phone (602) 207-4620

Signed copies of the reports required in Section 2.4.5.7, Section 2.4.5.8, Section 2.4.7.4, and Section 3.1 shall be submitted to:

Arizona Department of Environmental Quality  
Aquifer Protection Permit Program  
3033 North Central Avenue  
Phoenix, Arizona 85012

#### 2.4.10 Analytical Methodology

The permittee shall use any EPA approved or Arizona State approved analytical method for each parameter required in this permit as long as the method provides detection limits which are adequate for the regulatory limits of the parameters specified in the permit. All samples must be analyzed by a laboratory certified by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification, for each analysis performed. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods.

A list of certified laboratories can be obtained at the address below:

Arizona Department of Health Services  
Office of Laboratory Licensure and Certification  
3443 North Central Avenue, Suite 810  
Phoenix, Arizona 85012  
Phone (602) 255-3453

Upon submittal of the samples to a state-certified laboratory for analysis, a copy of the appropriate portions of the signed permit shall be forwarded to the laboratory for reference.

2.4.11 Reporting Deadline

Sample Collected During Quarter Beginning:	Quarterly Report Due By:
January	April 28
April	July 28
July	October 28
October	January 28

2.4.12 Contingency Plan Requirements

2.4.12.1 AL, DL, or AQL Exceedance Contingency

1. If preliminary laboratory results indicate an AL, DL, or AQL exceedance at the POC well YMC-3, Cottonwood Spring, Fools Gulch Spring, or the heap leach underdrain system, the permittee may request the laboratory to re-analyze the sample before reporting the results to ADEQ. Within five days of receiving *final* laboratory results indicating an AL, DL, or AQL exceedance, the permittee shall notify the ADEQ Aquifer Protection Permit Compliance.
2. Verification sampling shall be conducted within five days of receiving laboratory results indicating that an AL, DL, or AQL has been exceeded. The verification sample(s) need only be collected from the point at which the AL, DL, or AQL has been exceeded and analyzed for only the parameter(s) which has exceeded the AL, DL, or AQL.
3. Within five days of receiving the laboratory results from the verification sampling, the permittee shall notify the ADEQ Aquifer Protection Permit Compliance in writing of the results, regardless of whether the results are positive or negative.
4. If the results of verification sampling indicate that an AL, DL, or AQL has not been exceeded, no further action is required unless otherwise instructed by ADEQ.
5. If the analytical results from the verification sampling confirm that an AL, DL, or AQL has been exceeded, the permittee shall, within 14 days of receiving the laboratory results, collect an additional set of water samples from the point of compliance well, spring, or underdrain system. These water samples shall be submitted to a laboratory for analyses of the parameters listed on Tables 4.13, 4.14, or 4.15, whichever is applicable. The results from this second verification sampling shall be reported in writing to the ADEQ Aquifer Protection Permit Compliance within five days of receiving the laboratory results.
6. If the results from the second verification sampling confirm that an AL, DL, or AQL has been exceeded, the permittee shall within 30 days of receiving the laboratory results, submit to the ADEQ Aquifer Protection Permit Compliance, either (1) or (2):
  - (1) A written report that includes all of the information as specified in A.A.C. R18-9-113.C.1 through 5. Upon approval by the ADEQ Aquifer Protection Permit Compliance, the permittee shall initiate the actions necessary to mitigate or remediate the impacts of the exceedance.
  - (2) A demonstration that the AL, DL, or AQL exceedance resulted from error(s) in sampling, analysis, or statistical evaluation.

The ADEQ reserves the right to require the construction and installation of additional monitor wells in the event of a verified exceedance at any of the four monitoring points. In addition, ADEQ may require additional monitoring, investigation, or remediation beyond those specified in this permit in the event of an AL, DL, or AQL exceedance. If the permittee submits a demonstration that an AL, DL, or AQL exceedance was due to error(s) in sampling, analysis, or statistical evaluation, and this demonstration is not accepted by the ADEQ Aquifer Protection Permit Compliance, the ADEQ may require that the permittee submit the written report required pursuant to Section 2.4.12.1.6(1).

#### 2.4.12.2 *De Minimus* Exceedances in Surface Impoundments

The permittee shall initiate the following actions within three days of becoming aware of an exceedance of the *de minimus* leak detection action leakage rate of 0.6 gpm or 1,000 gpad. All information shall be recorded in a log book, as described in Section 2.4.8.2, and maintained on site:

1. Pump out all fluid collected in the leachate collection system,
2. Quantify and record the amount of fluid pumped from the leachate collection system,
3. An assessment of the potential for migration of liquids out of the containment system,
4. An assessment of the current conditions of the liner system.

#### 2.4.12.3 Rapid and Large Leakage Exceedances in Surface Impoundments

Additional response actions based on leakage rates in excess of 6.9 gpm or 11,000 gpad shall include:

1. Notify the ADEQ Aquifer Protection Permit Program within 24 hours of becoming aware of an exceedance.
2. Quantify and record the amount of fluid pumped from the leachate collection system.
3. Head reduction on the liner including emptying of the impoundment.
4. Visual inspections to identify areas of leakage.
5. Repair of all identified areas of leakage.
6. Closure or partial closure of the impoundment if identified areas of leakage cannot be repaired.
7. After repairs have been made, the leakage rate shall be monitored while the pond is being filled.

The permittee may be required to install additional groundwater monitoring wells if the above alert levels are exceeded and/or there is a large, sudden release from the process ponds or the solution process ditches.

Within 30 days of a confirmed rapid and large leakage rate exceedance, the permittee shall submit a written report to ADEQ Aquifer Protection Permit Compliance which includes the documentation specified in A.A.C. R18-9-113.C.1 through 5.

#### 2.4.12.4 *De Minimus* Exceedances in Heap Leach Pad

The permittee shall at a minimum, initiate the following actions within three days of becoming aware of an exceedance of the *de minimus* leak detection action leakage rate of 15 gpd for any one of the monitoring areas 2 through 11, or 0.5 gpd for area 1. All information shall be recorded in a log book to be kept on site:

1. Quantify and record the amount of fluid collected in the leak detection sump.
2. Identify the area of the heap leach pad that is leaking.

#### 2.4.12.5 Rapid and Large Leakage Exceedances in Heap Leach Pad

The permittee shall initiate the following response actions based on leakage rates in excess of 74 gpd for any one of the monitoring areas 2 through 11, or 2.2 gpd for area 1:

1. Notify the ADEQ Aquifer Protection Permit Program within 24 hours of becoming aware of an exceedance,
2. Quantify and record the amount of fluid pumped from the leachate collection system,
3. Conduct an assessment of the potential for migration of liquids out of the containment system.
4. Determine the location of the leak and if feasible, remove the ore from the affected area and repair

the liner. If removal of the ore from the affected area is not feasible, the permittee shall prevent leach solution from reaching the area of the leak by ceasing to leach the ore above the affected area or covering the top of the heap above the affected area with a synthetic liner, or another method proposed by the permittee and approved by the Aquifer Protection Permit Program.

5. A report on the responsive actions taken and the change in the leak rate.

The permittee may be required to install additional groundwater monitoring wells if the above alert levels are exceeded and/or there is a large, sudden release from the heap leach pad or solution transport ditches.

Within 30 days of a confirmed rapid and large leakage rate exceedance, the permittee shall submit a written report to ADEQ Aquifer Protection Program Compliance which includes the documentation specified in A.A.C. R18-9-113.C.1 through 5. In addition to actions already taken, the report shall detail additional response actions to be taken for increased leakage rates.

#### 2.4.12.6 Waste Rock Characterization and Management Plan

If the results from either or both required analyses listed on Table 4.16 indicate an AL exceedance, the permittee shall identify the area where the non-inert waste rock was deposited and isolate this material by covering it on all sides with inert material, or treat the non-inert material by another method proposed by the permittee and approved by ADEQ Aquifer Protection Permit Program. The location of all non-inert waste material shall be documented.

If subsequent mining of non-inert material is anticipated, the permittee shall segregate the inert material from the non-inert material. The non-inert material would be disposed in an area of the south waste rock dump where it could be isolated on all sides with at least 20 feet of inert material. The plan for separation and isolation of non-inert material would be documented in a disposal plan approved by the ADEQ Aquifer Protection Permit Program.

If, there are two or more AL exceedances within any four consecutive quarters of waste rock characterization, the Aquifer Protection Permit Program shall re-assess the potential for the waste rock dump to discharge contaminants to the aquifer.

#### 2.4.12.7 Slope Failure

If a slope failure involving the heap leach pad occurs, the permittee shall promptly close the active area in the vicinity of the failure, and conduct a field investigation of the failure to analyze its origin and extent, its impact on the heap leach operations, temporary and permanent repairs and changes in operational plans considered necessary.

If physical evidence shows the deformation of the slope during the operation of the mine and operations which may compromise the stability of the face, or if slope failure occurs, the permittee shall:

1. Within five days of becoming aware of the slope failure, notify the ADEQ Aquifer Protection Permit Compliance pursuant to A.A.C. R18-9-113.B, and
2. Within 30 days, submit a written report to ADEQ Aquifer Protection Permit Compliance pursuant to A.A.C. R18-9-113.C.1 through 5 and identify alternate methods of control which may include but are not limited to temporary cessation within the area of instability.

Upon approval by the ADEQ Aquifer Protection Permit Program, the permittee shall initiate the actions necessary to mitigate the impacts of the failure.

#### 2.4.12.8 Emergency Response

The permittee shall develop and maintain at least one copy of an emergency response plan at the location where day-to-day decisions regarding the operation of facilities are made. The permittee shall revise promptly all copies of the emergency response plan to reflect approved changes. The permittee shall advise anyone responsible for the operation of the facility of the location of copies of all emergency plans.

The permittee shall provide for emergency response on a 24-hour basis in the event that a condition arises which results in imminent and substantial endangerment to public health or the environment. The emergency response plan shall be kept at the facility and provide the following:

1. Designation of an emergency response coordinator who shall notify the ADEQ Aquifer Protection Permit Compliance within 24 hours that emergency response measures are taken or those portions of the contingency plan that address an imminent and substantial endangerment are activated.
2. A general description of the procedures, personnel and equipment to be used to assure appropriate mitigation of unauthorized discharges.
3. A list of names, addresses and telephone numbers of persons to be contacted in the event of an emergency.

The emergency response coordinator shall notify the ADEQ Emergency Response Unit immediately upon discovering a release of a hazardous substance in excess of a reportable quantity in accordance with 40 C.F.R. 302 et seq. All releases of hazardous substances shall be reported in accordance with 40 C.F.R. 302 et seq.

Within 30 days of completion of any mitigation action, the permittee shall submit to the ADEQ Aquifer Protection Permit Compliance, a written report describing the cause, impacts, and mitigation of the discharge.

#### 2.5 Temporary Cessation

The permittee shall notify the ADEQ Aquifer Protection Permit Program in writing before temporarily ceasing any operation at the facility. The notification shall include a description of any action taken to maintain discharge control systems such that discharge is minimized to the greatest extent practicable during temporary cessation and that an exceedance of an AWQS does not occur at the POC during temporary cessation. Notification of a temporary cessation does not relieve the permittee of any permit responsibilities.

#### 2.6 Closure and Post Closure

##### 2.6.1 Closure Notification

The permittee shall notify the ADEQ Aquifer Protection Permit Program of the intent to cease operations prior to ceasing, without intent to resume, an activity for which the facility was designed or operated. Within 90 days following notification, the permittee shall submit for approval, to the ADEQ Aquifer Protection Permit Program, a closure plan according to the requirements of A.R.S. § 49-252 and A.A.C. R18-9-116.C which eliminates, to the greatest extent practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance. This plan shall be in addition to the approved closure strategy included in the *Application*.

##### 2.6.2 Closure/Post-Closure Pit Modeling

At closure, the permittee shall evaluate and model the post-closure effects of the open pit. Factors to be evaluated shall include groundwater intrusion, estimated static water level in the pit and estimated amount of time needed to reach static water level, geochemistry of pit water, and the geochemistry of exposed rocks in

the pit. The model shall also evaluate the potential for the water level in the pit to rise to an elevation where the hydraulic gradient reverses and the pit water migrates into both groundwater and surface water. This closure/post-closure evaluation shall be submitted to ADEQ prior to complete closure of the mine.

#### 2.6.3 Detoxification/Neutralization of Heap Leach Material

Prior to closure and rinsing of the heap leach material with fresh water, the permittee shall collect four effluent, or pore water, samples from the spent ore and have them analyzed for pH, weak acid dissociable (WAD) cyanide, nitrate, and any other constituents that may be present as a result of the leaching process. Samples shall be taken at the toe of the heap.

Rinsing of the heap leach material with fresh water (passive rinsing) shall be performed for a period of time until gold values in the rinsate from the heap reach a level which become uneconomical to recover. Following passive rinsing, active rinsing with hydrogen peroxide or an equivalent agent shall be conducted. The permittee shall actively rinse the heap leach material until the effluent meets all AWQS.

Following active rinsing, the permittee shall collect six effluent samples over a 6-day period from the toe of the heap. Each of the six samples shall be analyzed for pH, WAD cyanide, nitrate, and any of the metals detected from the four pre-neutralization samples. When the mean value for WAD cyanide is less than 0.2 milligrams per liter with no individual sample exceeding 2.5 times the mean, the pH is between 6.0 and 8.5, and all other parameters meet AWQS, the heap leach material shall be considered neutralized.

After neutralization of the heap has been completed, residual seepage that discharges from the heap must meet AWQS if discharged to the subsurface and SWQS if discharged to any 'Waters of the State' as defined by A.R.S. § 49-201.37.

#### 2.6.4 Closure Completion

Upon completion of closure activities, the permittee shall give written notice to the ADEQ Aquifer Protection Permit Program indicating that the approved closure plan has been fully implemented.

#### 2.6.5 Post-Closure Requirements

Upon completion of closure activities, the permittee shall submit a post-closure plan to the ADEQ Aquifer Protection Permit Program for approval. The requirements shall be established based on a review of facility closure activities and shall be reviewed and approved by the ADEQ Aquifer Protection Permit Program.

Post-closure requirements shall include maintenance and monitoring activities consisting of: periodic verification that all the containment, monitoring structures, and facilities retain their integrity and their operability, appropriate repairs, and monitoring of groundwater. These activities shall continue for a period of time and frequency to be determined at the time of closure, and approved by the ADEQ Aquifer Protection Permit Program. The frequency of the monitoring shall not be modified nor the monitoring cease without approval by the ADEQ.

##### 2.6.5.1 Post-Closure Plan

The post-closure plan shall ensure that any reasonable probability of further discharge from the facility, and of exceeding AWQS at the applicable POC, are eliminated, to the greatest extent practicable. The post-closure plan shall comply with the requirements of A.R.S. § 49-252 and A.A.C. R18-9-116.

##### 2.6.5.2 Post-Closure Completion

The permittee shall submit a written notice to the ADEQ Aquifer Protection Permit Program when the post-closure activities have been completed.

### 3.0 COMPLIANCE SCHEDULE

The permittee shall submit the required information to the ADEQ Aquifer Protection Permit Program within the time frames specified from the effective date of this permit.

#### 3.1 Requirements

1. Prior to construction or any discharging activities, the Yarnell Mining Company shall submit a bond for closure. The amount will be determined by ADEQ after the completion of an Environmental Impact Study being performed by the U.S. Bureau of Land Management.
2. Within 30 days, submit a copy of the facility emergency response plan. The plan shall include all of the information as required in A.A.C. R18-9-114.B.1 through 5.
3. Within 30 days of completion of construction of any facility referenced in Section 2.4, submit the results of all quality control/assurance testing and verification testing.
4. Within 60 days of the completion of the ambient groundwater monitoring period for Cottonwood Spring, Fools Gulch Spring, and the underdrain system, submit the tabulated groundwater data and statistical calculations used for determining ALs and AQLs.
5. Within 24 months following the construction of Phase I of the heap leach facility, the permittee shall obtain a maximum of 12 monthly analyses of water samples for the underdrain system. Within 60 days of the completion of the ambient water quality monitoring of the underdrain system, the permittee shall submit all analytical data and calculations necessary to establish DLs and AQLs for the underdrain system.
6. Within 24 months of the effective date of this permit, the permittee shall obtain a maximum of 12 monthly analyses of water samples from Cottonwood Spring and Fool's Gulch Spring. Within 60 days of the completion of the ambient water quality monitoring for the springs, the permittee shall submit all analytical data and calculations necessary to establish ALs and AQLs for each spring.

4.0 MONITORING REQUIREMENT TABLES

Table 4.1 Operational Monitoring

Parameter	Performance Levels	Inspection Frequency
Solution Ponds	No visible cracks or leaks in liner; pumps and fittings maintained without leaks and in good working order; minimum two feet of freeboard; no evidence of seepage	Daily
Berm Integrity	No substantial erosion; no evidence of seepage; no slumping	Weekly and after storms
Leak Detection Sumps	No impairment of access; pumps working properly; level of liquids in sumps observed and recorded in on-site log; no visible cracks in sump	Daily
Solution Ditches	No evidence of spillage on the crest or outside the ditch embankment or leakage; no evidence of seepage; no visible cracks or leaks in liner; minimum two feet of freeboard	Daily
Underdrain Sump	No impairment of access; no visible cracks in sump	Daily

Table 4.2 Solution Pond Leak Detection Monitoring

Sampling Point	Identification			Location
1	Barren Solution Pond Leak Detection Sump			34° 11' 49" N 112° 44' 13" W
2	Pregnant Solution Pond Leak Detection Sump			34° 11' 51" N 112° 44' 18" W
Parameter	Alert Level	Monitoring Method	Monitoring Frequency	Reporting Frequency
Presence of Fluid	None	Field Inspection	Daily during fluid containment	Quarterly
Volume Pumped	None	Record volume pumped	As pumped	"
Rate Pumped	N/A	Record rate pumped	As pumped	"
<i>De Minimus</i> Leakage Rate	0.6 gpm or 1,000 gpad <sup>1</sup>	Record volume collected	Daily during fluid containment	"
Rapid and Large Leakage Rate	6.9 gpm or 11,000 gpad <sup>2</sup>	Record volume collected	Daily during fluid containment	"

<sup>1</sup> If leakage rate exceeds 0.6 gpm or 1,000 gpad, implement contingency plan in Section 2.4.12.2

<sup>2</sup> If leakage rate exceeds 6.9 gpm or 11,000 gpad, implement contingency plan in Section 2.4.12.3

Table 4.3 Heap Leach Pad Leak Detection Monitoring

Sampling Point	Identification			Location
3	Leach Pad Detection Sump A, Monitoring Areas 2, 3, 4, 6			34° 11' 58" N 112° 44' 31" W
4	Leach Pad Detection Sump B, Monitoring Areas 7, 9, 10, 11			34° 11' 58" N 112° 44' 31" W
5	Leach Pad Detection Sump C, Monitoring Areas 5, 8			34° 11' 58" N 112° 44' 31" W
Parameter	Alert Level	Monitoring Method	Monitoring Frequency	Reporting Frequency
Presence of Fluid	None	Field Inspection	Daily during fluid containment	Quarterly
Volume Pumped	None	Record volume pumped	As pumped	"
Rate Pumped	N/A	Record rate pumped	As pumped	"
<i>De Minimus</i> Leakage Rate	15 gpd per area <sup>3</sup>	Correspondence dated 22 AUG 97	Daily during fluid containment	"
Rapid and Large Leakage Rate	74 gpd per area <sup>4</sup>	Correspondence dated 22 AUG 97	Daily during fluid containment	"

Table 4.4 Heap Leach Pad Leak Detection Monitoring

Sampling Point	Identification			Location
6	Leach Pad Detection Sump C, Monitoring Area 1			34° 11' 58" N 112° 44' 31" W
Parameter	Alert Level	Monitoring Method	Monitoring Frequency	Reporting Frequency
Presence of Fluid	None	Field Inspection	Daily during fluid containment	Quarterly
Volume Pumped	None	Record volume pumped	As pumped	"
Rate Pumped	N/A	Record rate pumped	As pumped	"
<i>De Minimus</i> Leakage Rate	0.5 gpd per area <sup>5</sup>	Correspondence dated 22 AUG 97	Daily during fluid containment	"
Rapid and Large Leakage Rate	2.2 gpd per area <sup>6</sup>	Correspondence dated 22 AUG 97	Daily during fluid containment	"

<sup>3</sup> If leakage rate exceeds 15 gpd, implement contingency plan in Section 2.4.12.4

<sup>4</sup> If leakage rate exceeds 74 gpd, implement contingency plan in Section 2.4.12.5

<sup>5</sup> If leakage rate exceeds 0.5 gpd, implement contingency plan in Section 2.4.12.4

<sup>6</sup> If leakage rate exceeds 2.2 gpd, implement contingency plan in Section 2.4.12.5

Table 4.5 Monitoring Points

Monitoring Point	Designation	ADWR No.	Cadastral Location	Physical Location
YMC-03	Hazardous & non-hazardous Point of Compliance	55-548395	(B-10-5) 23acb	34° 11' 50" N 112° 44' 40" W
Cottonwood Spring	Hazardous & non-hazardous monitoring point	NA	(B-10-5) 14bdd	34° 12' 59" N 112° 44' 31" W
Fool's Gulch Spring	Hazardous & non-hazardous monitoring point	NA	(B-10-05) 15ddc	34° 12' 08" N 112° 45' 19" W
Heap Leach Underdrain System	Hazardous & non-hazardous monitoring point	NA	(B-10-05) 23bab	34° 12' 19" N 112° 44' 42" W

Table 4.6 Ambient Water Monitoring Parameters

Field pH	Nitrite/Nitrate as total Nitrogen	Lead
Field conductivity	Calcium	Manganese
Field temperature	Magnesium	Mercury
Lab pH	Potassium	Nickel
Lab conductivity	Sodium	Selenium
Total dissolved solids	Antimony	Silica
Sulfate	Arsenic	Silver
Chloride	Barium	Thallium
Fluoride	Beryllium	Zinc
Carbonate	Cadmium	Gross Alpha
Bicarbonate	Chromium	Gross Beta
Hydroxide	Copper	Cyanide, Total <sup>7</sup>
Total alkalinity	Iron	

Table 4.7 Compliance Groundwater Monitoring, POC YMC-3

Parameter	AQL	Alert Level	Sampling Frequency	Reporting Frequency
Field pH (standard units)	None	6.4	Quarterly	Quarterly
Total dissolved solids (mg/l)	None	655	"	"
Antimony <sup>8</sup> (mg/l)	0.006	0.005	"	"
Cadmium <sup>8</sup> (mg/l)	0.005	0.003	"	"
Mercury <sup>8</sup> (mg/l)	0.002	0.001	"	"
Nitrate+Nitrite as total nitrogen (mg/l)	10.0	1.2	"	"
Sulfate (mg/l)	None	95	"	"
Cyanide, total <sup>7</sup> (mg/l)	None	0.10	"	"
Cyanide, free <sup>9</sup> (mg/l)	0.2	None	see footnote 9	see footnote 9

<sup>7</sup> If concentration of total cyanide is equal to or greater than 0.2 mg/l, permittee must analyze sample for WAD and free cyanide.

<sup>8</sup> Dissolved; field-filtered sample required.

<sup>9</sup> Monitored only if total cyanide is greater than or equal to 0.2 mg/l.

Table 4.8 Compliance Monitoring for the Underdrain System Sump

Parameter	Discharge Limit	Sampling Frequency	Reporting Frequency
Field pH (standard units)	None	Quarterly, or when water is present	Quarterly
Total dissolved solids (mg/l)	None	"	"
Antimony <sup>10</sup> (mg/l)	0.006	"	"
Cadmium <sup>10</sup> (mg/l)	0.005	"	"
Mercury <sup>10</sup> (mg/l)	0.002	"	"
Nitrate + Nitrite as total nitrogen (mg/l)	10.0	"	"
Sulfate (mg/l)	None	"	"
Cyanide, total <sup>11</sup> (mg/l)	None	"	"
Cyanide, free <sup>12</sup> (mg/l)	0.2	see footnote 13	see footnote 13

Table 4.9 Compliance Monitoring for Cottonwood and Fools Gulch Springs

Parameter	SWQS or AQL	Alert Level	Sampling Frequency	Reporting Frequency
Field pH (standard units)	6.5 - 9.0	Reserved <sup>13</sup>	Quarterly, or when water is present	Quarterly
Total dissolved solids (mg/l)	None	Reserved	"	"
Antimony <sup>14</sup> (mg/l)	0.006	Reserved	"	"
Cadmium <sup>14</sup> (mg/l)	Calculated <sup>15</sup>	Reserved	"	"
Mercury <sup>14</sup> (mg/l)	0.00001	Detection Limit	"	"
Sulfate (mg/l)	None	Reserved	"	"
Cyanide, total <sup>16</sup> (mg/l)	0.0097	Reserved	"	"
Turbidity (NTU)	50	Reserved	"	"

<sup>10</sup> Dissolved; field-filtered sample required.

<sup>11</sup> If concentration of total cyanide is equal to or greater than 0.2 mg/l, the permittee shall analyze the sample for WAD and free cyanide

<sup>12</sup> Monitored only if total cyanide is greater than or equal to 0.2 mg/l.

<sup>13</sup> 'Reserved' indicates that insufficient data exists to determine an alert level. Alert levels shall be calculated and inserted into the permit upon submittal of the required data by the permittee.

<sup>14</sup> Both field and unfiltered samples required

<sup>15</sup> Calculations may be found in the Arizona Administrative Code, Title 18, Chapter 11.

<sup>16</sup> If concentration of total cyanide is equal to or greater than 0.0097 mg/l, permittee must analyze sample for WAD and free cyanide

Table 4.10 Biennial Compliance Groundwater Monitoring for POC, YMC-3

Parameter	AQL	Alert Level	Sampling Frequency	Reporting Frequency
Calcium (mg/l)	None	130	Every 2 years	Every 2 years
Magnesium (mg/l)	None	30	"	"
Potassium (mg/l)	None	7	"	"
Sodium (mg/l)	None	115	"	"
Chloride (mg/l)	None	100	"	"
Fluoride (mg/l)	4.0	3	"	"
Carbonate (mg/l CaCO <sub>3</sub> )	None	Reserved <sup>17</sup>	"	"
Bicarbonate (mg/l CaCO <sub>3</sub> )	None	Reserved	"	"
Hydroxide (mg/l CaCO <sub>3</sub> )	None	Reserved	"	"
Total Alkalinity (mg/l CaCO <sub>3</sub> )	None	425	"	"
Nitrate (mg/l)	10.0	1.2	"	"
Cation/anion balance (calculated)	None	±5%	"	"
Arsenic <sup>18</sup> (mg/l)	0.05	0.01	"	"
Silica (mg/l)	None	Reserved	"	"
Manganese (mg/l)	None	11	"	"
Selenium <sup>18</sup> (mg/l)	0.05	0.01	"	"
Zinc (mg/l)	None	0.5	"	"
Gross Alpha (pCi/l)	15	Reserved	"	"

<sup>17</sup> 'Reserved' indicates that insufficient data exists to determine an alert level. Alert levels shall be calculated and inserted into the permit upon submittal of the required data by the permittee.

<sup>18</sup> Dissolved; field-filtered sample required

Table 4.11 Biennial Compliance Groundwater Monitoring for the Underdrain System

Parameter	Discharge Limit	Sampling Frequency	Reporting Frequency
Calcium (mg/l)	None	Every 2 years	Every 2 years
Magnesium (mg/l)	None	"	"
Potassium (mg/l)	None	"	"
Sodium (mg/l)	None	"	"
Chloride (mg/l)	None	"	"
Fluoride (mg/l)	4.0	"	"
Carbonate (mg/l CaCO <sub>3</sub> )	None	"	"
Bicarbonate (mg/l CaCO <sub>3</sub> )	None	"	"
Hydroxide (mg/l CaCO <sub>3</sub> )	None	"	"
Total Alkalinity (mg/l CaCO <sub>3</sub> )	None	"	"
Nitrite/Nitrate as total Nitrogen (mg/l)	10.0	"	"
Cation/anion balance (calculated)	None	"	"
Arsenic <sup>19</sup> (mg/l)	0.05	"	"
Silica (mg/l)	None	"	"
Manganese (mg/l)	None	"	"
Selenium <sup>19</sup> (mg/l)	0.05	"	"
Zinc (mg/l)	None	"	"
Gross Alpha (pCi/l)	15	"	"

<sup>19</sup> Dissolved; field-filtered sample required

Table 4.12 Biennial Compliance Groundwater Monitoring for Cottonwood and Fools Gulch Springs

Parameter	SWQS or AQL	Alert Level	Sampling Frequency	Reporting Frequency
Calcium (mg/l)	None	Reserved <sup>20</sup>	Every 2 years	Every 2 years
Magnesium (mg/l)	None	Reserved	"	"
Potassium (mg/l)	None	Reserved	"	"
Sodium (mg/l)	None	Reserved	"	"
Chloride (mg/l)	None	Reserved	"	"
Fluoride (mg/l)	4.0	Reserved	"	"
Carbonate (mg/l CaCO <sub>3</sub> )	None	Reserved	"	"
Bicarbonate (mg/l CaCO <sub>3</sub> )	None	Reserved	"	"
Hydroxide (mg/l CaCO <sub>3</sub> )	None	Reserved	"	"
Total Alkalinity (mg/l CaCO <sub>3</sub> )	None	Reserved	"	"
Nitrate (mg/l)	10.0	Reserved	"	"
Arsenic <sup>21</sup> (mg/l)	0.05	Reserved	"	"
Silica (mg/l)	None	Reserved	"	"
Iron (mg/l)	None	Reserved	"	"
Manganese (mg/l)	None	Reserved	"	"
Selenium <sup>21</sup> (mg/l)	0.002	Reserved	"	"
Zinc <sup>21</sup> (mg/l)	Calculated <sup>22</sup>	Reserved	"	"
Gross Alpha (pCi/l)	15	Reserved	"	"

<sup>20</sup> 'Reserved' indicates that insufficient data exists to determine an alert level. Alert levels shall be calculated and inserted into the permit upon submittal of the required data by the permittee.

<sup>21</sup> Dissolved; field-filtered and unfiltered samples required

<sup>22</sup> Calculations may be found in the Arizona Administrative Code, Title 18, Chapter 11.

Table 4.13 Contingency Groundwater Monitoring for POC, YMC-3

Parameter	AQL	Parameter	AQL
Field pH	None	Cation/anion balance	None
Field conductance	None	Antimony <sup>23</sup> (mg/l)	0.006
Field temperature	None	Arsenic <sup>23</sup> (mg/l)	0.05
Lab pH	None	Barium <sup>23</sup> (mg/l)	2
Lab conductance	None	Beryllium <sup>23</sup> (mg/l)	0.004
Total dissolved solids (mg/l)	None	Cadmium <sup>23</sup> (mg/l)	0.005
Sulfate (mg/l)	None	Chromium <sup>23</sup> (mg/l)	0.1
Chloride (mg/l)	None	Copper (mg/l)	None
Fluoride (mg/l)	4.0	Iron (mg/l)	None
Carbonate (mg/l)	None	Lead <sup>23</sup> (mg/l)	0.05
Bicarbonate (mg/l)	None	Manganese (mg/l)	None
Hydroxide (mg/l)	None	Mercury <sup>23</sup> (mg/l)	0.002
Total alkalinity (mg/l)	None	Nickel <sup>23</sup> (mg/l)	0.1
Nitrate (mg/l)	10.0	Selenium <sup>23</sup> (mg/l)	0.05
Nitrite/Nitrate as total nitrogen (mg/l)	10.0	Silica	None
Calcium (mg/l)	None	Thallium <sup>23</sup> (mg/l)	0.002
Magnesium (mg/l)	None	Zinc (mg/l)	None
Potassium (mg/l)	None	Cyanide, total <sup>24</sup> (mg/l)	None
Sodium (mg/l)	None	Cyanide, free <sup>25</sup> (mg/l)	0.2
		Gross alpha (pCi/l)	15

<sup>23</sup> Dissolved; field filtered sample required.

<sup>24</sup> If total cyanide concentration is equal to or greater than 0.2 mg/l, permittee must analyze sample for free and WAD cyanide.

<sup>25</sup> Monitored only if total cyanide is greater than or equal to 0.2 mg/l.

Table 4.14 Contingency Groundwater Monitoring for the Underdrain System

Parameter	DL	Parameter	DL
Field pH	None	Cation/anion balance	None
Field conductance	None	Antimony <sup>26</sup> (mg/l)	0.006
Field temperature	None	Arsenic <sup>26</sup> (mg/l)	0.05
Lab pH	None	Barium <sup>26</sup> (mg/l)	2.0
Lab conductance	None	Beryllium <sup>26</sup> (mg/l)	0.004
Total dissolved solids (mg/l)	None	Cadmium <sup>26</sup> (mg/l)	0.005
Sulfate (mg/l)	None	Chromium <sup>26</sup> (mg/l)	0.1
Chloride (mg/l)	None	Copper (mg/l)	None
Fluoride (mg/l)	4.0	Iron (mg/l)	None
Carbonate (mg/l)	None	Lead <sup>26</sup> (mg/l)	0.05
Bicarbonate (mg/l)	None	Manganese (mg/l)	None
Hydroxide (mg/l)	None	Mercury <sup>26</sup> (mg/l)	0.002
Total alkalinity (mg/l)	None	Nickel <sup>26</sup> (mg/l)	0.1
Nitrate (mg/l)	10.0	Selenium <sup>26</sup> (mg/l)	0.05
Nitrite/Nitrate as total nitrogen (mg/l)	10.0	Silica (mg/l)	None
Calcium (mg/l)	None	Thallium <sup>26</sup> (mg/l)	0.002
Magnesium (mg/l)	None	Zinc (mg/l)	None
Potassium (mg/l)	None	Cyanide, total <sup>27</sup> (mg/l)	None
Sodium (mg/l)	None	Cyanide, free <sup>28</sup> (mg/l)	0.2
		Gross alpha (pCi/l)	15

<sup>26</sup> Dissolved; field-filtered sample required

<sup>27</sup> If total cyanide concentration is equal to or greater than 0.2 mg/l, permittee must analyze sample for free and WAD cyanide.

<sup>28</sup> Monitored only if total cyanide is greater than or equal to 0.2 mg/l.

Table 4.15 Contingency Groundwater Monitoring for Cottonwood and Fools Gulch Springs

Parameter	SWQS or AQL	Parameter	SWQS or AQL
Field pH	6.5 - 9.0	Sodium (mg/l)	None
Field conductance	None	Antimony <sup>29</sup> (mg/l)	0.006
Field temperature	None	Arsenic <sup>29</sup> (mg/l)	0.05
Lab pH	None	Barium <sup>29</sup> (mg/l)	2.0
Lab conductance	None	Beryllium <sup>29</sup> (mg/l)	0.004
Total dissolved solids (mg/l)	None	Cadmium <sup>29</sup> (mg/l)	Calculated <sup>30</sup>
Total suspended solids (mg/l)	None	Chromium <sup>29</sup> (mg/l)	Calculated
Sulfate (mg/l)	None	Copper <sup>29</sup> (mg/l)	Calculated
Chloride (mg/l)	None	Iron (mg/l)	None
Fluoride (mg/l)	4.0	Lead <sup>29</sup> (mg/l)	Calculated
Carbonate (mg/l)	None	Manganese (mg/l)	None
Bicarbonate (mg/l)	None	Mercury <sup>29</sup> (mg/l)	0.00001
Hydroxide (mg/l)	None	Nickel <sup>29</sup> (mg/l)	Calculated
Total alkalinity (mg/l)	None	Selenium <sup>29</sup> (mg/l)	0.002
Nitrate (mg/l)	10.0	Silica (mg/l)	None
Nitrite/Nitrate as total nitrogen (mg/l)	10.0	Thallium <sup>29</sup> (mg/l)	0.002
Calcium (mg/l)	None	Zinc <sup>29</sup> (mg/l)	Calculated
Magnesium (mg/l)	None	Cyanide, total <sup>31</sup> (mg/l)	0.0097
Potassium (mg/l)	None	Gross alpha (pCi/l)	15

Table 4.16 Contingency Monitoring for Waste Rock

Analysis	Alert Level	Sample Frequency
Acid Base Accounting	The ANP/AGP ratio is $\leq$ 3 or total sulfur $\geq$ 0.1%	Quarterly
EPA Method 1312, SPLP (or similar approved by ADEQ) for:	AQL:	Quarterly
Antimony	0.006 mg/l	
Arsenic	0.05 mg/l	
Beryllium	0.004 mg/l	
Cadmium	0.005 mg/l	
Chromium	0.1 mg/l	
Lead	0.05 mg/l	
Mercury	0.002 mg/l	
Selenium	0.05 mg/l	
Thallium	0.002 mg/l	

<sup>29</sup> Both field-filtered and unfiltered samples required.

<sup>30</sup> Calculations may be found in the Arizona Administrative Code, Title 18, Chapter 11.

<sup>31</sup> If total cyanide concentration is equal to or greater than 0.0097 mg/l, the permittee shall analyze sample for free and WAD cyanide.

## 5.0 REFERENCES AND PERTINENT INFORMATION

### 5.1 References

The terms and conditions set forth in this permit have been developed based upon the information contained in the following:

1. Aquifer Protection Permit Application dated December, 1995.
2. Inventory No. 101015, including all correspondence, maps, drawings, engineering reviews and hydrological reviews.
3. Public Notice dated: January 28, 1998 and February 4, 1998.
4. Public Hearing comments and correspondence received between January 28, 1998 and March 16, 1998.
5. Other:

### 5.2 Facility Information

The ADEQ Aquifer Protection Permit Program shall be notified within 30 days of any change in any of the information below:

1. Facility Contact Person: Mr. Mark Montoya, General Manager
2. Address: P.O. Box 1182, Yarnell, AZ 85362
3. Emergency Telephone Number: (520) 427-3353
4. Landowner of Facility Site: Yarnell Mining Company  
P.O. Box 1182  
Yarnell, AZ 85362

## 6.0 GENERAL CONDITIONS AND RESPONSIBILITIES

### 6.1 Inspections

The director may, on presentation of credentials, enter into, on, or through any public or private property from which a discharge has occurred, is occurring, or may occur, as is reasonably necessary to ensure compliance with this permit. The director or a department employee may take samples, inspect and copy records required to be maintained pursuant to this permit, inspect equipment, activities, facilities and monitoring equipment or methods of monitoring, take photographs and take other action reasonably necessary to determine the application of, or compliance with, this permit. The owner or managing agent of the property shall be afforded the opportunity to accompany the director or department employee during inspections and investigations, but prior notice of entry to the owner or managing agent is not required if reasonable grounds exist to believe that such notice would frustrate the enforcement of this permit. If the director or department employee obtains any samples before leaving the premises, he shall give the owner or managing agent a receipt describing the samples obtained and a portion each sample equal in volume or weight to the portion retained. If an analysis is made of samples, or monitoring and testing are performed, a copy of the results shall be furnished promptly to the owner or managing agent. [A.R.S. § 49-203.B.1]

### 6.2 Confidentiality of Information

Any records, reports or information obtained from any person under Title 49, Chapter 2 of the Arizona Revised Statutes, including records, reports or information obtained or prepared by the director or a department employee, shall be available to the public, except that:

1. Income tax returns are confidential
2. Other information, or a particular part of the information, shall be considered confidential on either:
  - i. A showing, satisfactory to the director, by any person that the information, or a particular part of the information, if made public, would divulge the trade secrets of the person.
  - ii. A determination by the attorney general that disclosure of the information or a particular part of the information would be detrimental to an ongoing criminal investigation or to an ongoing or contemplated civil enforcement action under this Title 49, Chapter 2 of the Arizona Revised Statutes, in superior court.

Notwithstanding A.R.S. § 49-205.A, the following information shall be available to the public:

1. The name and address of any permit applicant or permittee.
2. The chemical constituents, concentrations and amounts of any pollutant discharge.
3. The existence or level of a concentration of a pollutant in drinking water or in the environment.

Notwithstanding A.R.S. § 49-205.A, the director may disclose any records, reports or information obtained from any person under this permit, including records, reports or information obtained by the director or department employees, to:

1. Other state employees concerned with administering this permit or if the records, reports or information are relevant to any administrative or judicial proceeding under Title 49, Chapter 2 of the Arizona Revised Statutes.
2. Employees of the United States environmental protection agency if such information is necessary or required to administer and implement or comply with the clean water act, the safe drinking water act, CERCLA or provisions and regulations relating to those acts.

Financial information required to be supplied under A.R.S. § 49-243.N is confidential. [A.R.S. § 49-205]

### 6.3 Preservation of Rights

This permit shall not be construed to abridge or alter causes of action or remedies under the common law or statutory law, criminal or civil, nor shall any provision of this permit, or any act done by virtue of this permit, be construed so as to stop any person, this state or any political subdivision of this state, or owners of land having groundwater or surface water rights or otherwise, from exercising their rights or, under the common law or statutory law, from suppressing nuisances or preventing injury due to discharges. [A.R.S. § 49-206]

### 6.4 Reporting of Bankruptcy or Environmental Enforcement

The permittee shall notify the Director within five days after the occurrence of any one of the following:

1. The filing of bankruptcy by the permittee.
2. The entry of any order or judgment against the permittee for the enforcement of any environmental protection statute and in which monetary damages or civil penalties are imposed. [A.A.C. R18-9-113.D]

### 6.5 Annual Registration of Permittee; Fee

The permittee shall pay an annual registration fee to ADEQ. The annual registration fee is based upon the amount of influent of pollutants in gallons per day as established by A.R.S. § 49-242.D. [A.R.S. § 49-242.C and D]

### 6.6 Monitoring Requirements

The permittee shall conduct any monitoring activity necessary to assure compliance with any other Aquifer Protection Permit condition, with the applicable water quality standards established pursuant to A.R.S. §§ 49-221 and 49-223, and with A.R.S. §§ 49-241 through 49-251.

The permittee shall make, for each sample taken or measurement made as required by this permit, a monitoring record consisting of all of the following:

1. The date, time, and exact place of a sampling or measurement and the name of each individual who performed the sampling or measuring.
2. The procedures used to collect the sample or make the measurement.
3. The date on which sample analysis was completed.
4. The name of each individual or laboratory who performed the analysis.
5. The analytical techniques or methods used to perform the sampling and analysis.
6. The chain of custody records.
7. Any field notes relating to the information described in 1 - 6 above.

The permittee shall retain or have access to a monitoring record made pursuant to Section 6.6 for a period of 10 years after the date of the sample or measurement. [A.A.C. R18-9-112.A, C, and D]

### 6.7 Proper Operation

1. The facility shall be so designed, constructed and operated as to ensure the greatest degree of discharge

reduction achievable through application of the best available demonstrated control technology, processes, operating methods or other alternatives, including, where practicable, a technology permitting no discharge of pollutants.

2. Pollutants discharged shall in no event cause or contribute to a violation of aquifer water quality standards at the applicable point of compliance for the facility.
3. No pollutants discharged shall further degrade, at the applicable point of compliance, the quality of any aquifer that already violates the aquifer quality standard for that pollutant. [A.R.S. § 49-243.B.1, 2, and 3]

#### 6.8 Technical and Financial Capability

1. The permittee shall have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit.
2. The Director may establish any of the permit conditions described in A.A.C. R18-9-109 through R18-9-116 on the basis of the Director's evaluation of the permittee's technical or financial capability necessary to carry out the terms and conditions of the individual Aquifer Protection Permit.
3. The permittee shall maintain any bond, insurance policy, or trust fund provided under R18-9-108(B)(8)(c)(iii) or R18-9-121(A). A bond, insurance policy, or trust fund required to be maintained under this subsection shall remain in effect for the duration of the permit. [A.A.C. R18-9-117]

#### 6.9 Other Rules and Laws

The issuance of this permit does not waive any federal, state, county or local government rules, regulations or permits applicable to this facility.

#### 6.10 Permit Actions

The filing of a request by the permittee for a permit action does not stay any existing permit condition. [A.A.C. R18-9-121]

##### 6.10.1 Permit Modifications

The permittee shall give written notice to the Director 180 calendar days before any major modification to the facility described in A.R.S. § 49-201(19) pursuant to A.A.C. R18-9-113.A.

The Director may modify an individual Aquifer Protection Permit based upon a request or upon the Director's initiative. A request for permit modification shall be in writing and shall contain the facts and reasons which justify the request. The Director may modify an individual Aquifer Protection Permit if the Director determines any one or more of the following:

1. That material and substantial alterations or additions to a permitted facility justify a change in permit conditions.
2. That the discharge from the facility violates or could reasonably be expected to violate any Aquifer Water Quality Standard.
3. That rule or statutory changes have occurred, such as to require a change in the permit.

Notwithstanding A.A.C. R18-9-121(G) and R18-9-124(F), and with the written concurrence of the permittee, the Director may make minor modifications to the individual Aquifer Protection Permit without giving public notice or conducting a public hearing, for any of the following reasons:

1. To correct typographical errors.
2. To increase the frequency of monitoring or reporting.
3. To change an interim compliance date in a compliance schedule if the permittee can show just cause and that the new date does not interfere with the attainment of a final compliance date requirement.
4. To change construction requirements, if the alteration complies with the requirements of this permit and provides equal or better performance.
5. To replace monitoring equipment, including wells, if such replacement results in equal or greater monitoring effectiveness. [A.A.C. R18-9-121.C and D]

#### 6.10.2 Additional Information

The permittee may be required to submit additional information pursuant to A.A.C. R18-9-108, including an updated permit application.

#### 6.10.3 Permit Transfer

The Director may transfer an individual Aquifer Protection Permit if the Director determines that the proposed transferee shall comply with A.R.S. §§ 49-241 through 49-251 and this permit. A permittee is responsible for complying with permit conditions, A.R.S. §§ 49-241 through 49-251, and this permit, regardless of whether the permittee has sold or otherwise disposed of the facility, until the Director transfers a permit pursuant to this subsection. [A.A.C. R18-9-121.E]

#### 6.10.4 Permit Suspension or Revocation

The Director may suspend or revoke an individual Aquifer Protection Permit or Groundwater Quality Protection Permit, for any of the following reasons:

1. Non-compliance by the permittee with any applicable provision of Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, Title 18, Chapter 9, Article 1 of the Arizona Administrative Code, or any permit condition.
2. The permittee's misrepresentation or omission of any fact, information, or data related to an Aquifer Protection Permit application or permit conditions.
3. If the Director determines that the permitted activity is causing or may cause a violation of any Aquifer Water Quality Standard.
4. If a permitted discharge has the potential to cause or will cause imminent and substantial endangerment to public health or the environment. [A.A.C. R18-9-121.F]

#### 6.10.5 Public Notice

The Director shall issue a public notice of all proposed permit actions pursuant to A.A.C. R18-9-124. [A.A.C. R18-9-121.G]

#### 6.11 Temporary Cessation, Closure, Post-Closure

The permittee shall notify the Director before any temporary cessation of operations at the facility. An individual Aquifer Protection Permit shall specify any measures to be taken by the permittee if there is any temporary cessation of operations at a facility.

The permittee shall notify the Director of the permittee's intent to cease operations prior to ceasing, without intent to resume, an activity for which the facility was designed or operated.

A permittee who ceases, without intending to resume, an activity for which a facility was designed and operated, shall submit to the Director for approval a closure plan within 90 days following the notification. A closure plan shall describe all of the following:

1. The approximate quantities and the chemical, biological, and physical characteristics of the materials to be removed from the facility.
2. The destination of the materials to be removed from the facility and an indication that placement of the materials at that destination is approved.
3. The approximate quantities and the chemical, biological, and physical characteristics of the materials that will remain at the facility.
4. The methods to be used to treat any materials remaining at the facility.
5. The methods to be used to control the discharge of pollutants from the facility.
6. Any limitations on future land or water uses created as a result of the facility's operations or closure activities.
7. The methods to be used to secure the facility.
8. An estimate of the cost of closure.
9. A schedule for implementation of the closure plan and the submission of a post-closure plan.

Within 60 days after receipt of a complete closure plan, the Director shall approve or reject the closure plan. The Director shall approve a closure plan that eliminates, to the greatest extent practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance.

An individual Aquifer Protection Permit may prescribe any part of a closure plan submitted pursuant to Section 6.11, paragraph 3.

The permittee shall submit to the Director for approval, and shall adhere to, a post-closure monitoring and maintenance plan for a facility, unless the Director determines that the closure of the facility will eliminate, to the greatest degree practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance. The post-closure plan shall describe all of the following:

1. The duration of post-closure care.
2. The monitoring procedures to be implemented by the permittee, including monitoring frequency, type, and location.
3. A description of the operating and maintenance procedures to be implemented for maintaining aquifer quality protection devices, such as liners, treatment systems, pump-back systems, and monitoring wells.
4. A schedule and description of physical inspections to be conducted at the facility following closure.
5. An estimate of the cost of post-closure maintenance and monitoring.

6. A description of limitations on future land or water uses, or both, at the facility site as a result of facility operations.

Within 60 days after receipt of complete post-closure plan, the Director shall approve or reject the post-closure plan. The Director shall approve a post-closure plan that eliminates, to the greatest extent practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance.

An individual Aquifer Protection Permit may prescribe any part of a post-closure plan submitted pursuant to A.A.C. R18-9-116.F.

The permittee shall give the Department written notice that a closure plan or a post-closure plan has been implemented fully. [A.A.C. R18-9-116]

#### 6.12 Closure Notification and Approval

A person who owns or operates a groundwater protection permit facility as defined in A.R.S. § 49-241.01, subsection C or a person who has been issued a permit pursuant to Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, shall notify the director of the intent to permanently cease and activity for which the facility or a portion of the facility was designed or operated.

Within ninety days of the notification in paragraph 1 of this section, the owner or operator shall submit a closure plan to the director.

Within sixty days of submittal of a complete closure plan, the director shall determine whether or not the closure plan is for a clean closure.

If the director determines that the closure plan is for a clean closure, the director shall send a letter of approval to the owner or operator and no aquifer protection permit shall be required.

If the director determines that the proposed closure plan achieves a closure condition other than clean closure, the owner or operator shall submit either an application for an aquifer protection permit or a request to modify a current aquifer protection permit in order to address closure activities and post-closure monitoring and maintenance at the facility. The director shall require submittal of a permit application or a request to modify a permit within ninety days or a reasonable time not to exceed one year, if the applicant can supply a scope of work justifying a schedule for collecting the technical information necessary to apply. [A.R.S. § 49-252]

#### 6.13 Violations and Enforcement

Any person who owns or operates a facility contrary to the provisions of this permit or Title 18, Chapter 9, Article 1 of the Arizona Administrative Code, who violates the conditions specified in this permit issued pursuant to Title 18, Chapter 9, Article 1 of the Arizona Administrative Code, or who violates any Groundwater Protection Permit continued pursuant to A.A.C. R18-9-103(A) is subject to the enforcement actions prescribed in Title 49, Chapter 2, Article 4 of the Arizona Revised Statutes. [A.A.C. R18-9-130]

## 7.0 AQUIFER WATER QUALITY STANDARDS

### 7.1 General Standards Applicable to All Aquifers

1. A discharge shall not cause the concentration of a pollutant in an aquifer to exceed at the applicable point of compliance any one of the maximum concentrations prescribed in A.A.C. R18-11-406, unless a higher Aquifer Quality Limit has been established by this permit.
2. A discharge shall not cause a pollutant to be present in an aquifer classified for a drinking water protected use in a concentration which endangers human health.
3. A discharge shall not cause or contribute to a violation of a water quality standard established for a navigable water of the state.
4. A discharge shall not cause a pollutant to be present in an aquifer which impairs existing or reasonably foreseeable uses of water in an aquifer. [A.A.C. R18-11-405]

RESPONSIVENESS SUMMARY

June 15, 1998

**Facility:** Yarnell Project

**Permittee:** Yarnell Mining Company  
P.O. Box 1182  
Yarnell, AZ 85362

This responsiveness summary is prepared in accordance with the requirements of Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Article 1, Section 124. Comments received by the ADEQ during the public comment period (January 28, 1998 through March 16, 1998) and public hearing (March 2, 1998) were evaluated, and changes made to the permit where appropriate.

The Aquifer Protection Program (APP) of the Arizona Department of Environmental Quality (ADEQ) was established in 1986 to protect the aquifers of the State. Any person who owns or operates a facility that discharges shall obtain an individual Aquifer Protection Permit pursuant to A.A.C. R18-9-107. Any facility owner applying for an APP permit must make the following five demonstrations to the satisfaction of the ADEQ Water Permits Section (WPS). If an applicant satisfies the following requirements, the law requires ADEQ to issue an APP permit:

1. The facility will not cause or contribute to an exceedance of an Arizona Aquifer Water Quality Standard (AWQS) at the applicable point of compliance (POC) or, if an AWQS for a pollutant has been already been exceeded in an aquifer, that no additional degradation of the groundwater will occur pursuant to A.A.C. R18-9-108.B.6.
2. The facility will be designed, constructed, and operated as to ensure the greatest degree of discharge reduction achievable through the application of the Best Available Demonstrated Control Technologies (BADCT), processes, operating methods, or other alternatives.
3. The person applying for the APP is technically capable of carrying out the conditions of the permit pursuant to A.A.C. R18-9-108.B.7.
4. The person applying for the APP is financially capable of constructing, operating, closing, and assuring proper post-closure care of the facility pursuant to A.A.C. R18-9-108.B.8.
5. The facility complies with applicable municipal or county zoning ordinances and regulations pursuant to A.A.C. R18-9-108.B.10. However, mines greater than five or more contiguous commercial acres are exempt from zoning requirements pursuant to Arizona Revised Statutes (A.R.S.) § 11-830.2.

Overlaying the Arizona law is the Federal Mining Law of 1872. This law was enacted in 1872 to promote domestic mineral resource development, population settlement, and economic growth of the West. It states "that all valuable mineral deposits in lands belonging to the United States, both

surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States and those who have declared their intention to become such, under regulations prescribed by law, and according to the local customs or rules....". The Yarnell Mining Company is a legal U.S. corporation and as such, has the right to mine in accordance with this law.

The ADEQ Water Permits Section received numerous comments about the need for this permit to address issues outside of the authority of the APP program. As mentioned, the ADEQ Water Permits Section only has statutory authority through the five demonstrations required for the APP to regulate aquifer water quality. Most concerns relating to airborne viruses, blasting, catastrophic weather, dust, quality of life, noise levels, economics of precious metals, political ideology, taxes, the history of mining, visual impacts, falling rocks, real estate values, road closures, business profitability, the social and/or economic impacts to a community or the world, or acts of God are outside the authority of the APP. Therefore, the Water Permits Section can respond only to those comments directly related to aquifer water quality pursuant to its APP statutory authority.

Persons who submitted written or spoke comments are listed below.

1. Ella K. Quay
2. Archie W. Quay
3. James R. Kuipers, Center for Science in Public Participation
4. Roger Flynn, Esq., Western Mining Action Project
5. Nita Crane
6. Don Newhouse
7. Mark J. Dorsten
8. Matthew C. Blake
9. Mr. and Mrs. Edwin C. Phillips
10. Phil Waner
11. Emma Waner
12. Erven White
13. Charlotte White
14. Julia Bengston
15. Terry Palmberg
16. Paul R. Bauer
17. Mary A. DeHoff
18. Jack Scheall
19. Norma Scheall
20. Kelly Stouffer
21. Donna Stouffer
22. Otto Berthelson
23. William Ashworth
24. Carole K. Ashworth
25. Jennifer Steitz
26. Freja Joslin

27. James H. Nagel
28. Mr. and Mrs. R. Chrzanowski
29. Mr. and Mrs. Allen W. Shahan
30. Joe P. Magdaleno
31. Alden R. Hibbert
32. Thomos P. Horn
33. Ben Crane
34. Paul J. Myers
35. Barbra Billingslea
36. Danny R. Tatum
37. Wayne M. Schlegel
38. Jacqueline Woodruff
39. Alice Shuping
40. Stanford T. Shuping
41. Harriet Berthelson
42. Gerard G. Kneipp
43. Jackie Urbans
44. Paul Wopschall
45. Ryan Crehan
46. Holly Arklin
47. Doug Roberts
48. Christa Iceforest-Romppanen
49. Phillip J. Connor
50. Michael Rubinstein
51. Gloria Phillips
52. Josh Keith
53. Claudia Billingslea
54. Glenda Kennedy
55. Jim Kennedy
56. Harland O. Plattenberg
57. H. Mason Coggin, Director, Arizona Department of Mines and Mineral Resources
58. John Willerton
59. Bill Hawes, Assistant Mine Inspector
60. Mark Montoya, Yarnell Mining Company
61. John U. Hays
62. Lisa York
63. Carol Christiansen
64. Gabe Wortman
65. Valerie Sien
66. Arlon E. Rice
67. Carol Ann Beard
68. Robert Pearl
69. Virgil F. Carson
70. Sallie Maxwell

71. Justin Boe
72. Aaron Green
73. Alfred G. Austin
74. Tisha A. Muñoz
75. Leyla Arsan
76. Aimee Boulanger
77. Erin Branner
78. Ramsey Devereux
79. Dave Sien
80. Lauren Retenbach
81. Stephen G. Keehner
82. Allison Scott
83. Denise Rowcroft
84. Anastasia Rabin
85. Melody Albino
86. Ann Marie Piombino
87. Dan Desmond
88. Heidi Hampe

### **Comments**

Both written and oral comments were received during the public notice period of January 28 through March 16, 1998. Italics indicate comments (C) that have been summarized or taken verbatim from letters and statements. ADEQ's responses (R) are shown in regular font.

**C1:** *“Is ADEQ honoring the permitting process? Are our public comments of any value? Has ADEQ struck a deal with the Yarnell Mining company on the APP permit?”*

**R1:** The ADEQ is bound by law to honor the permitting process. The Yarnell Mining Company (YMC) has submitted a complete APP application. This application was reviewed by the ADEQ for administrative and technical completeness from April 1995 through August 1997. By law, the ADEQ is required to inform the public of permits currently in process. The public has a right to participate and are invited to participate. As a result of the comments and concerns received during the public notice period, ADEQ has made four changes to the YMC APP draft permit (see R40, R57, R58, and R59).

### **Comments Regarding Aquifer Water Quality Standard Compliance Demonstration and Water Monitoring:**

**C2:** Several commenters are concerned about the effects to the aquifer in the event of a discharge from the mine, and the distance potential contamination could migrate. Comments were received concerning potential effects to wells in the communities of Peoples Valley, Congress, Stanton, Wickenburg, southern Arizona, Mexico, and Puerto Rico.

*“And the other factor is any water that could run down the hill is endangering not only the -- the plant life, animals, but the people that live down in Wickenburg and Congress and further down the stream even than that.”*

**R2:** Groundwater flow path (that is, the path groundwater flows moving from a high point to a lower point) is the key factor to consider when evaluating the potential migration of pollutants in groundwater.

According to the potentiometric maps submitted with the APP application and similar hydrologic maps produced by the United States Geological Survey (USGS), groundwater flow direction from the proposed Yarnell mine site is to the south, south-southwest, and south-southeast. A groundwater divide (the high point of the groundwater system), identified by the USGS and the Arizona Department of Water Resources (ADWR), lies approximately 1/4-mile north of the proposed mine site. The communities of Yarnell, Peeples Valley, and Glen Ilah are located north of the Yarnell mine site on the other side of the groundwater divide. Therefore, groundwater cannot flow north from the Yarnell mine up and over the divide from the mine. Congress is located southwest of the mine site, but across gradient (sideways). Likewise, groundwater cannot flow across the regional gradient to reach Congress. This situation is analogous to a small tributary, in that the tributary cannot cross a river and run up the other side of the bank and beyond.

Wickenburg is located approximately 17 miles downgradient (in the groundwater sense) and downstream (in the surface water sense) from the mine site. The Hassayampa Wildlife Preserve is located on the Hassayampa River just south of Wickenburg. In the event of a spill or leak of process solution at the Yarnell mine, the solution would have to travel 17 miles through the regional aquifer to reach Wickenburg. Due to natural attenuation processes and travel time of groundwater, not to mention groundwater monitoring and contingency requirements of the APP permit, the likelihood of cyanide being detected in the groundwater in Wickenburg is nil.

Because of the vastly greater distance, residents in southern Arizona, Mexico, and Puerto Rico can be confident that a spill at the Yarnell Mine will not contaminate their aquifers or surface waters.

A few ranches and the community of Stanton lie in a downgradient direction closer (within two to four miles) of the proposed mine site. To protect these areas, the APP permit is written with numerous safeguards to both groundwater and surface water. The heap leach pad will be constructed with a composite liner system and the surface impoundments will be double lined and include a leak detection system. Quarterly monitoring is required at the downgradient groundwater point of compliance well YMC-03, at two springs, from the leach pad underdrain system, the leak detection sumps, and the waste rock. If any groundwater or surface water impacts are discovered, ADEQ has the authority to require additional monitoring, preventative, or remedial actions.

In addition to the measures mentioned above, protection from cyanide contamination is further aided by its degradation characteristics. If cyanide is released to the environment in the surface and groundwater, it tends to rapidly convert to nitrate, which is vastly less toxic.

The Yarnell Mine Discharge Impact Study presents calculations, showing that even with a considerable leak of cyanide from the leach pad into the groundwater, the concentration of cyanide in the groundwater would be diluted and degraded to an undetectable level within less than one-quarter of a mile from the property. The ADEQ has re-calculated and verified this analysis. On a more practicable basis, case histories of cyanide releases at mines have demonstrated the relatively rapid degradation of the chemical.

Regardless of this conclusion, YMC would be required to implement immediate control and remediation measures and would be subject to fines in the event of a cyanide release or an AWQS or Surface Water Quality Standards (SWQS) exceedance pursuant to A.R.S. § 49-262.

In response to one commenter's statement that "streams in Montana affect streams in Arizona", there is absolutely no evidence nor a logical explanation of how Arizona groundwaters or surface water have been impacted by polluted streams in Montana.

**C3:** Point of Compliance Monitor Well, YMC-03: Three commenters expressed the concern that one point-of-compliance well for the Yarnell Mining Project is inadequate.

*"The point of collection of -- POC -- point of compliance -- is a single well.... It seems to me like one point collection is inadequate.... You're talking about something that is going to be spread out over almost 200 acres."*

**R3:** Although the mine site property is 187 acres, the heap leach pad and three process solution/stormwater ponds are the only facilities classified as discharging and, therefore, falling under the APP program. These facilities comprise 48 of the 187 acres. Other activities including the open pit, two waste rock dumps, the 1940's tailing material, and other ancillary operations and buildings are not classified as discharging. The four APP-permitted facilities are all located immediately southeast of the topographical high point on Yarnell Hill. Surface water runoff from this area drains to the southeast, down a drainage/wash. As mentioned in R2, groundwater also flows to the southeast in this area.

Groundwater flow is in the Yarnell Granodiorite and is controlled on a regional scale by sources of recharge, topography, the thickness of the weathered zone, and the hydraulic character of the weathered and unweathered zones. In general, the groundwater flow parallels the surface topography. In the area of the mine, groundwater contours indicate that a groundwater divide lies directly west of the area where the discharging facilities will be located; therefore, groundwater will not flow to the west or southwest. (This groundwater divide is in addition to the divide discussed above in R2). YMC-03, the point of compliance well, is located in the drainage that lies to the southeast of the four facilities.

In addition to the point of compliance well, YMC is required by the APP permit to monitor and sample any waters draining from the underdrain system of the heap leach pad. The underdrain system will lie directly beneath the entire composite liner of the heap leach pad and will convey any shallow localized groundwater into the three surface impoundments. This shallow localized

groundwater directly beneath the heap leach pad will be the first point of contact between a leak and the aquifer. Monitoring the shallow groundwater in the underdrain system is actually a better way of detecting a discharge, as it will allow for mitigation of a leak before it reaches the point of compliance well.

If in the future, there is any evidence of an impact to the downgradient well due to the mine's operation, ADEQ has the authority to require the permittee to install new monitor wells and/or monitor and sample any well, private or public supply pursuant to A.R.S. § 49-203.B.2.

**C4:** *"It appears that other additional monitoring wells should be located at other sites downgradient from the heap leach facility, including north, east, and south of the proposed facility."*

**R4:** The commenter is referred to R3. As stated, the point of compliance is located downgradient of the discharging facilities at the mine site, (i.e., the heap leach pad and the three surface impoundments). This location is designed to intercept any contaminants and is based on site conditions and direction of groundwater flow. In accordance with A.R.S. § 49-244.2, the point of compliance can not be located further than 750 feet from the downgradient edge of the Pollutant Management Area (PMA). There are also three additional points that are required to be monitored at the YMC mine site, that are not designated as POCs. These are: the underdrain system, Cottonwood Spring, and Fool's Gulch Spring. The underdrain system is located directly beneath the heap leach pad and is, therefore, an earlier warning system for any leaks. Cottonwood Spring is located to the northeast of the heap leach pad; Fool's Gulch Spring is located on the west of the YMC mine site.

**C5:** *"The APP does not adequately explain why only one point of compliance (POC) is proposed"*

**R5:** The APP permit is intended to operate as a "license" for the operator, not a compendium that includes all engineering designs, hydrologic analyses, AWQS compliance demonstrations, laboratory analyses, well construction data, decisions, rationales, and correspondence. There are literally volumes of documents that support the decisions finalized in the permit. While the rationale for this decision is discussed in R3 and R4, the entire Yarnell Mine file is available for inspection at the ADEQ office in Phoenix.

**C6:** *"....has there been adequate testing of the wells downwater from Yarnell? We need a baseline so that we have something to go on in case there is a major disaster upstream. How do we know where it came from?"*

**R6:** In accordance with A.A.C. R18-9-108.C.1, and in addition to the required information listed in R18-9-108.A and B, a person applying for a APP permit shall submit, if requested by ADEQ, "a documentation of the existing quality of the water in the aquifers underlying the site....". YMC submitted water quality, well construction data, and pumping test data from four on-site wells, two test wells drilled off the proposed mine site, and four private domestic wells located downgradient with their APP application. The water quality data from the four on-site wells consists of eight

quarters of water samples beginning in April 1995 through December 1996. YMC also collected and submitted water quality data from nine springs within the area of the proposed mine site. This information is contained in Volume I of the Baseline Hydrologic Characterization Report submitted June 14, 1996 as a supplement to the APP application. This water quality data is used to establish, ambient, or baseline, water quality. If a discharge from the Yarnell Mine occurs, future samples can be compared with this historical record.

**C7:** *“The APP is seriously deficient in ground water data and characterization at the site. The proposed APP is based on only a limited number of “background” samples (from well YMC-03). Overall, the failure to require (ADEQ) and submit (YMC) adequate baseline data for all surface and ground water as part of the application violates APP requirements.”*

**R7:** The commenter is referred to R6. YMC included, with their APP application, water quality, well construction data, and pumping test data from four on-site wells, two test wells drilled off the proposed mine site, and four private domestic wells located downgradient. The water quality data from the four on-site wells consists of eight quarters of water samples from April 1995 through December 1996. YMC also collected and submitted water quality data from nine springs within the area of the proposed mine site. This information is contained in Volume I of the Baseline Hydrologic Characterization Report submitted June 14, 1996 as a supplement to the APP application. This is a considerable body of water quality data that more than adequately supports issuance of the APP.

**C8:** *“...there’s already cyanide infecting a well quite close to where this mining company wants to build the cyanide heap leach mine, and that is a result of past mining in that area.”*

**R8:** Concentrations of total cyanide have been detected three out of seven quarterly sample from well YMC-04, located in the center of the northern portion of the mine area. Free cyanide was detected one quarter out of the seven quarters. There is no federal or state water quality standard for total cyanide; only free cyanide. The AWQS for free cyanide is 0.20 mg/l; the only detectable concentration of free cyanide in well YMC-04 was 0.02 mg/l; ten times less than the AWQS.

The Yarnell Mine operated as a 70-ton per day flotation and cyanide mill operation from 1936 to 1940. The cyanide in YMC-04 is probably due to this previous operation. There were no environmental laws regulating mining operations in 1940. As stated in the introduction of this Responsiveness Summary, the Aquifer Protection Program was established in 1986 to protect the aquifers of the State and to prevent the occurrence of such a discharge from happening again.

**C9:** *“There is no mention of monitoring or aquifer protection related to the pit dewatering, or related to aquifer impacts caused by a hydrologic cone-of-depression surrounding the pit. Will the pit dewatering be necessary? If so, what will be the water quantity and quality? How will it be used? Has the potential impact to other water rights and users been evaluated?”*

**R9:** YMC conducted a computer model simulation (*Computer Simulation of Groundwater Withdrawal for Proposed Yarnell Mine, Yavapai County, Arizona, Groundwater Resources*

Consultants, January 1998) on the effects of de-watering the Yarnell mine pit and the pumping from the on-site production well, YMC-04. The computer model results indicate that de-watering of the Yarnell mine pit would not be necessary until years 6 and 7 of the mine operations, due to the low permeability and transmissivity of the fractured granodiorite rock. During years 6 and 7, the average pumpage from the pit is estimated to be three to ten gallons per minute (gpm).

The groundwater pumped from the pit will be used for mine processes and dust suppression. Because the pit water will be used in the mining operations and will not be discharged from the site, there is no need to monitor or analyze this water.

According to the computer model results, the potential impacts from de-watering the pit during years 6 and 7 and pumping the production well YMC-04 for seven years (at a rate of 15 gpm) at the end of year 7 will cause a maximum of one foot of drawdown at Fools Gulch Spring, approximately 15 feet of drawdown at Cottonwood Spring, and have no effect on Cox Spring. A private domestic well located approximately 1,000 feet west of the pit is proposed to have a total drawdown of less than five feet. This computer model simulation report is included in the Yarnell Mining Project file at the ADEQ Phoenix office.

**C10:** *“If water pollution with cyanide is found in nearby wells and groundwater, who cares if it’s going to take forty years to dissipate?”*

**R10:** It appears that the commenter’s specific concern is that ADEQ may ignore a discharge of a hazardous pollutant to the groundwater based on the fact that the pollutant would degrade or dissipate in “forty years”. The A.R.S. § 49-243.B.2 states “that pollutants discharged will in no event cause or contribute to a violation of aquifer water quality standards at the applicable point of compliance.” This means if YMC’s point-of-compliance well, and/or any other downgradient well became contaminated and caused a violation of an AWQS, YMC would be in violation of their APP permit and be subject to fines up to \$25,000 per day per violation pursuant to A.R.S. § 49-262.C. There are no time period allowances for the degradation or “dissipation” of contaminants in this statute.

**C11:** *“I don’t know why we are not monitoring for all materials that are listed in the aquifer water quality standards in the State of Arizona. We have standards to measure pollution. Let’s use them.”*

**R11:** In accordance with A.R.S. § 49-223.G, ADEQ only has regulatory authority to require monitoring for chemicals that are likely to be present in the facility’s discharge. Hence, just because there is an AWQS for asbestos and pesticides does not mean ADEQ can require YMC to monitor for asbestos and pesticides. Based on the mineralogy of the Yarnell Granodiorite and the chemicals proposed to be used in the mining operations, asbestos and pesticides would not be expected to be present in a discharge in any concentration.

As shown on Table 4.6 of APP Permit No. 101015, YMC collected eight quarters of ambient groundwater quality data from their four on-site wells (April, 1995 through December, 1996). The

list of parameters on Table 4.6 consists of 38 chemicals. All of the inorganic elements that have established numeric AWQS are included in this list of 38, with the exception of asbestos.

Based on these eight quarters of ambient groundwater quality data and the mineralogy of the Yarnell Granodiorite, the WPS-MU developed a short list of "indicator parameters", shown on Table 4.7 of the permit which YMC must perform quarterly sampling for at the point of compliance well, YMC-03.

"Indicator parameters" are selected as site-specific, early signals to a discharge. These are the chemicals that would be most likely to be present and reach YMC-03 first in the event of a discharge. If an "indicator parameter" is detected in concentrations above the Alert Levels stated in Table 4.7 of the APP permit, YMC is required, as stated in Part 2.5.12.1.5 of the permit, to analyze for all of the inorganic parameters for which AWQS have been established, except asbestos.

In addition to the quarterly monitoring list of "indicator parameters", YMC will be required to sample YMC-03 every two years for the combined lists of parameters shown in Table 4.7 and Table 4.10.

**C12:** *"The Incorrect Legal Standard for Discharge Compliance was Used - The proposed APP appears to be based on allowing discharges as long as they do not violate all Aquifer Water Quality Standards (AWQSs). However, such a regulatory regime only applies if there are no violations of an AWQS at the time of permitting. ARS 49-243.B.3. In this case, YMC admits that the AWQS for TDS, iron, and manganese are being exceeded. In such a case, a non-degradation discharge standard applies to all discharges that may affect those parameters."*

**R12:** Parameters which have established numeric Aquifer Water Quality Standards are listed in A.A.C. R18-11-406. There are no AWQS for total dissolved solids (TDS), iron, manganese, or sulfate listed in R18-11-406. The federal secondary Maximum Contaminant Levels (MCLs) established for manganese, iron, TDS, and sulfate, are based on aesthetic characteristics (taste, odor) only and are not enforceable. A.R.S. § 49-243.B.3 does not apply to the Yarnell Mining Project, as there were no AWQS exceedances in any of the four on-site monitor wells.

The Yarnell Mining Project is required to meet all numeric AWQS as listed in R18-11-406, which are more stringent than any "non-degradation discharge standards", at the point of compliance.

**C13:** *"Compliance Monitoring - The APP incorrectly limits compliance monitoring to a subset of the applicable parameters. Of particular concern are parameters to which the non degradation standard applies that were omitted from these Tables (e.g., iron, TDS)."*

**R13:** The commenter is referred to R11 and R12.

**C14:** *"There's also the State Board of regulations. I was talking to the resident hydrologist for the mine and the regulations are in accordance with the federal regulations, and so this means that this area of Yarnell....has the same environmental regulations of the City of Phoenix."*

**R14:** As stated in A.R.S. § 49-223, the Arizona AWQS were adopted in 1986 from the primary drinking water maximum contaminant levels established by the U.S. EPA. The MCLs and the federal drinking water standards are applicable and enforceable in every city and every state in the U.S. The MCLs do not change for rural areas versus populated areas. The AWQS are applicable and enforceable for every drinking water aquifer in the state of Arizona; again, there are no stricter or more lenient water quality standards for one city than another, rural or populated.

**C15:** *“How much water will be needed for dust suppressants at that site? It doesn't ever quantify that total number.... and I would like to know what chemicals will be added to those dust suppressants too.”*

**R15:** A table is provided in the ADEQ Air Quality Control Permit No. 1000383 for YMC, Attachment “B”, Section IV.C.2 that states the quantity and application frequency of water that will be used for dust suppression of the unpaved haul roads. Section IV.C.2 of the Air Quality Control Permit also states that if the water application intensities as shown in the table do not achieve 90 percent dust control, YMC will be allowed to add magnesium chloride (MgCl<sub>2</sub>) or equivalent chemical to the water. The amount of MgCl<sub>2</sub> that can be added and the frequency at which it can be used, is also stated in Section IV.C.2. There is no AWQS for either magnesium or chloride.

**C16:** One commenter wrote that the YMC APP application did not submit adequate waste and discharge characterization for the proposed discharging facilities, in accordance with A.A.C. R18-9-108.B.4. For the heap leach facility, the commenter states that the application should *“detail the expected or projected characterization of the types and concentrations of metals and pollutants that may be discharged from the facility upon closure.”* *“YMC has not accounted for the possibility of mobilization of metals that may occur upon closure....selenium, arsenic, mercury, and other pollutants.”*

**R16:** The commenter is referred to Section 2.6.3 of the APP permit which discusses the closure and rinsing of the heap leach pad. This section clearly states that the effluent from the rinsed heap leach material must meet all AWQS and that the pH of the effluent must be between 6.0 and 8.5 for the heap leach pad to be considered rinsed and closed. “All AWQS” includes all hazardous metals (e.g., selenium, arsenic, mercury, etc.), cyanide, nitrate, and radiochemicals. Section 2.6.3 goes on to state that after the effluent meets all AWQS, it still cannot be discharged off site or subsurface until it meets all SWQS.

Because the heap leach material will consist of only inorganic constituents and sodium cyanide will be applied to the heap leach pad during operation, the only constituents that should be in the effluent of this process are the original inorganic constituents, sodium, cyanide, and nitrate. Based on these facts, the ADEQ WPS-MU concludes that adequate discharge characterization has been conducted.

**C17:** *“According to my review of page 11, alert levels and aquifer quality limits which are exceeded in the monitoring well YMC-3 might actually go unreported to ADEQ for months between leak, preliminary lab results, final lab results and the reporting timetable.”*

*“What happens if there is a leak in between the times they monitor?”*

**R17:** Alert levels are established to serve as an early warning system indicating a potential violation of either an AWQS or AQL at the point of compliance. Exceeding an alert level is not a violation of law or a water quality standard. Alert levels bring early attention to facility problems, but do not require compliance or enforcement action.

The contingency plan outlined in Section 2.4.12.1 of the APP permit allows YMC to request the laboratory to reanalyze the sample for verification. Requiring verification sampling as a second step is scientifically prudent. It is not reasonable to require that a facility implement immediate remediation plans based on a single laboratory analysis.

The groundwater flow velocity for the Yarnell Granodiorite is estimated to be between 5 and 40 ft per year. This figure is based on the hydraulic conductivity measured in well YMC-03 and using a porosity of 0.04 for the granodiorite. Therefore, contamination would travel, at the most, 6.5 inches in the five days that Yarnell has to notify ADEQ of the alert level exceedance. In the “worst case scenario”, that is, if a leak started the day after quarterly sampling was conducted, 5 months may pass before the leak is detected, verified, and re-verified. However, in that 5 months, the “plume” would have traveled, at most, 16 feet.

**C18:** *“How will the people downstream of the mine be notified of any water contamination should there be a mishap?”*

**R18:** The method and urgency of notification by ADEQ and/or Yarnell Mining Project to immediate downgradient well owners would depend on the specific circumstance with which an AWQS exceedance at the POC occurred. ADEQ will notify the downgradient well owners, including the Town of Wickenburg public supply well operator, as soon as possible once the discharge was known and verified. However, owing to the slow movement of groundwater (on the order of 5 to 40 feet per year), even a large and catastrophic discharge to the aquifer would allow ADEQ, the Yarnell Mining Company, and downgradient water users the time to consider what alternative drinking water options and remediation options were available.

**C19:** *“Why doesn’t the APP include emergency precautions and monitoring for the communities of Yarnell and Glen Ilah?”*

**R19:** The purpose of an Aquifer Protection Permit is to protect the aquifer. The communities of both Yarnell and Glen Ilah lie upgradient from the Yarnell Mining Project, hence, groundwater would have to flow uphill from Yarnell Hill to Yarnell and Glen Ilah. Therefore, monitoring and emergency precautions are unnecessary in the aquifer below Yarnell and Glen Ilah.

**C20:** *“Have provisions been made to replace the water in the aquifer with uncontaminated water should the current water be contaminated?”*

**R20:** An aquifer is defined as “a body of rock that is sufficiently permeable to conduct ground water.” Neither ADEQ, nor the U.S. EPA, have the means to “replace” any contaminated aquifer with uncontaminated water. ADEQ is also concerned about the groundwaters of Arizona becoming

contaminated, but ADEQ is very confident that the APP permit for the Yarnell Mining Project contains sufficient monitoring and safeguards to protect the aquifer.

**Comments Regarding BADCT and Engineering Design:**

**C21:** *"Why doesn't the YMC use stainless steel tanks for leaching instead of a heap leach pad using a clay liner and HDPE?"*

**R21:** Heap leach pads are lined leaching facilities commonly employed in both precious and base metals industry. The YMC heap leach pad facility is designed and will be constructed in accordance with the prescriptive BADCT criteria as specified in Section 2.4 of the *Final Draft, Arizona Mining BADCT Guidance Manual (August, 1996)*. The BADCT design, when appropriately applied, results in conformance with AWQS or will not further degrade the quality of any aquifer that already violates the AWQS at the point of compliance (A.R.S. § 49-243.B.3). Yarnell Mining Company, through facility design, construction and operation criteria, has demonstrated that the use of a composite liner (60-mil [1 mil = 1/1000-inch] HDPE overlying compacted clay-amended liner) will satisfy the requirements of AWQS at the point of compliance. Interested parties are referred to the following documents, which contain the design, construction and operation criteria, including quality assurance and quality control (QA/QC) during the construction and operational phase of the project:

- 1) *Facilities Design Report For The Yarnell Project*, dated April 12, 1996.
- 2) *Responses To ADEQ Comments On Technical Issues Associated With The Aquifer Protection Permit Application For The Yarnell Project*, dated June 27, 1997.

**C22:** *The ponds and heap leach high density polyethylene (HDPE) liner thickness and configuration are inadequate.*

**R22:** The selection of a geomembrane for a particular application is based on site specific conditions. The 60-mil HDPE geomembrane selected for the ponds (pregnant and barren) and the heap leach pad liner systems satisfies the design criteria based on the liner's physical, chemical, and mechanical compatibility with the Yarnell ponds and heap leach pad construction and proposed operations. The configuration and design of the ponds (pregnant and barren) and the heap leach pad are adequate because they meet BADCT requirements as outlined in the *Final Draft, Arizona Mining BADCT Guidance Manual (August, 1996)*.

The two process solution ponds (pregnant and barren) will be composed of a primary and secondary liner, incorporating a leak collection and recovery system. The commenter is referred to the document included with APP application entitled "*Facility Design Report for the Yarnell Project*, April 12, 1996."

The heap leach pad liner will be constructed as a composite liner system consisting of a 60-mil HDPE geomembrane material overlying a clay-amended local soil. A leak collection and recovery

system will be constructed between the HDPE liner and liner bedding layer as described in the above referenced APP application.

**C23:** *“Why doesn’t the ADEQ require that the applicant use more sophisticated, advanced, and far less polluting methods of mining and recovery, such as underground mining and closed circuit cyanide recovery?”*

*“What proof can ADEQ provide that the submitted plan of operation is indeed the least polluting, most technologically advanced of gold ore mining and processing that is available?”*

**R23:** ADEQ has no authority to dictate that the applicant use a particular mining method, whether it be underground, open pit, etc. However, pursuant to A.R.S. 49-243.B.1, the applicant is required to demonstrate:

*“That the facility will be so designed, constructed, and operated as to ensure the greatest degree of discharge reduction achievable through application of the best available demonstrated control technology, processes, operating methods or other alternatives, including, where practicable, a technology permitting no discharge of pollutants. In determining best available demonstrated control technology, processes, operating methods or other alternatives, the director shall take into account site specific hydrologic and geologic characteristics and other environmental factors, the opportunity for water conservation or augmentation and economic impacts of the use of alternative technologies, processes or operating methods on an industry-wide basis....”.*

The submitted plans for construction and operation of facilities are designed to meet the AWQS at the point of compliance pursuant to A.R.S. § 49-243.B.3. For more details, the commenter is referred to R21 and R22.

**C24:** *“I note that the leach system has been designed to handle a specific amount of “maximum rainfall” in a 24-hour period, but did not find any mention of that exact amount. I recorded over 7 inches of rain in no more than 12 hours when the remnants of Hurricane Nora moved over and past Yarnell. This was indeed an unusual event, but any potential flood handling system should at least be sufficient to deal with such and amount of rainfall.”*

**R24:** The process solution ponds used in the heap leach operation at the Yarnell project are designed for the 100-year/24-hour storm event. Precipitation-frequency data is taken from the (National Oceanic and Atmospheric Administration (NOAA) Atlas for Arizona (U.S. Department of Commerce, 1973) and is summarized below for total precipitation depth in a 24-hour period:

10-year	3.3 inches
25-year	3.8 inches
100-year	5.2 inches

These values were used in the design analyses for the project, and are described in more detail in Appendices C and E of the APP application, titled, "*Facilities Design Report For The Yarnell Project*, dated April 12, 1996."

**C25:** "*Where would have the excess runoff from Hurricane Nora go?*"

**R25:** The precipitation total from Hurricane Nora in 1997 was 6.65 inches in a 24-hour period, measured at the meteorological station on Yarnell Hill. This storm exceeded the precipitation total of 5.2 inches for the 100-year, 24-hour storm for the site. Following the storm event, ADEQ reviewed the design fluid volumes and pond capacities contained in the *Facility Design Report for the Yarnell Project*, dated April 12, 1996, and were satisfied that the solution storage ponds are adequately sized to contain precipitation from an equivalent of the Hurricane Nora, along with a 24-hour power outage. The additional precipitation from such a storm would be accommodated by the pond freeboard included in the design.

In actual operation, precipitation and process solutions would drain to the ponds at lower rates than projected in the design calculations. In addition, pumping from the PLS pond could continue with backup pump and stand-by generator, and timely solution management also would reduce the volume of stored solution in the pond prior to anticipated storm events. For more details on solution storage pond capacity, the commenter is referred to APP application and, the October 10, 1997 SMI letter addressed to Mark Montoya, Project Manager, Yarnell Project.

**C26:** "*If the heap leach pad or ponds do overflow and leak, what preventative measures are being taken below the ponds to insure that the overflow doesn't enter the streams, rivers, and groundwater?*"

**R26:** The leachate from the heap leach pad is collected in the pregnant leachate solution (PLS) pond. In addition there are barren solution pond and storm water pond. The ponds are designed with built-in design capacity to contain precipitation total of a 100-year, 24-hour storm event, including 24-hour drain-down from the heap leach pile in the event of power failure. The solution capacities of the ponds are well above the normal operating volumes and provide a sufficient margin of safety to prevent the overflow of leachate and barren solution into streams and groundwater from a large amount of rainfall.

In the event of a leak in the PLS pond or the heap leach pad, the leaked solution will be collected in the leak detection system and discharged into the PLS pond or the barren solution pond. Design details of the leak collection and recovery system employed in the heap leach pad and PLS pond construction are shown in the drawings contained in the document entitled *Facilities Design Report For The Yarnell Project*, dated April 12, 1996.

**C27:** "*What protection will be used to prevent erosion?*"

**R27:** The Yarnell Mining Project utilizes a built-in design criteria for structures such as diversion channels which are sized to convey the peak run-off below the critical velocities. Erosion will also be prevented by constructing channels in bedrock. A riprap transition zone between diversion

channels and natural drainages will be provided in those locations where natural drainages are not in bedrock. This will serve to minimize scour and maintain the natural drainage. To prevent embankment erosion, the channels will be lined using native grass where needed. Erosion on the face of the waste dumps will be prevented by maintaining and enhancing the diversion channels, if warranted, to convey run-off after reclamation with minimal maintenance. Erosion at the waste rock dumps will be further minimized by establishing vegetation on the surface of the dumps. During the operational life of the Yarnell Mining Project, the erosion prevention will be an ongoing process using best management practices (BMPs) to rectify any problem areas and to provide long lasting solutions to the erosion problem where needed.

**C28:** *"We insist that a double synthetic liner over an engineered clay substrate be required with leak monitoring systems between each of the three layers."*

**R28:** The heap leach pad and solution ponds at the Yarnell Mining Project are designed and shall be constructed to meet prescriptive design criteria as outlined in the *Final Draft, Arizona Mining BADCT Guidance Manual (August, 1996)*. The heap leach pad liner incorporates a leak detection system. A second liner and a leak detection/collection system will not further reduce the head on the bottom liner significantly enough to justify the additional expense.

The solution ponds (pregnant and barren) will be constructed with a primary and secondary liner of 60-mil HDPE. An HDPE geonet will be placed between the two HDPE liners as a leak detection layer. The secondary HDPE liner will be installed on top of a 6-inch thick liner bedding material consisting of clay amended local material. The liner bedding material will be placed over a prepared subgrade and compacted to provide a maximum permeability of  $1 \times 10^{-6}$  cm/sec. In the event of a leak in the primary liner, the solution will be collected in the leak detection layer and transported by gravity to a sump. The use of an additional leak detection and collection system below the secondary liner would be redundant and would not support technical or economic justification.

**C29:** *"Triple lined systems with leak detection and collection have been proven to be both practicable and effective. We strongly recommend using a "state of the art" triple liner, as it is the system which can provide the highest practicable possibility of meeting the zero discharge standard...."*

**R29:** The commenter is referred to R21, R22, and R28.

**C30:** *"The leach pad should have a leak detection system under the leach pad and in the entire piping system sufficient to detect any leakage within 1 hour and appropriate action be taken immediately."*

**R30:** The leak detection system layout includes the entire leach pad area. The leach pad is divided into eleven separate areas for detection of leaks as shown in Figures 2 and 3 of the document entitled *Responses to ADEQ Comments on Technical Issues Associated with the Aquifer Protection Permit Application for the Yarnell Project*, dated June 27, 1997. The design of the leak detection system and the leak detection system sumps based on leakage, if any, does not warrant that the leakage must be detected within one hour. The leak detection drain sumps, each with a capacity of 282 gallons,

will be inspected on daily basis following a standard operating procedure. The leak detection contingency plan for leak detection beneath the leach pad is contained in the above referenced document.

**C31:** *“The facility shall be so designed, constructed and operated as to ensure the greatest degree of discharge reduction achievable....” This infers concurrence, where practicable, with a “zero discharge standard” as recommended by EPA guidelines.”*

**R31:** Arizona statutes and rules governing the Aquifer Protection Program pertain to discharge reduction of a facility, not zero-discharge. As stated previously, the APP program is a state-administered program and is not required to follow EPA guidelines. YMC has designed and shall construct and operate the heap leach and associated facilities to meet or exceed the prescriptive BADCT guidelines and specifications contained in the *Final Draft, Arizona Mining BADCT Guidance Manual (August, 1996)*. The prescriptive design appropriately applied will reduce aquifer loading so that AWQS will not be exceeded at the point of compliance (A.R.S. 49-243.B.3). The design, construction and operation criteria, including construction quality assurance (CQA) requirements during the construction phase of the project are contained in the documents listed in R21.

**C32:** *“The acceptable amount of leakage from the leach pad is zero.”*

**R32:** The commenter’s concern is answered by A.R.S. § 49-243.1:

*“The facility will be so designed, constructed, and operated as to ensure the greatest degree of discharge reduction achievable through application of the best available demonstrated control technology, processes, operating methods or other alternatives, including, where practicable, a technology permitting no discharge of pollutants. In determining best available demonstrated control technology, processes, operating methods or other alternatives the director shall take into account site specific hydrologic and geologic characteristics and other environmental factors, the opportunity for water conservation or augmentation and economic impacts of the use of alternative technologies, processes or operating methods on an industry-wide basis....”*

YMC, through its design, construction and operations criteria, has sufficiently demonstrated that it shall achieve the greatest degree of discharge reduction using best available demonstrated control technologies, processes or operating methods commonly employed on an industry-wide basis, and will meet the AWQS at the point of compliance. YMC has met the requirements of the law. The commenter is also referred to R31.

**C33:** *“These large and rapid leak rates are allowed to exist for weeks before being reported to ADEQ, and therefore the public as well. On page 12, in the section on surface impoundments, it states that these large leaks should be reported in writing “within 30 days” of being “confirmed”. The section on heap leach pad leaks does not even offer a timetable. The threshold of what constitutes a “large” leak must be brought down....”*

**R33:** The ADEQ WPS-MU has taken this commenter's suggestion into consideration and hence, the reporting time limit for exceedances of both De Minimus and Rapid and Large leaks for both the surface impoundments and the heap leach pad shall be revised in the final APP permit. The reporting time limit for a De Minimus leak for both the surface impoundments and the heap leach pad will be changed from 5 days to 3 days. The reporting time limit for both surface impoundments and the heap leach pad for Rapid and Large leaks will be changed from 30 days to 24 hours.

The Rapid and Large Leakage (RLL) is the high-level trigger that indicates a serious malfunction of the system components in the double-lined unit and that warrants immediate action. The RLL rate for the leak collection and recovery system in surface impoundments is based on leakage rates in excess of 11,000 gallons per acre per day or 6.9 gallons per minute.

The RLL value is calculated using EPA's preliminary method of calculation for a hypothetical leak detection system, which consists of a 1-foot granular layer with 1 cm/sec hydraulic conductivity. The equations apply to flow from a single defect in the geomembrane, rather than multiple defects. This is the only analytical method available for estimating the rapid and large leakage rate until the EPA develops further guidance on calculating RLL values.

**C34:** *"Once this mine is abandoned, how long will this clay layer be able to support itself under that weight? Will there be subsidence? Cracking?"*

**R34:** The YMC heap leach pad is designed and will be constructed such that it supports itself against differential settlement and desiccation (drying out of the clay-amended soil liner leading to the development of microcracks) indefinitely after the operational life of the heap leach facility. Technical specifications for the earthwork requirement for the leach pad liner bedding material (amended clay), work description and performance standards and testing (QC/QA) ensuring long term stability and integrity of the facility are contained in the document, titled *Responses To ADEQ Comments On Technical Issues Associated With The Aquifer protection permit Application For The Yarnell Project*, dated June 27, 1997.

**C35:** *"After we looked at the map, it occurred to us that the leach field may have some residue after percolation and the evaporation....What is the amount of residue that maybe present there and will ADEQ monitor on a regular basis after the mining has been done?"*

**R35:** The YMC will construct and operate a heap leach pad; this is not the same as a septic system leach field. The Yarnell heap leach pad will be constructed with a 60-mil, HDPE liner overlying a 12-inch layer of clay. A leak detection system will be constructed between the clay-amended\* liner and the HDPE liner. All liquids draining from the heap leach pad and the leak detection system shall be conveyed into a system of double-lined ponds for processing and recirculation. No fluids are allowed to percolate into the ground.

During the closure phase of the permit, YMC will be required to rinse the heap leach material to specifications stated in Part 2.7.3 of the APP permit. Impounded water and/or solutions in the ponds that are present at closure will be allowed to evaporate. Any sludge, or residue, remaining in the bottom of the ponds will be sampled and analyzed to determine if it is non-hazardous or hazardous

material, as defined by A.R.S. §§ 49-201.17 and 49-921.5. If the sludge is determined to be hazardous, YMC will be required to dispose of it off-site at an appropriate hazardous waste facility in accordance with all state and federal regulations. Only non-hazardous material will be buried in the pond, along with the liners, fill in the impoundments with backfill dirt, then regrade and revegetate the area. Excess process reagents, including cyanide, will be resealed in containers and returned to suppliers or used at other mine sites.

YMC will be required to continue monitoring the groundwater and springs after closure of the mine. This is known as the post-closure phase of the permit. The frequency and duration of any post-closure water monitoring will be determined at the time of closure by ADEQ and will be based on compliance with AWQS during operation of the mine.

The law requires that each permittee submit their water samples to a state-certified laboratory. The laboratories are required to run Quality Assurance/Quality Control checks on all submittals, which include blanks and spikes. If there is any question as to the validity of the analytical results, ADEQ has the authority, as stated in A.R.S. § 49-203.B.1, to collect a sample of its own for a check.

**C36:** *"If there's a leak in the heap leach pad -- that's our pad which is saturated with cyanide solution -- if that leak gets above 74 gallons per day per area of the heap leach pad -- and it's just divided into several areas -- "that affected area will be excavated and repaired if feasible." That's a direct quote. So we're going to have to see 74 gallons per day per area in the heap leach pad before we see a repair. And even then, that repair is only going to happen if it's feasible."*

*"If you have a leak or discharge problem, the company must stop mining, determine where the leak is coming in, fix the leak and resolve the cause of the problem."*

**R36:** In the event, there is an exceedance of the *de minimus* leak detection action leakage rate of 15 gpd for each monitoring area or there is an exceedance of the Rapid and Large Leakage (RLL) rate of 74 gpd per area, YMC shall implement the Contingency Plan Requirements outlined under *De Minimus* Exceedances in Heap Leach Pad in Section 2.4.12.4 and Section 2.4.12.5, respectively, of the APP Permit.

**C37:** *"I did not see any allowance for catastrophic events....What would happen to the Wickenburg aquifer when all this sodium cyanide and dissolved heavy metals come cascading downhill by a large airplane crash or nutcake terrorist."*

**R37:** No amount of planning or design can anticipate such an event as cited above. The final engineering design and construction plans do, however, meet the requirements of the *Final Draft, Arizona Mining BADCT Guidance Manual (August, 1996)*, which is the same criteria as all other mines in the state of Arizona must meet.

### Comments Regarding Waste Rock Characterization:

**C38:** Acid Rock Drainage Potential from the Waste Rocks: Several commenters were concerned about the acid generating potential from the waste rock. Three commenters requested that ADEQ require liners under the waste rock dumps.

*“The other concern I have is how tearing up the rock in that area is going to lead to an increasing sulfuric acid introduced through the air and rain contamination of that rock.” “I know in Montana, the largest superfund site in the country in Montana is a result of a mine in which sulfite rock was exposed to air, causing sulfuric acid...”*

**R38:** Acid Rock Drainage is the product formed as a result of the natural chemical and biological oxidation of sulfide minerals when exposed to air and water. The primary sources of acidic rock drainage involve sulfide-bearing mine rock which has been disturbed and for which the exposed surface area has been increased. Potential sources include: open pits, waste rock dumps, tailings impoundments, and underground mine workings. Not all minerals, or even sulfur-bearing minerals, are acid-forming (e.g. gypsum, galena, sphalerite); most acid generation is associated with pyrite and copper sulfides, such as pyrrhotite and chalcopyrite.

The Yarnell ore deposit is contained entirely within the Yarnell Granodiorite, a plutonic rock composed of potassium feldspar, quartz, biotite, plagioclase, hornblende, and sphene. These are not acid-generating minerals. This is the rock type that will be put on the waste rock piles. The Yarnell gold deposit is structurally controlled within the Yarnell Fault zone. This mineralized rock does contain minor amounts of pyrite; however, this rock will be excavated and placed on the lined heap leach pad.

YMC collected 41 rock samples from various points and depths in and around the ore zone and submitted them for acid-base accounting tests. The Acid Neutralization Potential: Acid Generating Potential (ANP/AGP ratio) for all of the Yarnell rock samples ranged from 6.7 to 126.4. These results are above the ratio of 3 used as a minimum ANP/AGP ratio in standard screening criteria.

The Net Neutralization Potential (NNP) for the Yarnell rock samples ranged from 2 to 8. Although widely-used standard screening criteria suggest that the NNP be greater than 20 for non-acid generation determination, knowledge of the site specific mineralogy is critical to the evaluation. The potential acid neutralizing minerals in the Yarnell Granodiorite include feldspar and plagioclase. Feldspar and plagioclase can act as acid neutralizers, but do not neutralize as rapidly as carbonates. The duration of a typical ABA test is 24 hours. This is not enough time to allow a breakdown of the silicate minerals. Hence, the low NNP values.

The most critical factor is the amount of sulfide sulfur content present. There must be a minimum of 0.3% sulfide sulfur content present in order to even consider the potential for acid generation. The highest total sulfur content of the Yarnell rock samples was 0.04 %. Total sulfur content (%) equals HCl extractable sulfur (%) plus sulfide sulfur (%) plus residual sulfur (%). If the highest total sulfur is 0.04% then the sulfide sulfur % must be lower, and is certainly lower than the 0.30% used as a minimum cutoff in the above screening tests.

As evidence of the lack of acid generation in the Yarnell Granodiorite, is the fact that the fault zone, or ore zone, has been open from historical mining and exposed to the air and water for at least 50 years. There are no observable or detectable acidic waters emanating from Yarnell Hill. Additionally, Highway 89, near Yarnell, and less than 1000 feet from the mine site, cuts through the Yarnell Granodiorite, exposing the rock to rain and oxygen; again, there is no acid rock drainage running down and/or ponding up below these cuts. The yards of the residents of Yarnell and Glen Ilah are also composed of the Yarnell Granodiorite.

Using all of the above criteria and the rock sample results, it was determined that the Yarnell Granodiorite is not acid-generating and therefore, that liners are not necessary for the waste rock dumps. However, the APP permit does require that YMC conduct ABA testing and metal leachability tests on the waste rock material that is within 20 feet of either side of the ore zone on a quarterly basis for the duration of the project.

One commenter compared the potential from the Yarnell Granodiorite to the Montana Superfund National Priority Listing (NPL) Clark-Fork sites, a cluster of four large contamination areas located along the Clark Fork River, northwest of Butte, Montana. These four sites comprise over 5,000 acres of mining and smelter wastes left from over 100 years of mining. Due to historical mining practices of using the Clark Fork River to discharge mining wastes, 140 miles of stream and riparian habitat are now threatened with acidic, metal-laden surface waters. Several old ponds and tailings have also contributed to the contamination.

It is not appropriate to compare the Clark-Fork Superfund sites with the Yarnell Mining Project or any new mine. First, the contamination at the Clark-Fork Superfund sites is due to long-term mining operations with no environmental regulations. Second, the mineralogy and petrology of the Clark-Fork sites is different from the Yarnell Granodiorite.

**C39:** *“Waste Rock/Tailings Facility - Another deficiency with the APP is its characterization of the tailings and waste rock at the site. For the Yarnell Project, it appears the ADEQ has relied on YMC’s static ABA tests to determine that the waste rock will be “inert”.*

**R39:** The commenter is referred to R38 above for a discussion of the waste rock characterization. The concern that the Yarnell Granodiorite is a serious acid-generating source that requires liners should be put into perspective.

The WPS-MU concurs with the commenter that reliance on any static ABA test as the sole means of determining acid mine drainage potential should be avoided. Again, knowing the mineralogy of the rock type is the key to determining acid rock drainage. The waste rock samples have a low acid neutralizing potential but the total sulfur content of the Yarnell Granodiorite samples analyzed is 7-1/2 times lower than the minimum sulfide sulfur content value considered to be potentially acid generating. Therefore, the determination that the waste rock at Yarnell has little or no potential for acid generation remains unchanged.

**C40:** *"It states that on the waste rock section,... that if there is an acid drainage problem from the waste rock, "it will be isolated and the problem will be remedied if possible". .... What is worrisome to me is the phrase "if possible"...."*

**R40:** In order to assess the acid rock drainage potential of the waste rock dump, YMC will sample the waste rock on a quarterly basis for metal leachability and acid-base accounting tests. The leachability test will include the metals indicated in Table 4.16 of the APP permit. If the results from either the leachability or acid-base accounting tests exceed an alert level indicated in Table 4.16, YMC shall implement the Contingency Plan Requirements outlined under Waste Rock Characterization and Management Plan in Section 2.4.12.6 of the APP Permit.

Based on this commenter's concern, the wording in the permit has been modified to state:

"If the results from either or both required analyses listed on Table 4.16 indicate an AL exceedance, the permittee shall identify the area where the non-inert waste rock was deposited and isolate this material by covering it on all sides with inert material, or treat the non-inert material by another method proposed by the permittee and approved by ADEQ Aquifer Protection Permit Program. The location of all non-inert waste material shall be recorded in a log book.

If subsequent mining of non-inert material is anticipated, the permittee shall segregate the inert material from the non-inert material. The non-inert material would be disposed in an area of the south waste rock dump where it could be isolated on all sides with at least 20 feet of inert material. The plan for separation and isolation of non-inert material would be documented in a disposal plan approved by the ADEQ Aquifer Protection Permit Program.

If, there are two or more AL exceedances within any four consecutive quarters of waste rock characterization, the Aquifer Protection Permit Program shall re-assess the potential for the waste rock dump to discharge contaminants to the aquifer."

**C41:** *"I am also worried about the trace minerals and what's going to be dealt with where they're going to put those when the mine does close."*

**R41:** It is not clear what the commenter's concern is: trace minerals or trace metals. A trace mineral is conventionally defined as any mineral, for example, sphene, pyrite, ilmenite, that constitutes less than 1% of a rock type as determined from a whole rock analysis. The only trace mineral in the Yarnell Granodiorite that was of concern to the WPS-MU was pyrite. See R38 for comments regarding pyrite and any potential for acid rock drainage.

A trace metal is a single element, for example, antimony, arsenic, beryllium, or lead, that constitutes less than 1% of the total chemical elements making up a rock sample, groundwater sample, etc. Not all trace metals are hazardous substances. There are four potential sources of trace metals at the Yarnell mine site:

1. the heap leach pad,
2. the waste rock dumps,

3. the sludge in the bottom of the surface impoundments, and
4. the process solutions.

The APP permit requires that, at closure, the YMC rinse the heap leach pad until all metals and cyanide are in concentrations below the AWQS. In addition, any rinsate from the heap leach pad cannot discharge off to surface waters until the rinsate meets SWQS.

On the basis of the mineralogy of the Yarnell Granodiorite and the initial ABA tests and metal leachability tests, the two waste rock dumps are not discharging facilities, as defined in A.R.S. § 49-201.11. However, as a safeguard, the waste rock dumps will be sampled for metal leachability and acid-base accounting once every quarter for the duration of the mining operation. If any rock sample exceeds an Alert Level for the leachability or ABA tests, that rock material will be isolated, that is, surrounded, in the waste rock dumps with inert rock material.

At the time of closure, the residual process solution will be allowed to evaporate in the solution impoundments. After the solutions have completely evaporated, any residual sludge remaining in the bottom of the ponds will be sampled and analyzed to determine if it is non-hazardous or hazardous material, as defined by A.R.S. §§ 49-201.17 and 49-921.5. If the sludge is determined to be hazardous, YMC will be required to dispose of it off-site at an appropriate hazardous waste facility in accordance with all State and Federal regulations. If the sludge is determined to be non-hazardous, YMC will bury it in the pond, along with the liners, fill in the impoundments with backfill dirt, then regrade and revegetate the area.

**C42:** *"The APP also does not explain why the old tailings, originating from the same or similar geologic formation as the ore and waste rock, can generate acid but the pit and waste rock cannot."*

**R42:** The commenter does not provide any evidence as to why the old tailings "can generate acid". The old tailings material is derived from rock within the ore zone (Yarnell Fault zone). YMC will be placing rock from the ore zone on top of a composite-lined leach pad. As stated in R38, the rock that will be placed on the waste rock dumps will be Yarnell Granodiorite. The potential for the open pit to generate acid will be evaluated at closure as per Section 2.6 of the APP permit. If it is determined that there is a potential for discharge of pollutants, ADEQ has the authority to reclassify the pit as a discharging facility.

YMC collected three samples from the old tailings and submitted the samples for ABA tests. The results indicate that all three samples contained a total sulfur < 0.06%. The minimum sulfide sulfur content for acid-generation concern is 0.30%. As previously stated, a rock must have at least 0.30% sulfide sulfur in it to be potentially acid generating. These test results show that there is not enough sulfur content in the tailing material to generate acid.

YMC also collected and analyzed surface water samples from nine springs in the area and submitted those analyses with the APP application. One of the nine springs was Cottonwood Spring, which is located in the drainage just below the old tailings and discharges from the granodiorite. All nine of the springs had a pH of 8.0 or greater, including that of the Cottonwood Spring. A pH must be <7.0 to be considered acidic. It should be noted that there is a small vegetated wetland in the

immediate vicinity of the Cottonwood Spring. If the old tailings were indeed discharging acidic waters, this wetland would not exist.

**C43:** *"It appears that ADEQ has accepted YMC's argument that its claim of a lack of significant current pollutant discharges from the tailings facility (even if proven true) is conclusive evidence that no discharge will occur from the tailings once the millions of tons of waste rock are deposited on top of the tailings. ....it is clear that the downward force of the waste rock on the tailings will "squeeze" some, likely a significant amount" of the pore water currently in place within the tailings."*

**R43:** The ADEQ has determined that covering the old cyanide-leached tailings pile with granodioritic waste rock is more beneficial than leaving them exposed. As the commenter states, the dumping of waste rock will exert a downward force on the tailings that may force some residual pore waters out. However, given the small volume and limited aerial extent of the tailings, there will be an insignificant amount of water released, if any. Nevertheless, YMC is still required to meet all SWQS and AWQS at the Cottonwood Spring, located just below the old tailings pile.

**C44:** *"At a minimum, the APP should detail why the release of metals from the dumps are not considered at least a possible condition that mandates that the dumps be considered "discharging facilities"."*

**R44:** In accordance with A.R.S. § 49-201.11, there must be a "reasonable probability" that a pollutant will reach an aquifer in order to categorize a facility as "discharging". The YMC submitted 12 drill cores from different areas and different depths of the ore deposit and surrounding area for metal leachability tests. Two out of the 12 samples exceeded the AWQS for antimony. These were the only two exceedances and both of these samples were collected from the ore zone (fault zone). Rock from the ore zone will be mined and placed on top of the lined heap leach pad. YMC will be required to monitor and sample the waste rock material that is within 20 feet of either side of the ore zone, in accordance with Sections 2.4.7.4 and 2.4.12.6 of the APP permit. The required waste rock tests will consist of metal leachability and acid-base accounting tests.

**C45:** *"Based on the information contained in the Permit and supporting documents, adequate characterization of the area beneath the heap leach pad and ponds appears inadequate."*

**R45:** YMC included in their APP application, information on the geology of the Yarnell Hill area, the hydraulic properties of the three hydrogeologic units in the area based on short and long pump tests and slug tests, depths of groundwater from several wells and test pits in the area, groundwater flow directions, and water quality data from the four on site wells and nine nearby springs. Forty-one rock samples of the Yarnell Granodiorite and ore zone were submitted for acid base accounting tests and 12 samples were submitted for Synthetic Precipitation Leaching Procedure tests. Soil tests to address moisture content, grain size, and plasticity were also conducted on the soils in the leach pad area. The ADEQ, WPS-MU considers the analyses from all of these tests to provide adequate characterization of the site material. (Commenter is referred to Volumes I and II of the *Baseline Hydrologic Characterization Report for the Proposed Yarnell Mine Project*, dated June 14, 1996,

and Responses to ADEQ Comments on Hydrologic and BADCT Technical Review of the Aquifer Protection Permit Application for the Yarnell Project, dated October 28, 1996.)

**Comments Regarding Closure/ Post-Closure Issues:**

**C46:** *“Post-Closure Analysis - Although YMC may argue that a post-closure plan may not have to be submitted at the present time, YMC does have to submit detailed cost calculations to ensure proper closure and post-closure conditions (R18-9-108.B.8). This requirement begs the question of how can such detailed costs be calculated if the applicant has not submitted adequate closure information. This error must be corrected.”*

**R46:** The fact that YMC did not submit a detailed closure or post-closure plan is not an error; A.R.S. § 49-243.A.8, adopted as law in 1996, and which supersedes A.A.C. R18-9-108.B.8, states “the Director shall consider, and the applicant for an individual permit may be required to furnish with the application, the following information: .....8. A closure strategy.” (Emphasis added). The closure strategy does not require detail; just a general strategy or plan. The intent of this change in law was to allow for those APP-permitted facilities who do not plan to close for several years from the present, and for which a detailed closure plan would be speculation at best. YMC did, however, submit a detailed closure plan to the U.S. Bureau of Land Management (BLM) in their Mining Plan of Operations document.

**C47:** *“Will the abandoned cyanide heap-leach pad and the overburden of waste rock leak toxic chemicals and acid mine drainage into this hole after years of rainwater running over it?”*

**R47:** As specified in Section 2.6.3 of the Yarnell Mining Project APP, the heap leach material will be rinsed and neutralized upon closure. The effluent from the heap leach material must meet all AWQS and SWQS before being allowed to discharge off the pad to groundwater or waters of the U.S. Acid-base accounting and metal leachability tests conducted on the waste rock indicate that the waste rock is not acid generating and has a very low potential for metal leachability. As stated in R38, the Yarnell Granodiorite and the Yarnell Fault zone have been exposed to “years of rainwater” running over them and there is no evidence to date of acidic metal-laden waters emanating from Yarnell Hill.

**C48:** *“The suggestion that the [Closure/Post-Closure Pit Modeling] evaluation be submitted “prior to complete closure”, rather than prior to project approval, indicates that the potential for significant impact to the environment has been underestimated by the ADEQ.”*

**R48:** The pit modeling evaluation that is referred to in Section 2.6.2 of the APP permit is part of the closure/post-closure plan requirements and as such, is not required until closure of the mine. During operation of the mine, YMC will be pumping any groundwater out of the pit and using it for mining processes and dust suppression. The pumping of this groundwater will create a reversal of groundwater flow into the pit as opposed to out of the pit and into the aquifer. The potential for a contaminant discharge to the aquifer and/or surface waters from the open pit is more likely to occur after operations, that is, at closure when pumping of the pit ceases.

However, based on the mineralogy and hydraulic parameters of the Yarnell Granodiorite and the closure reclamation plans as outlined in the Yarnell Project Mining Plan of Operations (submitted to the Bureau of Land Management, March 1996), the likelihood of a discharge even at closure is minimal. However, the APP permit will require a closure/post-closure pit model evaluation. An advantage of deferring the pit modeling evaluation until closure, is that actual field data, such as water levels, groundwater flow rates, percentages of exposed wall rock, and the geochemistry of pit water can be used in the model instead of assumptions and predictions.

ADEQ has the statutory authority to reclassify the open pit as a discharging facility at closure should the model indicate a problem. If that is the case, the Yarnell Mining Project would be required to implement discharge reduction measures and meet all AWQS and SWQS at a newly defined point of compliance.

**C49:** *"The Mine Pit is a Potential Discharging Facility - Under Arizona law, the mine pit may be a discharging facility and, as such, must be covered by the APP. As recognized by the APP statute, only a mine pit that is "hydrologically isolated" cannot be considered a "discharging facility"."*

**R49:** The commenter is correct in stating that the mine pit may be a discharging facility. However, there must be "a reasonable probability" for a discharge of a pollutant to the aquifer, as defined in A.R.S. § 49-201.11 for it to be categorized as a discharging facility. What are the "pollutants" that would be discharged from the mine pit? Citing the acid generation and leachability issues discussed in R38 and R44, it is ADEQ's determination that there is no reasonable probability for a discharge while the mine is in operation and pumping groundwater out of the pit.

The "hydrologically isolated" issue is addressed A.R.S. § 49-243.G.1. A.R.S. § 49-243.G.1 is discussing BADCT elements and that a mine pit that creates a "passive containment that is sufficient to capture the pollutants discharged and that is hydrologically isolated" may indeed be considered a non-discharging facility. However, this statute does not exclude other mine pits from being categorized as non-discharging facilities during operation. This determination is made on a site-specific basis for each mine.

During mining operations, a mining company will most likely be pumping the groundwater out of the mine pit in order to excavate the rock. The pumping of the groundwater creates a "hydrologic sink" which is an effective method to prevent the mine pit from discharging any pollutants to the aquifer. However, at closure, when the pumping of the groundwater ceases, the mine pit may become, over time, a discharging facility. That is why most mining companies, including YMC, are required to conduct a closure audit of mine pit effects.

**C50:** *"What is the status of the open pit? What are the anticipated groundwater levels? What are the levels when combined with storm runoff? Has the expected chemical composition been substantiated by reliable data?"*

**R50:** The open pit has been designated by the ADEQ WPS-MU as a non-discharging facility. The commenter is referred to R9 and R49.

**C51:** *“What happens when the 300-foot hole that the Yarnell Mine plans to leave behind eventually fills with water? Will this result in a huge pond of stagnant water providing a breeding ground for viruses, plagues and insects?”*

*“I also note that there is no plan by the company to fill in the huge open pit that will be left as a scar upon the formerly pristine land when the operation is over. The pit will accumulate water from rain and runoff; any toxic chemicals remaining in the newly exposed rock that forms the walls of this pit that are water soluble will be leached from the rock and said polluted water will accumulate in the pit or run off into the lower desert to become surface and ultimately groundwater pollution. How can the company be allowed to leave such a continuous hazard unfilled? One which will be a pollution source for perhaps hundreds, maybe thousands of years.”*

**R51:** The details of a closure plan, including the pit, shall be addressed in a closure plan to be submitted by the Yarnell Mining Company prior to closure of the entire mine. The commenter is referred to R9, R49, and R50.

**C52:** *“We insist that a long-term monitoring program be instituted after the completion of mining including surface and groundwater testing and a plan for corrective action if acid or toxic leakage develops.”*

**R52:** Closure and post-closure monitoring and frequencies will be evaluated and determined at the time of closure and will be partly based on the permittee’s compliance with APP requirements and rules during operation. It is certain that YMC will be required to continue monitoring groundwater and spring water after closure, but the frequency and duration will have to be determined at closure. Corrective action plans, or contingency plans, will also be required. The commenter is also referred to R16, R35, and R41.

**C53:** *“What is the amount of residue that may be present there and will ADEQ monitor on a regular basis after the mining has been done?”*

**R53:** It is unclear what the commenter is referring to by “residue”. The commenter is referred to R16, R35 and R41.

**Other Comments:**

**C54:** *“Where has this thing been that the -- that the public gets 30 days to look at it and then you set up this report, or this meeting here to talk about it? It’s been laying around for six months. Why wasn’t it distributed so we would have had time to look at it?”*

**R54:** YMC submitted an APP application to the ADEQ, Water Permits Section, Mining Unit on December 20, 1995. The WPS-MU completed the engineering and hydrologic review in August 1997. A draft of the APP permit was developed in the Fall of 1997 and submitted for ADEQ management review and comments in January 1998. A notice was published in the Prescott Courier and the Wickenburg Sun newspaper on January 28, 1998 commencing the 30-day public comment period.

All documents, maps, and correspondence submitted by YMC are a matter of public record and therefore are available for public viewing by request and have been since the APP application was first submitted. ADEQ is not required to notify the public of the status of an APP application but only required to post a public notice when a draft permit is written.

In accordance with the A.A.C. R18-9-124.C, the public comment period "shall extend for no more than 30 calendar days after the date of the first publication of the public notice." The ADEQ Water Quality Division did, however, extend this 30-day public comment period an additional 16 days from February 28 to March 16 at the request of the public.

**C55:** *"I wish to protest the manner in which notice was (apparently) given that the permits had been applied for. Publication of legal notices in the Wickenburg and Prescott papers is hardly proper notice for the citizens of Yarnell. I would be willing to bet that no more than 5% of the people in this area subscribe to either paper. There should have been a direct mailing to all box holders, at the very least."*

**R55:** ADEQ has established rules pertaining to the procedure of how to notify the public regarding the issuance of a permit. Each notice of impending permit issuance is published as a legal notice at least once, in one or more newspapers of general circulation in the county or counties concerned pursuant to A.A.C. R18-1-401. In the case of the Yarnell Project, the notice was published in both the Prescott Courier and the Wickenburg Sun one day per week for two consecutive weeks. ADEQ has determined that this method is the most effective means to reach the most people. Unfortunately not everyone will be notified by this mode of communication. Commenter is also referred to R54.

**C56:** *"The ADEQ should not issue the permits until the federal National Environmental Policy Act (NEPA) and approval process is completed. --- ADEQ cannot issue any permits until the federal NEPA and decision making process is completed."*

**R56:** The ADEQ Aquifer Protection Program is a state-administered program through a state-funded agency. There are no state or federal laws that prohibit an APP permit from being issued prior to issuance of a federal permit. The purpose of an Aquifer Protection Permit is to ensure protection of the aquifers within the state of Arizona. The ADEQ is satisfied that the Yarnell APP permit accomplishes this. Meetings and discussions have been ongoing between the ADEQ, WPS-MU staff and the BLM project staff throughout the permitting process of the Yarnell Project. Any serious concerns of the BLM with regards to the technical merit of the APP permit have previously been discussed with the ADEQ.

**C57:** *"Too much time is allowed between when a leak occurs, when a leak is allowed to be detected, when a second verification of that leak comes in, when DEQ is notified, and when the leak is actually responded to. As I calculated it, it could definitely be more than a quarter, potential up to six months when a leak occurs and when it actually is responded to and remedied. "Within 30 days of a spill that might cause an exceedence of an alert level, or might cause imminent and substantial endangerment to public health or the environment, the permittee shall submit to ADEQ*

*a written report that includes the documentation, a review of this report, any additional monitoring and actions..”.*”

*“If there is a spill which might cause imminent and substantial endangerment to public environment -- they have 30 days to report this. That is not okay with me. It's one thing to have 30 days to report a leak that may be small and insufficient, but this is a leak that is imminent and substantial endangerment to the public health and environment.”*

**R57:** The WPS-MU has re-considered Section 2.4.12.9, Accidental Discharge in the Yarnell Mining Project APP in light of this commenter's statement and has determined that spills of the size that would cause “imminent and substantial endangerment to public health or the environment” would best be addressed by YMC in the emergency response plan and ADEQ's Hazardous Waste Section, Emergency Response Unit (HAZMAT Program). Therefore, Section 2.4.12.9 shall be removed from the APP permit and be placed in the Yarnell Project, Emergency Response Plan to be submitted by YMC within 30 days of the effective date of this permit.

**C58:** *“Failure in drainage structures, such as ditches or diversion berms, which do the important work of keeping runoff away from contamination sources could occur and ADEQ would not be informed of the actions taken to deal with this threat for 30 days (p. 14).”*

**R58:** Section 2.5.12.8, Drainage Structure Failure, of the APP permit refers to stormwater structures. Stormwater is defined in the *Final Draft, Arizona Mining BADCT Guidance Manual (August, 1996)* as rainfall or runoff that has not come into contact with any process reagents or other sources of potential pollutants (e.g. leach material). These structures are not considered to be discharging facilities and as such, do not need to be regulated in an APP permit. As a result of this commenter's observation, this section will be deleted in the final APP permit. Stormwater runoff and structures at the Yarnell Mining Project will be addressed and permitted by the Federal National Pollutant Discharge Elimination Systems (NPDES) program.

**C59:** *“There's a section down here called storm water and water surface -- water considerations. It says that they were adequately incorporated into the design of the tailing facilities. I would like to know by who this was determined and I would like to see some of the numbers that they have on how they determine that this was adequate.”*

**R59:** The commenter is referring to the Stormwater and Surface Water Considerations section on page iii of the Executive Summary. This section was incorporated into the executive summary in error. Stormwater and surface water issues at the Yarnell mine will be addressed through the Federal NPDES permitting process. The WPS-MU wishes to thank the commenter for bringing this to our attention; this section will be deleted in the final permit.

**C60:** *“Where will this material be pumped to after it's collected? There's no definition as to what happens to the material after it leaks and what do you do with it then?”*

**R60:** It is unclear as to what “material” the commenter is referring to. Please refer to Sections 2.4.12.1 through 2.4.12.5 of the APP permit for contingencies regarding an exceedance of a leakage rate and R26 and R33 for an explanation of leaks and the leak detection system.

**C61:** *“The Draft Air Quality Control Permit and Aquifer Protection Permit for the YMC are difficult to assess as stand-alone documents. The level of detail and background information contained in the permits is insufficient to make a thorough evaluation of the proposal.”*

**R61:** The commenter is referred to R5.

**C62:** *“How will the mine be monitored?”*

**R62:** The commenter is referred to Tables 4.1 through 4.16 of the Yarnell Mining Project APP permit for details on the monitoring of the heap leach pad, process solution ponds, point-of-compliance monitor well, springs, underdrain system sump, and waste rock.

**C63:** Self-Monitoring Requirements: Four commenters made a request that ADEQ conduct all required water and facility monitoring instead of the permittee, due to distrust of a facility to report problems.

*“...the self monitoring system has always been rather flawed because it really is to their benefit to maximize profits.”*

**R63:** ADEQ does not have the resources to conduct field sampling and analyses on wells for the 300+ APP-permitted facilities located in Arizona. There is no justification for ADEQ to conduct monitoring at the Yarnell Mining Project while excluding numerous other mines in the state or the hundreds of industrial sites with equally-hazardous chemicals that are located in highly populated areas. For the ADEQ to be able to conduct its own monitoring of sites, a substantial increase in the general funds (collected from taxes) allotted to ADEQ by the Arizona legislation would be required.

**C64:** *“I think it’s ridiculous that there’s no mandatory visits and that ADEQ should have unannounced visits to the mine every three months and there should be a set plan to monitor ground and surface water.”*

**R64:** In accordance with A.R.S. § 49-203.B.1, ADEQ has the regulatory authority to “enter into, on or through any public or private property from which a discharge has occurred, is occurring or may occur, as is reasonably necessary to ensure compliance....” This is a state law; it is not necessary to write it in the APP permit with specific dates and times for such visits. If ADEQ determines at some time that it is necessary to make a site visit to the Yarnell Mine, it will do so. To specify a frequency of “every three months” defeats the purpose of unannounced visits.

The commenter is referred to Sections 2.4.5, 2.4.7, 2.4.8, 2.4.9, 2.4.12, and Tables 4.5 through 4.15 of the YMC APP permit for the groundwater, surface water, and underdrain system monitoring requirements.

**C65:** *"I request that the ADEQ inform me how the granting of the permits applied for by the applicant would not be of violation of the public trust referred to in this statement by the Director of ADEQ Russell Rhoades: "The government and people of Arizona have entrusted the Arizona Department of Environmental Quality (ADEQ) with the critical mission of preserving, protection and enhancing our state's environment as well as safeguarding the public health.""*

**R65:** The commenter is referred to the introduction of this Response Summary for the scope and purpose of the ADEQ Aquifer Protection Program. As stated in the introduction, the purpose of the APP program is to protect the aquifers of the State of Arizona. In accordance with the Aquifer Protection Program rules and statutes, if an APP applicant satisfies all five demonstration requirements, the law requires ADEQ to issue an APP permit. The ADEQ WPS-MU is satisfied that the Yarnell Mining Project has met all of the requirements of the law and that the Yarnell Mining Project APP provides adequate safeguards and protection for the aquifer.

**C66:** Time Limit for APP Permit: Three commenters requested that ADEQ set a time limit on the APP permit. *"A time limit should also be imposed on the Aquifer Protection Permit so it gets revisited every so many years."*

**R66:** The WPS-MU has taken this request into consideration and has decided not specify a time limit in the APP permit. This decision is based on the short time frame that the mine will be operating (6 to 7 years). In the event that the mine exceeds the footprint or operational parameters stated in the APP application, ADEQ would be required to reopen the permit to make the appropriate major modification and associated technical review.

**C67:** *"Why does the mine have 5 days to report a slope failure or ground contamination but only 48 hours to report an emission violation?"*

**R67:** The five day allowance is stated in rule A.A.C. R18-9-113.C: "Except as otherwise provided in R18-9-114.B [Emergency Response rules], an individual Aquifer Protection Permit shall require that a permittee notify the Director within five days after becoming aware of a violation of a permit condition or that an alert level has been exceeded."

Travel time of hazardous constituents within different media also needs to be considered. The travel time of an airborne constituent is much less than a constituent in the groundwater or soil. Estimated velocity of groundwater flow at the Yarnell site is on the order of 5 to 40 ft per year. (This figure is based on the hydraulic conductivity measured in well YMC-03 and using a porosity of 0.04 for the granodiorite.) Therefore, if a leak in the heap leach pad developed and was detected in well YMC-03, the contamination would travel, at the most, 6.5 inches in the five days that Yarnell has to notify ADEQ of the discharge.

**C68:** *"What do the people who own or manage the mines pay in the way of getting permits?"*

**R68:** The fee schedule for facilities requiring an individual APP permit are determined pursuant to A.A.C. R18-9-123.A. Applicants are not required to pay over \$16,000 for an APP permit (ARS 49-241.02.A). YMC's fee was \$16,000.00.

**C69:** *“If ADEQ were to approve of the primitive open-pit, cyanide heap leach method, who would pay, and what, and how.”*

**R69:** 1) the Yarnell Mining Company, 2) \$16,000, 3) by check, cash, money order or other redeemable securities.

**C70:** *“The Yarnell mine seems to be a wholly owned subsidiary of Bema Gold, Inc. Yet neither of the permit application are made in Bema’s name. Is this an attempt to limit potential liability? Bema wants to have its mining acumen acknowledged, but doesn’t appear to be willing to put its money where its mount is. What are they afraid of?”*

**R70:** The YMC is a wholly owned subsidiary of Bema Gold, Inc. As such, the commenter is correct, a wholly owned subsidiary is set up in order to limit the potential liability to the parent company. This is legal and therefore the YMC is recognized by the state of Arizona as a legal operating business entity.

**C71:** *“I want to know where else in Arizona, a source of pollution (with similar deadly pollutants in both kind and amount) comparable to the proposed Yarnell Mine may be found in such close proximity to nearly a thousand people, who were there before the pollution source ‘moved in’. Would such a thing be allowed on the outskirts of Phoenix? Of course not.”*

**R71:** Mines are constructed where mineral deposits are located. Phoenix is located in a basin which contains a thick (over 5,000 feet) sequence of alluvial sediments, such as sand, gravel, and silt. (Phoenix does have several sand and gravel operations.) Hence, the fact that there are no metal mines in or near Phoenix is not due to ADEQ’s denial of permits, but to geologic factors.

A small cyanide leach operation did exist in the mid-1980’s about 25 miles from downtown Phoenix on the side of a hill and approximately 600 feet from the bank of a major stream. Because there were no groundwater or aquifer protection permits required for operation at that time, this mine used substandard liners and engineering controls. Consequently, the groundwater was contaminated with cyanide.

Monitor wells around the old leach operation show that only the monitor well closest to the leach solution pond has an AWQS exceedance of cyanide. The monitor wells 200 to 400 feet further downgradient have nitrate levels above the AWQS. This site is evidence that cyanide degrades rapidly into nitrate. The cyanide spill, however unfortunate, did not destroy the groundwater. Samples collected from the nearby stream show no detectable traces of cyanide.

The “deadly pollutants” that the commenter refers to are known as hazardous substances and are defined in A.R.S. § 49-201.17. If a chemical is determined to be “hazardous”, a concentration is then established at which the ingestion, inhalation, and/or absorption of that chemical becomes a potential health risk. All chemicals listed in A.R.S. § 49-201.17 can be “deadly” at specific concentrations; no one hazardous chemical is more “deadly” than another when ingested above this concentration. For example, drinking water containing 0.20 mg/l of cyanide is no more “deadly” than drinking water containing 0.005 mg/l of benzene. Phoenix has hundreds of industrial facilities

that use as much and more hazardous substances than the Yarnell Mining Project proposes to use. Many of these facilities are located as close, if not closer, to private residences as the Yarnell Mining Project is to Yarnell.

**C72:** *“What does the emergency response plan consist of and what kind of training is to be provided to take care of this emergency?”*

**R72:** With regards to the APP program, an emergency response plan must contain the minimum information pursuant to A.A.C. R18-9-114.B.1 - 5:

*B. An individual Aquifer Protection Permit shall require that a contingency plan contain all of the following:*

*1. A plan to provide emergency response on a 24-hour basis in the event that a condition arises which results in an imminent and substantial endangerment to the public health or the environment.*

*2. The designation of an emergency response coordinator to be responsible for activation of the contingency plan and emergency response measures.*

*3. A requirement that the emergency response coordinator notify the Department immediately in the event that emergency response measures are taken or those portions of a contingency plan that address an imminent and substantial endangerment are activated.*

*4. A list of names, addresses and telephone numbers of persons to be contacted in the event that an imminent and substantial endangerment to the public health or the environment arises.*

*5. A general description of the procedures, personnel and equipment to be used to assure appropriate mitigation of unauthorized discharges.*

Training of personnel to respond to emergencies is the responsibility of the mine operation not the ADEQ Aquifer Protection Program. The State Mine Inspector's office provides training in handling of cyanide, safety precautions, etc.

**C73:** *“I respectfully demand that a map of the proposed mine site, as it will appear when and if it is operating, which includes the entire Yarnell area, along with all of the houses in our community and the adjacent state highway, be made a part of both permit applications. The map should also designate all of the proposed pollution sources, such as the pit itself, the leach heaps, proposed generators, etc....I want to be sure that the ADEQ knows how close homes are to the proposed site, and that I have proof, evidence, that ADEQ knows. I can hardly believe that no map showing same is included with the applications. Is this an intentional oversight on the applicant's part? ;Surely such a map MUST be a part of any application that ADEQ would seriously consider.”*

**R73:** ADEQ respectfully declines to require such a map with said permit. ADEQ is fully aware of the proximity of the Yarnell Mining Project to the communities of Yarnell and Glen Ilah; ADEQ staff have visited the site on numerous occasions. In addition, there are several various maps of the Yarnell mine site and surrounding area included in the YMC APP application and supporting documents, all of which are included in the Yarnell Mining Project file.

The commenter is referred to the introduction of this responsiveness summary for a clarification of the regulatory purpose and limitations of the ADEQ Aquifer Protection Program.

### **Comments Regarding Financial Requirements**

**C74:** *"I think the mine should post a bond to cover clean-up in the event of a leak. I question the adequacy of a \$285,924.00 bond. What exactly is the purpose of this bond? The bond should be revisited periodically to ensure the amount can cover clean-up and closure."*

**R74:** A bond is posted for the purpose of ensuring that the permittee is capable of meeting the closure and post-closure requirements of an individual Aquifer Protection Permit pursuant to A.A.C. R18-9-108.B.8.c.iii. The amount of the bond is calculated using industry guidelines and estimates for closure of the discharging facilities on private land only. Bonding on public land is the responsibility of the BLM. Bonding for the speculation of a potential release during operation is unlawful.

**C75:** *"We insist that a bond of no less than 2 million dollars be set so that U.S. taxpayers are not burdened with the cleanup of this mine if it has a huge leak or spill."*

**R75:** The commenter is referred to R73. The commenter has not included any data to support requiring a bond in the amount of two million dollars.

**C76:** *"The need to stay the permitting process is also supported by the fact that the company has not proposed, nor submitted, the required financial assurance / bond. Under R18-9-108.8, the APP applicant: "shall submit all of the following...(a) an estimate of the total cost of constructing, operating, closing, and assuring proper post-closure care...[As well as] evidence of a bond, insurance, or a trust fund assuring that the applicant will be financially capable of meeting the closure and post-closure requirements of the individual [APP]." (18-9-108.8.c.iii). As noted above, until the final project design, plans, etc., are finalized, such requirements cannot be met by the applicant. Thus, without such submittals, the APP is by definition incomplete and cannot be processed."*

**R76:** The commenter is referred to A.A.C. R18-9-108.B.8.c which states: *...the demonstration of financial capability shall be further supported by any one of the following: (i) The most recent copy of the person's 10K form filed pursuant to section 13 or 15(d) of the Federal Securities and Exchange Act of 1934 (c. 404, Title I; 48. stat. 894-95; 15 United States Code 78m and 78o, as amended. (ii) A report that contains all of the following information: a) A description of the person's status as a corporation, partnership, or other legal entity. b) A description of the person's business. c) An indication of the person's net worth, including a description of major assets and*

liabilities. d) A brief description of any judgment exceeding \$100,000.00 rendered against the person during the five years preceding the date of the application. e) A brief description of any bankruptcy or insolvency proceedings instituted by the person during the five years preceding the date of the application. f) If the person is a corporation, the names of its executive officers and their dates of birth. (iii) Evidence of a bond, insurance, or a trust fund assuring that the applicant will be financially capable of meeting the closure and post-closure requirements of the individual Aquifer Protection Permit.

Therefore, even though the ADEQ is requiring YMC to post a bond to cover the cost of closure, it is by no means the only vehicle available to demonstrate financial capability. Financial responsibility has been established with regards to satisfying the requirements to deem an application administratively complete. However, YMC must still post the correct bond amount to the ADEQ before a permit is signed and issued. That will take place once it is known that the permitting process is proceeding by a letter from ADEQ to YMC that the WQD intends to issue the permit.

**Comments on Issues Outside of ADEQ's Regulatory Authority:**

**C77:** Water Supply Issues: Several commenters were concerned about the quantity of water the YMC would be withdrawing from the aquifer for its operation.

*“How can ADEQ protect groundwater quality when no one yet knows from where the mining company will acquire the water needed for the project?”*

**R77:** The Arizona Department of Environmental Quality does not address, evaluate, or enforce water supply issues. The Arizona Department of Water Resources (ADWR) only requires assured water supply demonstrations from persons within an Active Management Area (AMA) who offer subdivided or unsubdivided land for sale or lease that may be marketed to the public. AMAs were established in the 1980 Arizona Groundwater Management Code where groundwater overdraft is most severe. The boundaries of AMAs are generally defined by groundwater basins and sub-basins rather than by the political lines of cities, towns or counties. The Code created four AMAs - Phoenix, Pinal, Prescott, and Tucson. A fifth AMA, the Santa Cruz AMA, was formed from a portion of the Tucson AMA in 1994. New AMAs can be designated by ADWR if necessary to protect the water supply or on the basis of an election held by local residents of an area. But again, assured water supply demonstrations are only required of developers, not industry (including mining). In summary, there is no state or federal regulatory agency in Arizona that has the authority to require a demonstration from any industry for assured water supply.

In addition, there are no laws that give ADEQ or ADWR the authority to prohibit a facility from pumping groundwater solely based on the facility type. In other words, there is no law that says a gold mine cannot pump groundwater just because it is going to be in the business of mining gold, or for more examples, that a golf course, truck wash, explosives manufacturer, or paper milling factory can't pump groundwater.

**C78:** *“How will the chemicals be stored on site?”*

**R78:** The storage of unused chemicals (product) on site is not addressed by the Aquifer Protection Program. Yarnell Mining Project addressed this question in the Mining Plan of Operations, Section 8.5.1.3, Chemical Storage Facilities. All chemicals shall be stored in areas with secondary containment such as inside the ADR plant, the warehouse, or on a concrete pad with berms.

**C79:** *“Migratory birds should be monitored at least every three months to see if they are being affected by the groundwater, and that....any migratory birds or any wildlife be physically prevented from access to the cyanide ponds or tailings ponds where the pollution exceeds the quality standards.”*

**R79:** The ADEQ Aquifer Protection Program does not monitor migratory birds or any wildlife. Although the ADEQ Aquifer Protection Program also does not require bird netting over surface impoundments, YMC is proposing to cover the two process solution ponds with netting. YMC will not be constructing or operating any tailing impoundments.

**C80:** *“Additionally, the affect of the open pit or pit lake, which will lead to increased evaporation of valuable water resources, should be considered.”*

**R80:** Refer to R76 for the discussion about water supply issues.

**C81:** *“Is it the policy of ADEQ to support damage to the environment, risk the health and welfare of the citizens of the State of Arizona, specifically those of Yarnell and Glen Ilah, and allow extensive pollution so that a mine may operate at a profit? Are the health and welfare of the citizens of the State of Arizona to be put at risk in order that a company may make money while it destroys the quality of air and water and creates a permanent blight on the landscape?”*

**R81:** The commenter is referred to the introduction of this responsiveness summary for the purpose and scope of the Aquifer Protection Program. The ADEQ Water Permits Section, Mining Unit staff, which includes engineers and hydrologists, have spent many months evaluating and determining the levels of safety and risk involved with this proposed mining operation. YMC has successfully met the required demonstrations for an Aquifer Protection Permit and hence, ADEQ WPS-MU does not believe that the operation of the Yarnell Project will “destroy” the water quality.