

## Response to Comments

### BHP Copper-Florence Project Class III UIC Permit and Aquifer Exemption

April 1997

#### Purpose:

In accordance with 40 CFR 124.17, EPA must respond to all significant comments raised during the public comment period and during the public hearing. Furthermore, EPA must specify which provisions of the draft permit have been changed in the final permit decision, and the reasons for the change.

#### Written comments were submitted by:

John Kline-BHP Copper

Corolla Hoag-BHP Copper

Bill Hawes-Arizona State Mine Inspector

Robert Kelm-resident of Florence

Joe Williams-U.S. EPA, National Risk Management Research Laboratory, Ada, OK

Paul Osborne-U.S. EPA, Reg. 8, National Ground Water Expert

#### Statements were made at the public hearing by:

Chuck Seller-Florence Chamber of Commerce

Col. R. B. Rodke-resident of Florence

Leslie Wakefield-resident of Florence

#### Response to comments:

John Kline-BHP Copper

1. Comment: The mine life should be termed "approximate 15-year mine life" and not "15-year mine life."

Response: EPA concurs. Pursuant to 40 CFR 144.36, Class III permits may be issued up to the life of the facility. The life of the facility will include the mining and closure period and the post-closure groundwater

monitoring period specified in the permit.

2. **Comment:** The permit should allow BHP to use a circulation cementing method, or alternative construction methods as long as the techniques have been approved by an EPA project officer. Since new technologies may be developed during the mine life, BHP requests similar flexibility with mechanical integrity testing.

**Response:** EPA concurs. The permit language will be changed to allow BHP to take advantage of an alternative to the tremie pipe method. Under permit condition II.C.5, new construction techniques must be approved by EPA and will be treated as a minor modification to the permit.

The draft permit allows alternative MIT Part II methods, as long as BHP has received written approval from the Director. In accordance with 40 CFR 146.8(d), EPA will add this flexibility to MIT Part I. Specifically, BHP may want to investigate the feasibility of the "casing cementing pressure/single point resistivity log." This test has already been approved for MIT Part I.

3. **Comment:** The draft permit requires the operator to monitor the organic concentration of the raffinate pond. However, the raffinate pond is designed as a control device with a skimmer and is therefore not representative of the injectate. The permit should be modified so that the organic sampling provisions target the injectate, not the raffinate pond.

**Response:** EPA concurs. EPA is concerned with the organic concentration of the injectate, not an intermediate step of the process.

4. **Comment:** On the groundwater quality limits tables, it should be noted that the limits are federal, not state, limits.

**Response:** Under permit condition II.F.2.d, the Aquifer Quality Limits (AQLs) are termed "federal" AQLs pursuant to federal regulations (40 CFR 141). For clarification, this permit condition will be cited in the footnote of the tables.

5. **Comment:** As discussed at earlier meetings, 2 months of baseline data collection for process-related organics is sufficient, as long as the organics are nondetectable.
- Response:** EPA concurs. Under permit condition II.F.3.a (Baseline Data and Statistical Methods), language will be added to clarify that collecting 2 months of nondetectable baseline data for process-related organics is acceptable.
6. **Comment:** EPA should be given a maximum of 45 days to review the groundwater quality baseline data. If EPA does not deny the baseline data within 45 days of receipt, the data should be considered acceptable.
- Response:** A 45-day review period is acceptable to EPA, however, EPA does not consider this to be an appropriate permit condition.
7. **Comment:** BHP requests that during the 30-year post-closure period, the Level 1 constituents are measured every quarter for 2 years. After 2 years of post-closure monitoring, the Level 1 sampling frequency should be reduced to once per year.
- Response:** EPA concurs with this request. The proposed sampling modification is minor and should not affect the goal of the monitoring program.
8. **Comment:** In regards to the first block demonstration (Part II, F.7) the conductivity monitoring should be clarified to read "electrical conductivity" and the "block" should be defined as "zone." BHP would like to use enough wells to demonstrate the concept of hydraulic control but does not feel that is necessary to use an entire block.
- Response:** EPA will make the changes to the permit language as an entire block is not necessarily required to make a demonstration of hydraulic control. Specifically, the term "block" will be changed to "zone." However, the requirement will contain some additional language that will require BHP to show that an adequate number of wells were utilized to demonstrate hydraulic control.
9. **Comment:** "Block-by-block" should be changed to "Zone-by-Zone" and the

wording should be changed to reflect varied mining and closure times within a zone.

Response: EPA concurs. EPA will make changes to the language in order to give BHP some flexibility in operation and closure times. However, EPA will also add language to the permit that clarifies that BHP must use a "close-as-you-go" approach. That is, after mining a zone, BHP must commence closure operations within the zone promptly (within 90 days).

10. Comment: The restoration requirements should reflect the fact that some constituents currently exceed the MCL (e.g., nitrate). The permit should require the operator to return the zone to MCLs, OR to the background concentration.

Response: EPA concurs. EPA will make this clarification under permit conditions II.I.1 and II.I.2 (Restoration and Plugging & Abandonment).

11. Comment: Part III, Section A of the permit should be modified to allow the injection of non-leach solutions.

Response: EPA understands that non-leach solutions, such as, neutralizing agents and ground water will be used during pre-operational and closure periods. EPA will expand the injectate fluid description under "Injection Fluid Limitation" (Part II, Section E) to include well testing and closure periods. However, the section "Effect of Permit" does not appear to be the correct location to make this clarification. "Effect of Permit" states that "the permittee is allowed to engage in underground injection well construction in accordance with the conditions of the permit." This reference back to the specific permit conditions should be adequate in describing acceptable injection fluids.

12. Comment: BHP has agreed to use sulfate as an indicator ion but wants to emphasize that sulfate does not have a primary MCL.

Response: EPA understands that sulfate does not currently have a primary MCL. However, EPA is investigating the health effects of sulfate and in the future may establish an MCL for this parameter. Furthermore, pursuant to 40 CFR 144.12, BHP must ensure that in addition to constituents

with MCLs, constituents without MCLs shall not impact USDWs in a way that could cause an adverse impact to the health of persons. This requirement is stated at Part II, Section I.1.b of the permit.

Corolla Hoag-BHP Copper

13. Comment: "BHP staff have a made a commitment to work cooperatively with all regulatory agencies to address every environmental concern. On a daily basis, I personally witnessed the close interaction of BHP geologists, geochemists, hydrologists, engineers, and attorneys with technical consultants and state and federal officials. These meeting will continue through the life of the project...I, therefore, fully support the development of the Florence copper oxide deposit by the in situ technique."

Response: Comment noted.

Bill Hawes-Arizona State Mine Inspector (Comments related to ADEQ permit only)

14. Comment: "There appears to be adequate safeguards to prevent contamination of aquifers in the area. The project will have virtually no long term impact on the land it uses. It appears the land could be returned to agricultural use shortly after completion of mineral extraction activities...The State Mine Inspector recommends approval of this permit, as we can find nothing that will adversely affect the health and safety of Arizona's citizens."

Response: Comment noted.

Robert Kelm-resident of Florence

15. Comment: "It is my contention to favor the issuing of a permit by ADEQ and the EPA to BHP project north of Florence, for the following reasons. This is a model prototype operation and is dearly needed to succeed for the future of mining in the North American continent. Therefore the amount of money and effort will be more than ample. My recommendations are for any reason this project is terminated I favor the withdrawal of all operating permits pointedly and including the SX/EW (solvent extraction/electrowinning) plant."

Response: The permit contains pre-mining, mining, and post-mining requirements.

If, during the mine life, the permittee terminates the operation, the permittee will be required to meet all restoration, plugging and abandonment, and post-closure monitoring requirements that are outlined in the permit. For this reason, EPA will not withdraw the permit if BHP terminates the project.

EPA's Underground Injection Control (UIC) permit only regulates the subsurface activities (injection well construction, well integrity testing, well operation, zone restoration, plugging and abandonment, and groundwater monitoring). Therefore, EPA's UIC permit does not include the operation of the SX/EW plant. The Arizona Department of Environmental Quality (ADEQ) permit addresses the SX/EW plant.

Joe Williams-U.S. EPA, National Risk Management Research Laboratory, Ada, OK

16. Comment: "The TSC (Technology Support Center) is in agreement that requiring the modeling post-audit in the permit is a prudent and conservative approach. At the time of the post-audit, the conceptual and numerical model can subsequently be modified to reflect any changes deemed necessary through the evaluation of on-site data. The only concern that the TSC might have is that a follow-up post-audit later in the 15-year life of the mine might be appropriate. As an example, significant changes may not have occurred in the 5-year time frame that may occur in a 10-year time frame. Therefore, a second formal post-audit may be warranted that would account for the longer time frame."

Response: EPA-Region 9 concurs with TSC's recommendation to require a post-audit at 15 years after the commencement of mining. This additional requirement will be made to the permit.

Paul Osborne-U.S. EPA, Reg. 8, National Ground Water Expert

17. Comment: There should be more specific requirements for restoration. This may include using neutralizing agents, and timeframes for beginning the restoration process after the mining phase for a block has ceased.

Response: The permit allows the use of neutralizing agents to aid the closure process. However, the language under "Injection Fluid Limitations" and "Block-by-Block Closure" will be clarified.

EPA-Region 9 concurs with the comment to establish a time frame for

the commencement of block closure. The "Block-by-Block Closure" section of the permit (Part II, Section I) describes a close-as-you-go process, however, specific language is needed. EPA will require BHP to commence the rinsing program within 90 days after the completion of mining within a zone.

18. Comment: The number of wells used to demonstrate hydraulic control may not be adequate.

Response: BHP is required to conduct a 90-day demonstration of hydraulic control. BHP will begin mining a major portion of the first block and will measure head and conductivity in wells surrounding the zone. This will include a significantly greater number of wells than the 4 pairs that the permit requires throughout the life of the project. The data collected will be used to demonstrate whether using 4 pairs of hydraulic control monitoring wells is adequate, or inadequate. If 4 pairs are found to be inadequate, the permit may have to be modified (strengthened) in order to address this issue.

19. Comment: The operator should have one set of nested piezometers in each block.

Response: Due to the existing permit requirements to prevent and detect vertical excursions, nested piezometers were not included in the permit. BHP will be required to implement a Corehole Abandonment Plan within a 500-foot radius of each injection and recovery well. Immediately above the Middle Fine Grained Unit (MFGU), BHP will install conductivity probes in the cemented annulus of each injection and recovery well to ensure that any migration of process fluids up the backside of the wellbore will be detected. And finally, BHP will monitor water quality in all formations (a total of 31 water quality monitoring wells).

20. Comment: Sufficient groundwater data should be collected quarterly for anions, cations, and total dissolved solids (TDS) to allow development of trilinear plots. This will allow better analysis of potential excursions.

Response: As part of the monitoring program in the permit, BHP must monitor fluoride, magnesium, sulfate, TDS, pH, specific conductance, and temperature on a quarterly basis. These parameters are considered the best indicators of possible excursions because, in general, they will be

in high concentrations within the mining zone and are poorly attenuated by the formation. Trilinear plots may be used by BHP as part of their normal operations, however, this is not a permit requirement at this time. The listed suite of indicator constituents should detect any excursions. Furthermore, in addition to the quarterly sampling, a full geochemical analysis is required every 2 years at each monitoring well.

21. Comment: The injection and recovery well patterns should be defined.

Response: As part of the application, BHP submitted drawings depicting a typical cell block. Some of these drawings have been included as Appendix D of the permit. In short, the injection and recovery wells will be arranged in rows of adjacent 5-spots (1 injection well surrounded by 4 recovery wells). The wells will be approximately 50-100 feet apart. There will be about 10-15 injection and recovery wells per acre. Wells may be converted from injection wells to recovery wells, or visa versa.

22. Comment: There should be some discussion of the nature and purpose of the organics found in the raffinate fluids. It should be emphasized that the term raffinate is usually used to designate waste extraction fluids (i.e., spent lixiviant). The term lixiviant is used to describe the injection fluids.

Response: As stated in Response #3, above, the draft permit incorrectly equates the injectate with the fluid in the raffinate pond. The injectate is taken from the raffinate pond, however, the top of the raffinate pond will have a thin organic layer that will be removed by skimmers. This correction in terminology has been made from the draft to the final permit.

The organic is similar to kerosene and is used to isolate and plate 99.9 percent pure copper. The recovery wells deliver a copper-rich solution (i.e., pregnant leach solution) that consists of water, dissolved copper, and other dissolved minerals. The organic is used to form a complex with the copper. The organic-copper complex is lighter than water and can be separated from the water phase by a weir. The pH of the organic-copper solution is then lowered which breaks the organic-copper bond. The organic solution and copper solution have different densities and this mixture is also separated by a weir. The resulting pure copper

solution is then sent to an electrowinning facility. The "raffinate" is the water phase of the first separation process. Water taken from the raffinate pond is re-acidified and sent to the injection wells.

23. Comment: More details on the over-pumping controls is needed. In uranium in-situ projects, the percentage of extraction to injection is usually stipulated in the permit (e.g., a minimum extraction to injection of 105 percent).

Response: The permit requires that BHP initiate contingency plans if the volume injected exceeds the volume recovered for more than a 48-hour period, or any of the 4 hydraulic control monitoring wells show a flat or outward gradient for a 48-hour period. BHP estimates that approximately 2.5 percent recovery over injection will be required, however, this rate may vary throughout the mine area. In order to conserve water use while insuring an inward flow, as long as BHP successfully uses the two methods for verifying inward flow (recovery greater than injection, and inward flow measured by the 4 monitoring wells), BHP will be given the flexibility to adjust the over-pumping rate.

24. Comment: Wells are required to have mechanical integrity at all times per 40 CFR 144.51 (q). This should be added to Part II, Section E of the permit.

Response: Comment noted. This provision will be added to the mechanical integrity language in the permit.

25. Comment: It is recommended that the forecast composition of the injectate be attached as an official appendix of the permit.

Response: EPA-Region 9 concurs. The forecast composition (including organic concentrations) will be added to the permit under Appendix D. Appendix D will include the "Operations Plan" and the "Forecast Composition of the Injectate."

Chuck Seller-Florence Chamber of Commerce

26. Comment: "BHP Copper has been a very, very good neighbor and business-wise, a very good neighbor to Florence itself...They have been very involved in

the community and have done a number of things for the community...I cannot speak to any scientific or environmental other than what I have seen...I'm impressed with the attempts that BHP has made to comply with any and all environmental clauses. I feel that we could use more businesses in Florence with the sense of social responsibilities which BHP has shown."

Response: Comment noted.

Col. R. B. Rodke-resident of Florence

27. Comment: "...I'm a certified professional land man with the American Association of Petroleum Land Men...I have been in the land business, in mineral acquisitions, oil acquisitions, since 1945 and presently do part-time work for various companies on a consultant basis...

...when Continental started their operations out here...Continental spent a total of \$34 million on this project and drilled approximately 2,000 coreholes down to the copper-bearing formations in this entire area. These coreholes were approximately 3 inches in diameter and 11 to 13 hundred feet deep. The coreholes were left opened and not properly cemented when Continental did their operations, as they anticipated an open pit operation..."

Response: Under Part II, Section D of the UIC permit, prior to injecting into any well, BHP is required to plug and abandon all coreholes within 500 feet of any injection or recovery well. Pursuant to federal requirements, BHP has submitted a "Well and Corehole Abandonment Plan" and have performed modeling to assure that 500 feet is an adequate distance to prevent groundwater contamination through vertical conduits.

28. Comment "...Continental had me buy options to see the affect on the water, lowering the water, for five miles in each direction, north, south, east, and west from the pit location. They had drilled a mining shaft down to the copper and took out copper and put it through a foundry or processing plant that they built , a pilot plant, which they built and still stands at their present headquarters building...

...Their proposal to the farmers--in fact, they knew that they would lower the water supply by these suction wells around there to keep the pit dry. Their problem was how they could compensate the farmers for their loss of water. The first proposal was that they would pay the cost of deepening their wells, and Continental lowered their pumps. The second proposal was that they would pay the difference in the lack of water that the farmers lost due to this pumping operation as a compensation to the farmers. The third proposal was that they would pay the farmers the economic lost and crops lost from the lack of water due to this operation around the pit lowering the water...No farmer in their right mind considered entertaining either one of those. About that time Continental put this on hold because of the conflict with the San Carlos Water District and the Indians and the farmers on the lowering operations, they put the project on hold and began to pursue an uranium project over on the Navajo Reservation near Crownpoint..."

Response: Unlike open pit mining, the in situ approach does not require dewatering the mining zone. BHP estimates that the in situ mine will use less water than if the land was used for farming.

Currently, cotton is grown on the southern portion of the proposed mine site. If cotton were grown over the entire project area (the in situ field and evaporation pond area), cotton production would consume 500 to 600 acre-ft more water per year than the proposed mine.

29. Comment: "...My concern was the fact that these 2,000 coreholes out there were not properly plugged and that the water, the acid, would be coming up into the water. It goes to the path of least resistance...I live out southeast of here, Cactus Forest, and it won't affect me one iota. My water would be just as good 50 years from now as it will now. My concern was what would it do if flow of the water comes from the southeast down to the airport and north--this is Hallapane's water for Continental--and goes through this prospect to feed the corner of Felix and Arizona Farms Road, and goes north west to Queen Creek, that was the path of the Old Gila River millions and millions of years ago..."

Response: Responded to corehole issue at Response # 27, above.

30. Comment: "My concern is the effect that this operation would have with this acid

leaking into the water supply. I have noticed Magma's notice to the public and in talking with the neighbor, Paul Phillips, who's right west of this mining operation, they had told him it would only be a weak vinegar solution that they we're putting down into the formation to extract the copper out. I'm quite familiar with the in-situ process. It will work; it will work. Economically, it's a good way to recover copper. My only concern is that they are going to ruin the water supply from here on out. It won't affect me because I'm upstream from them, but from there to Queen Creek, once it's gone, it's gone."

**Response:** The UIC permit requires BHP to maintain hydraulic control (an inward flow or hydraulic sink), water quality monitoring wells surrounding the mine area at multiple depths, and contingency plans to be activated if excursions are detected. Furthermore, after mining a zone, the UIC permit requires BHP to restore each mining zone to primary drinking water standards, or the pre-mining background concentration. The effectiveness of the restoration will be verified by post-mining groundwater monitoring. These operational and closure requirements will ensure that underground sources of drinking water are not endangered during or after mining.

31. **Comment:** "...that's a fine project if it would work, but what if it doesn't work, and who's going to monitor the wells and tell them when they need to start pulling more. When they pull more water they are going to be affecting all these farmers and all this area around here, and they are going to have to lower their wells or run out of water."

**Response:** The UIC permit requires BHP to monitor hydraulic control continuously and monitor indicator constituents at 31 water quality wells on a quarterly basis. The results of the hydraulic control and water quality monitoring are due to EPA at the end of each quarter.

The permit also details contingency plans for the loss of hydraulic control or water quality exceedances. If there is a loss of hydraulic control or there is an exceedance of a water quality parameter, BHP must initiate specific actions within specified timeframes or they will be in noncompliance with their permit.

As addressed in Response # 28, during normal operations, the project would consume less water than if the land was used for cotton farming.

If there is a loss of hydraulic control or there is a confirmed excursion, more water will be pumped to recover the lost fluids. However, if BHP complies with the operations plan as required in the permit at Part II, Section E.1, these events should be very infrequent or nonexistent and therefore the impacts on water supply should be minimal.

32. Comment: "...I wasn't impressed with the real honesty of BHP in telling the people that this was a mild vinegar solution, when in fact it is 10,000 gallons of concentrated sulfuric acid that they will be injecting daily in this hole. They're building a 150,000 gallon acid supply type out there on the premises, though a 15-day supply. Now, 10,000 gallons of acid times 33,000 times 365--I don't know. You can multiply it out, but it's one hell of a lot of acid to be injected into the drinking water of the people north and northwest as well as the people here in Florence...The project will work if it were in an area that weren't affecting the drinking water for generations to come."

Response: The permit does not authorize BHP to inject concentrated sulfuric acid into the mining zone. Under permit condition II.E.4, "Injection Fluid Limitation," BHP is only authorized to inject fresh groundwater for well testing and restoration, neutralizing agents to aid the restoration process, and DILUTE sulfuric acid during mining. Concentrated sulfuric acid will only be used to make the injectate (a dilute sulfuric acid solution with an acidity similar to vinegar). Specifically, the injectate will be composed of 8 to 10 g/L of sulfuric acid (less than 1 percent by weight) and will have a pH of approximately 2.

33. Comment: "...if they're so sure this deal would work, they should not be hesitant to put up a \$500 million bond, that if the deal doesn't work, they will be responsible for that, not just their word...A bond of \$500 million wouldn't cost them very much, they don't have to put up the cash, they would have to put up a small fee. That way, if it doesn't--we have an Australian Corporation...If they should walk away from this deal, you would have international lawsuits that you couldn't handle."

Response: BHP Copper submitted a statement of financial responsibility (dated Sept. 24, 1996 and signed by John T. Perry, Vice President of BHP Copper Company) to EPA for the Restoration and Plugging and Abandonment requirements outlined in Section I of the permit. BHP is

required to maintain the financial capability to meet all subsurface closure costs throughout the life of the project. BHP has also established financial responsibility with ADEQ for the closure and reclamation of the surface plant and facilities.

Leslie Wakefield-resident of Florence

34. Comment: "...my concern is Motorola. I do not want to see the State grant a variance for any pollutants that they do cause. In other words, if you buy property in certain areas in Maricopa County you have to sign a statement stating that you will not sue Motorola for any birth defects, et cetera, et cetera. I don't believe that we are going to be able to contain all these pollutants. If you do, that's wonderful; if you don't, I don't believe the State legislature should make any move to preclude people who have suffered loss from suing Magma or the State or all of them."

Response: Under federal regulations, BHP Coppér is required to contain all mining fluids within the 3-dimensional boundaries depicted in Attachment A of the permit (i.e., the aquifer exemption zone). BHP is also required to maintain hydraulic control (flow must be inward), monitor and report groundwater quality surrounding the site, and restore all mining zones to federal drinking water standards. Although no excursions are anticipated, if there is an excursion during the 15-year mine life, BHP must initiate contingency plans to capture the excursion. If BHP fails to initiate contingency plans and allows mining fluids to migrate beyond the exemption boundary, BHP will be in violation of Underground Injection Control (UIC) regulations (codified at 40 CFR 144 and 146) and subject to enforcement action under the Safe Drinking Water Act. U.S. EPA (a "federal" agency) cannot require the State to take enforcement action for the contamination of drinking water sources, however, EPA may take independent enforcement actions when drinking water sources are endangered.

Draft permit changes:

This section summarizes the location and content of the changes from the draft permit to the final permit.

throughout permit

\*changed "15-year mine life" to "approximate 15-year mine life"

Section B.3, page 7

\*added requirement to commence closure within 90 days after mining a zone

\*changed "block" to "zone"

Section C.2, page 8

\*added an alternative method for well construction

\*deleted "seven month" from cement test requirement

Section C.3, page 8

\*added requirement to put annular conductivity devices as close to MFGU as possible and no more than 20 feet above the MFGU

Section E.2, page 9

\*added requirement to maintain mechanical integrity at all times

\*added an alternative method to MIT Part I

Section E.4, page 11

\*expanded injection fluid limitation to include fresh water for well testing and restoration

\*added "Forecast Composition of Injectate" under Appendix D

\*changed organic monitoring program to target injectate, not raffinate pond

Section F, Tables 1 and 2, pages 14-17

\*added footnote to clarify "Aquifer Quality Limit"

\*changed "raffinate" to "injectate" in footnote

Section F.3, page 17, page 17

\*added note to allow 2 months of nondetectable organic concentrations for organic baseline

Section F, page 18, Table 3

\*labeled monitoring schedule, "Table 3"

\*deleted timeframes from table titles (timeframes included in text)

\*modified Level 1 sampling frequency from "at least once per quarter" to "at least

once per quarter for the first 2 years after closure and then annually thereafter"

Section F.7, page 19

\*changed "block" to "zone"

\*added provision that hydraulic control demonstration is of adequate scale

Section F.8, page 19

\*modified "raffinate" monitoring to be "injectate" monitoring

Section G, page 20

\*added requirement to include "summary of closure operations" in quarterly reports

Section I, pages 24-25

\*added requirement to commence closure within 90 days after mining a zone

\*changed "block" to "zone"

\*clarified restoration requirement to be MCLs, OR pre-mining background concentration

Section J, page 25

\*added 15-year audit

Section K, page 26

\*added clause that keeps UIC permit under authority of EPA

Distribution of final action by document

*Received copy of FINAL permit, aquifer exemption, and response to comments:*

John T. Kline, Project Manager, BHP Copper  
Shirin Tolle, Arizona Department of Environmental Quality  
Robert Kelm, resident of Florence  
Chuck Seller, Florence Chamber of Commerce  
Col. R. B. Rodke, resident of Florence  
Leslie Wakefield, resident of Florence  
Paul Osborne, U.S. EPA, Reg. 8, National Ground Water Expert  
Joe Williams, U.S. EPA, National Risk Management Research Laboratory

*Received copy of cover letter:*

Jacquelynn Ruff, Attorney, Wilmer, Cutler & Pickering  
Ann Valdo Howard, Arizona State Parks, SHPO  
Ivan Makil, President, Salt River Indian Community  
Alex Ramon, Chairman, Tohono O'odham Nation  
Ferrell Secakuku, Chairman, Hopi Tribal Council  
Carol Gleichman, Advisory Council  
Elaine Notah, Gila River Indian Community  
Thomas J. Lennon, Ph.D, President, WCRM  
Martin Antone Sr., President, Ak Chin Indian Community  
Mary Thomas, Governor, Gila River Indian Community  
Kevin J. Ryan, Inter Tribal Council of Arizona, Inc.  
Dr. John C. Raveslout, Gila River Indian Community  
Barbara Heslin, Arizona Game & Fish Department  
Sam F. Spiller, U.S. Department of the Interior, Fish and Wildlife Service  
Leigh Jenkins, Director, Cultural Preservation Office, Hopi Tribe  
Ken Rosen, Arizona State Land Department  
Marsha Day, Mayor of Florence  
Ralph Esquera, San Carlos Irrigation and Drainage District  
Emmit Rankin, adjacent landowner (east of project)  
Scott L. Riggins, adjacent landowner (west of project)  
Duane Yantorno, ASARCO, adjacent landowner (west of project)  
Arizona Department of Water Resources (ADWR)  
Mike Rogers, Pinal County Air Quality Board  
Pinal County Board of Supervisors  
Bill Hawes, Arizona State Mine Inspector  
Jeff R. Shaw  
Elaine and Rob Fischer, residents of Florence  
Brema Mercer, resident of Florence  
Kay Mandell, Mandell and Associates  
Steve Glass, Environet  
Katie Montano, resident of Florence  
Jerry Ravert, resident of Florence

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**Response:** Under permit condition II.F.2.d, the Aquifer Quality Limits (AQLs) are termed "federal" AQLs pursuant to federal regulations (40 CFR 141). For clarification, this permit condition will be cited in the footnote of the tables.

5. **Comment:** As discussed at earlier meetings, 2 months of baseline data collection for process-related organics is sufficient, as long as the organics are nondetectable.
- Response:** EPA concurs. Under permit condition II.F.3.a (Baseline Data and Statistical Methods), language will be added to clarify that collecting 2 months of nondetectable baseline data for process-related organics is acceptable.
6. **Comment:** EPA should be given a maximum of 45 days to review the groundwater quality baseline data. If EPA does not deny the baseline data within 45 days of receipt, the data should be considered acceptable.
- Response:** A 45-day review period is acceptable to EPA, however, EPA does not consider this to be an appropriate permit condition.
7. **Comment:** BHP requests that during the 30-year post-closure period, the Level 1 constituents are measured every quarter for 2 years. After 2 years of post-closure monitoring, the Level 1 sampling frequency should be reduced to once per year.
- Response:** EPA concurs with this request. The proposed sampling modification is minor and should not affect the goal of the monitoring program.
8. **Comment:** In regards to the first block demonstration (Part II, F.7) the conductivity monitoring should be clarified to read "electrical conductivity" and the "block" should be defined as "zone." BHP would like to use enough wells to demonstrate the concept of hydraulic control but does not feel that is necessary to use an entire block.
- Response:** EPA will make the changes to the permit language as an entire block is not necessarily required to make a demonstration of hydraulic control. Specifically, the term "block" will be changed to "zone." However, the requirement will contain some additional language that will require BHP to show that an adequate number of wells were utilized to demonstrate hydraulic control.
9. **Comment:** "Block-by-block" should be changed to "Zone-by-Zone" and the

wording should be changed to reflect varied mining and closure times within a zone.

Response: EPA concurs. EPA will make changes to the language in order to give BHP some flexibility in operation and closure times. However, EPA will also add language to the permit that clarifies that BHP must use a "close-as-you-go" approach. That is, after mining a zone, BHP must commence closure operations within the zone promptly (within 90 days).

10. Comment: The restoration requirements should reflect the fact that some constituents currently exceed the MCL (e.g., nitrate). The permit should require the operator to return the zone to MCLs, OR to the background concentration.

Response: EPA concurs. EPA will make this clarification under permit conditions II.I.1 and II.I.2 (Restoration and Plugging & Abandonment).

11. Comment: Part III, Section A of the permit should be modified to allow the injection of non-leach solutions.

Response: EPA understands that non-leach solutions, such as, neutralizing agents and ground water will be used during pre-operational and closure periods. EPA will expand the injectate fluid description under "Injection Fluid Limitation" (Part II, Section E) to include well testing and closure periods. However, the section "Effect of Permit" does not appear to be the correct location to make this clarification. "Effect of Permit" states that "the permittee is allowed to engage in underground injection well construction in accordance with the conditions of the permit." This reference back to the specific permit conditions should be adequate in describing acceptable injection fluids.

12. Comment: BHP has agreed to use sulfate as an indicator ion but wants to emphasize that sulfate does not have a primary MCL.

Response: EPA understands that sulfate does not currently have a primary MCL. However, EPA is investigating the health effects of sulfate and in the future may establish an MCL for this parameter. Furthermore, pursuant to 40 CFR 144.12, BHP must ensure that in addition to constituents

with MCLs, constituents without MCLs shall not impact USDWs in a way that could cause an adverse impact to the health of persons. This requirement is stated at Part II, Section I.1.b of the permit.

**Corolla Hoag-BHP Copper**

13. **Comment:** "BHP staff have a made a commitment to work cooperatively with all regulatory agencies to address every environmental concern. On a daily basis, I personally witnessed the close interaction of BHP geologists, geochemists, hydrologists, engineers, and attorneys with technical consultants and state and federal officials. These meeting will continue through the life of the project...I, therefore, fully support the development of the Florence copper oxide deposit by the in situ technique."

**Response:** Comment noted.

**Bill Hawes-Arizona State Mine Inspector (Comments related to ADEQ permit only)**

14. **Comment:** "There appears to be adequate safeguards to prevent contamination of aquifers in the area. The project will have virtually no long term impact on the land it uses. It appears the land could be returned to agricultural use shortly after completion of mineral extraction activities...The State Mine Inspector recommends approval of this permit, as we can find nothing that will adversely affect the health and safety of Arizona's citizens."

**Response:** Comment noted.

**Robert Kelm-resident of Florence**

15. **Comment:** "It is my contention to favor the issuing of a permit by ADEQ and the EPA to BHP project north of Florence, for the following reasons. This is a model prototype operation and is dearly needed to succeed for the future of mining in the North American continent. Therefore the amount of money and effort will be more than ample. My recommendations are for any reason this project is terminated I favor the withdrawal of all operating permits pointedly and including the SX/EW (solvent extraction/electrowinning) plant."

**Response:** The permit contains pre-mining, mining, and post-mining requirements.

If, during the mine life, the permittee terminates the operation, the permittee will be required to meet all restoration, plugging and abandonment, and post-closure monitoring requirements that are outlined in the permit. For this reason, EPA will not withdraw the permit if BHP terminates the project.

EPA's Underground Injection Control (UIC) permit only regulates the subsurface activities (injection well construction, well integrity testing, well operation, zone restoration, plugging and abandonment, and groundwater monitoring). Therefore, EPA's UIC permit does not include the operation of the SX/EW plant. The Arizona Department of Environmental Quality (ADEQ) permit addresses the SX/EW plant.

Joe Williams-U.S. EPA, National Risk Management Research Laboratory, Ada, OK

16. Comment: "The TSC (Technology Support Center) is in agreement that requiring the modeling post-audit in the permit is a prudent and conservative approach. At the time of the post-audit, the conceptual and numerical model can subsequently be modified to reflect any changes deemed necessary through the evaluation of on-site data. The only concern that the TSC might have is that a follow-up post-audit later in the 15-year life of the mine might be appropriate. As an example, significant changes may not have occurred in the 5-year time frame that may occur in a 10-year time frame. Therefore, a second formal post-audit may be warranted that would account for the longer time frame."

Response: EPA-Region 9 concurs with TSC's recommendation to require a post-audit at 15 years after the commencement of mining. This additional requirement will be made to the permit.

Paul Osborne-U.S. EPA, Reg. 8, National Ground Water Expert

17. Comment: There should be more specific requirements for restoration. This may include using neutralizing agents, and timeframes for beginning the restoration process after the mining phase for a block has ceased.

Response: The permit allows the use of neutralizing agents to aid the closure process. However, the language under "Injection Fluid Limitations" and "Block-by-Block Closure" will be clarified.

EPA-Region 9 concurs with the comment to establish a time frame for

the commencement of block closure. The "Block-by-Block Closure" section of the permit (Part II, Section I) describes a close-as-you-go process, however, specific language is needed. EPA will require BHP to commence the rinsing program within 90 days after the completion of mining within a zone.

18. **Comment:** The number of wells used to demonstrate hydraulic control may not be adequate.

**Response:** BHP is required to conduct a 90-day demonstration of hydraulic control. BHP will begin mining a major portion of the first block and will measure head and conductivity in wells surrounding the zone. This will include a significantly greater number of wells than the 4 pairs that the permit requires throughout the life of the project. The data collected will be used to demonstrate whether using 4 pairs of hydraulic control monitoring wells is adequate, or inadequate. If 4 pairs are found to be inadequate, the permit may have to be modified (strengthened) in order to address this issue.

19. **Comment:** The operator should have one set of nested piezometers in each block.

**Response:** Due to the existing permit requirements to prevent and detect vertical excursions, nested piezometers were not included in the permit. BHP will be required to implement a Corehole Abandonment Plan within a 500-foot radius of each injection and recovery well. Immediately above the Middle Fine Grained Unit (MFGU), BHP will install conductivity probes in the cemented annulus of each injection and recovery well to ensure that any migration of process fluids up the backside of the wellbore will be detected. And finally, BHP will monitor water quality in all formations (a total of 31 water quality monitoring wells).

20. **Comment:** Sufficient groundwater data should be collected quarterly for anions, cations, and total dissolved solids (TDS) to allow development of trilinear plots. This will allow better analysis of potential excursions.

**Response:** As part of the monitoring program in the permit, BHP must monitor fluoride, magnesium, sulfate, TDS, pH, specific conductance, and temperature on a quarterly basis. These parameters are considered the best indicators of possible excursions because, in general, they will be

in high concentrations within the mining zone and are poorly attenuated by the formation. Trilinear plots may be used by BHP as part of their normal operations, however, this is not a permit requirement at this time. The listed suite of indicator constituents should detect any excursions. Furthermore, in addition to the quarterly sampling, a full geochemical analysis is required every 2 years at each monitoring well.

21. Comment: The injection and recovery well patterns should be defined.

Response: As part of the application, BHP submitted drawings depicting a typical cell block. Some of these drawings have been included as Appendix D of the permit. In short, the injection and recovery wells will be arranged in rows of adjacent 5-spots (1 injection well surrounded by 4 recovery wells). The wells will be approximately 50-100 feet apart. There will be about 10-15 injection and recovery wells per acre. Wells may be converted from injection wells to recovery wells, or visa versa.

22. Comment: There should be some discussion of the nature and purpose of the organics found in the raffinate fluids. It should be emphasized that the term raffinate is usually used to designate waste extraction fluids (i.e., spent lixiviant). The term lixiviant is used to describe the injection fluids.

Response: As stated in Response #3, above, the draft permit incorrectly equates the injectate with the fluid in the raffinate pond. The injectate is taken from the raffinate pond, however, the top of the raffinate pond will have a thin organic layer that will be removed by skimmers. This correction in terminology has been made from the draft to the final permit.

The organic is similar to kerosene and is used to isolate and plate 99.9 percent pure copper. The recovery wells deliver a copper-rich solution (i.e., pregnant leach solution) that consists of water, dissolved copper, and other dissolved minerals. The organic is used to form a complex with the copper. The organic-copper complex is lighter than water and can be separated from the water phase by a weir. The pH of the organic-copper solution is then lowered which breaks the organic-copper bond. The organic solution and copper solution have different densities and this mixture is also separated by a weir. The resulting pure copper

solution is then sent to an electrowinning facility. The "raffinate" is the water phase of the first separation process. Water taken from the raffinate pond is re-acidified and sent to the injection wells.

23. Comment: More details on the over-pumping controls is needed. In uranium in-situ projects, the percentage of extraction to injection is usually stipulated in the permit (e.g., a minimum extraction to injection of 105 percent).

Response: The permit requires that BHP initiate contingency plans if the volume injected exceeds the volume recovered for more than a 48-hour period, or any of the 4 hydraulic control monitoring wells show a flat or outward gradient for a 48-hour period. BHP estimates that approximately 2.5 percent recovery over injection will be required, however, this rate may vary throughout the mine area. In order to conserve water use while insuring an inward flow, as long as BHP successfully uses the two methods for verifying inward flow (recovery greater than injection, and inward flow measured by the 4 monitoring wells), BHP will be given the flexibility to adjust the over-pumping rate.

24. Comment: Wells are required to have mechanical integrity at all times per 40 CFR 144.51 (q). This should be added to Part II, Section E of the permit.

Response: Comment noted. This provision will be added to the mechanical integrity language in the permit.

25. Comment: It is recommended that the forecast composition of the injectate be attached as an official appendix of the permit.

Response: EPA-Region 9 concurs. The forecast composition (including organic concentrations) will be added to the permit under Appendix D. Appendix D will include the "Operations Plan" and the "Forecast Composition of the Injectate."

Chuck Seller-Florence Chamber of Commerce

26. Comment: "BHP Copper has been a very, very good neighbor and business-wise, a very good neighbor to Florence itself...They have been very involved in

the community and have done a number of things for the community...I cannot speak to any scientific or environmental other than what I have seen...I'm impressed with the attempts that BHP has made to comply with any and all environmental clauses. I feel that we could use more businesses in Florence with the sense of social responsibilities which BHP has shown."

Response: Comment noted.

Col. R. B. Rodke-resident of Florence

27. Comment: "...I'm a certified professional land man with the American Association of Petroleum Land Men...I have been in the land business, in mineral acquisitions, oil acquisitions, since 1945 and presently do part-time work for various companies on a consultant basis...

...when Continental started their operations out here...Continental spent a total of \$34 million on this project and drilled approximately 2,000 coreholes down to the copper-bearing formations in this entire area. These coreholes were approximately 3 inches in diameter and 11 to 13 hundred feet deep. The coreholes were left opened and not properly cemented when Continental did their operations, as they anticipated an open pit operation..."

Response: Under Part II, Section D of the UIC permit, prior to injecting into any well, BHP is required to plug and abandon all coreholes within 500 feet of any injection or recovery well. Pursuant to federal requirements, BHP has submitted a "Well and Corehole Abandonment Plan" and have performed modeling to assure that 500 feet is an adequate distance to prevent groundwater contamination through vertical conduits.

28. Comment "...Continental had me buy options to see the affect on the water, lowering the water, for five miles in each direction, north, south, east, and west from the pit location. They had drilled a mining shaft down to the copper and took out copper and put it through a foundry or processing plant that they built , a pilot plant, which they built and still stands at their present headquarters building...

...Their proposal to the farmers--in fact, they knew that they would lower the water supply by these suction wells around there to keep the pit dry. Their problem was how they could compensate the farmers for their loss of water. The first proposal was that they would pay the cost of deepening their wells, and Continental lowered their pumps. The second proposal was that they would pay the difference in the lack of water that the farmers lost due to this pumping operation as a compensation to the farmers. The third proposal was that they would pay the farmers the economic lost and crops lost from the lack of water due to this operation around the pit lowering the water...No farmer in their right mind considered entertaining either one of those. About that time Continental put this on hold because of the conflict with the San Carlos Water District and the Indians and the farmers on the lowering operations, they put the project on hold and began to pursue an uranium project over on the Navajo Reservation near Crownpoint..."

Response: Unlike open pit mining, the in situ approach does not require dewatering the mining zone. BHP estimates that the in situ mine will use less water than if the land was used for farming.

Currently, cotton is grown on the southern portion of the proposed mine site. If cotton were grown over the entire project area (the in situ field and evaporation pond area), cotton production would consume 500 to 600 acre-ft more water per year than the proposed mine.

29. Comment: "...My concern was the fact that these 2,000 coreholes out there were not properly plugged and that the water, the acid, would be coming up into the water. It goes to the path of least resistance...I live out southeast of here, Cactus Forest, and it won't affect me one iota. My water would be just as good 50 years from now as it will now. My concern was what would it do if flow of the water comes from the southeast down to the airport and north--this is Hallapane's water for Continental--and goes through this prospect to feed the corner of Felix and Arizona Farms Road, and goes north west to Queen Creek, that was the path of the Old Gila River millions and millions of years ago..."

Response: Responded to corehole issue at Response # 27, above.

30. Comment: "My concern is the effect that this operation would have with this acid

leaking into the water supply. I have noticed Magma's notice to the public and in talking with the neighbor, Paul Phillips, who's right west of this mining operation, they had told him it would only be a weak vinegar solution that they we're putting down into the formation to extract the copper out. I'm quite familiar with the in-situ process. It will work; it will work. Economically, it's a good way to recover copper. My only concern is that they are going to ruin the water supply from here on out. It won't affect me because I'm upstream from them, but from there to Queen Creek, once it's gone, it's gone."

**Response:** The UIC permit requires BHP to maintain hydraulic control (an inward flow or hydraulic sink), water quality monitoring wells surrounding the mine area at multiple depths, and contingency plans to be activated if excursions are detected. Furthermore, after mining a zone, the UIC permit requires BHP to restore each mining zone to primary drinking water standards, or the pre-mining background concentration. The effectiveness of the restoration will be verified by post-mining groundwater monitoring. These operational and closure requirements will ensure that underground sources of drinking water are not endangered during or after mining.

31. **Comment:** "...that's a fine project if it would work, but what if it doesn't work, and who's going to monitor the wells and tell them when they need to start pulling more. When they pull more water they are going to be affecting all these farmers and all this area around here, and they are going to have to lower their wells or run out of water."

**Response:** The UIC permit requires BHP to monitor hydraulic control continuously and monitor indicator constituents at 31 water quality wells on a quarterly basis. The results of the hydraulic control and water quality monitoring are due to EPA at the end of each quarter.

The permit also details contingency plans for the loss of hydraulic control or water quality exceedances. If there is a loss of hydraulic control or there is an exceedance of a water quality parameter, BHP must initiate specific actions within specified timeframes or they will be in noncompliance with their permit.

As addressed in Response # 28, during normal operations, the project would consume less water than if the land was used for cotton farming.

If there is a loss of hydraulic control or there is a confirmed excursion, more water will be pumped to recover the lost fluids. However, if BHP complies with the operations plan as required in the permit at Part II, Section E.1, these events should be very infrequent or nonexistent and therefore the impacts on water supply should be minimal.

32. Comment: "...I wasn't impressed with the real honesty of BHP in telling the people that this was a mild vinegar solution, when in fact it is 10,000 gallons of concentrated sulfuric acid that they will be injecting daily in this hole. They're building a 150,000 gallon acid supply type out there on the premises, though a 15-day supply. Now, 10,000 gallons of acid times 33,000 times 365--I don't know. You can multiply it out, but it's one hell of a lot of acid to be injected into the drinking water of the people north and northwest as well as the people here in Florence...The project will work if it were in an area that weren't affecting the drinking water for generations to come."

Response: The permit does not authorize BHP to inject concentrated sulfuric acid into the mining zone. Under permit condition II.E.4, "Injection Fluid Limitation," BHP is only authorized to inject fresh groundwater for well testing and restoration, neutralizing agents to aid the restoration process, and DILUTE sulfuric acid during mining. Concentrated sulfuric acid will only be used to make the injectate (a dilute sulfuric acid solution with an acidity similar to vinegar). Specifically, the injectate will be composed of 8 to 10 g/L of sulfuric acid (less than 1 percent by weight) and will have a pH of approximately 2.

33. Comment: "...if they're so sure this deal would work, they should not be hesitant to put up a \$500 million bond, that if the deal doesn't work, they will be responsible for that, not just their word...A bond of \$500 million wouldn't cost them very much, they don't have to put up the cash, they would have to put up a small fee. That way, if it doesn't--we have an Australian Corporation...If they should walk away from this deal, you would have international lawsuits that you couldn't handle."

Response: BHP Copper submitted a statement of financial responsibility (dated Sept. 24, 1996 and signed by John T. Perry, Vice President of BHP Copper Company) to EPA for the Restoration and Plugging and Abandonment requirements outlined in Section I of the permit. BHP is

required to maintain the financial capability to meet all subsurface closure costs throughout the life of the project. BHP has also established financial responsibility with ADEQ for the closure and reclamation of the surface plant and facilities.

Leslie Wakefield-resident of Florence

34. Comment: "...my concern is Motorola. I do not want to see the State grant a variance for any pollutants that they do cause. In other words, if you buy property in certain areas in Maricopa County you have to sign a statement stating that you will not sue Motorola for any birth defects, et cetera, et cetera. I don't believe that we are going to be able to contain all these pollutants. If you do, that's wonderful; if you don't, I don't believe the State legislature should make any move to preclude people who have suffered loss from suing Magma or the State or all of them."

Response: Under federal regulations, BHP Copper is required to contain all mining fluids within the 3-dimensional boundaries depicted in Attachment A of the permit (i.e., the aquifer exemption zone). BHP is also required to maintain hydraulic control (flow must be inward), monitor and report groundwater quality surrounding the site, and restore all mining zones to federal drinking water standards. Although no excursions are anticipated, if there is an excursion during the 15-year mine life, BHP must initiate contingency plans to capture the excursion. If BHP fails to initiate contingency plans and allows mining fluids to migrate beyond the exemption boundary, BHP will be in violation of Underground Injection Control (UIC) regulations (codified at 40 CFR 144 and 146) and subject to enforcement action under the Safe Drinking Water Act. U.S. EPA (a "federal" agency) cannot require the State to take enforcement action for the contamination of drinking water sources, however, EPA may take independent enforcement actions when drinking water sources are endangered.

Draft permit changes:  
This section summarizes the location and content of the changes from the draft permit to the final permit.

throughout permit  
\*changed "15-year mine life" to "approximate 15-year mine life"

Section B.3, page 7  
\*added requirement to commence closure within 90 days after mining a zone  
\*changed "block" to "zone"

Section C.2, page 8  
\*added an alternative method for well construction  
\*deleted "seven month" from cement test requirement

Section C.3, page 8  
\*added requirement to put annular conductivity devices as close to MFGU as possible  
and no more than 20 feet above the MFGU

Section E.2, page 9  
\*added requirement to maintain mechanical integrity at all times  
\*added an alternative method to MIT Part I

Section E.4, page 11  
\*expanded injection fluid limitation to include fresh water for well testing and  
restoration  
\*added "Forecast Composition of Injectate" under Appendix D  
\*changed organic monitoring program to target injectate, not raffinate pond

Section F, Tables 1 and 2, pages 14-17  
\*added footnote to clarify "Aquifer Quality Limit"  
\*changed "raffinate" to "injectate" in footnote

Section F.3, page 17, page 17  
\*added note to allow 2 months of nondetectable organic concentrations for organic  
baseline

Section F, page 18, Table 3  
\*labeled monitoring schedule, "Table 3"  
\*deleted timeframes from table titles (timeframes included in text)  
\*modified Level 1 sampling frequency from "at least once per quarter" to "at least

once per quarter for the first 2 years after closure and then annually thereafter"

Section F.7, page 19

\*changed "block" to "zone"

\*added provision that hydraulic control demonstration is of adequate scale

Section F.8, page 19

\*modified "raffinate" monitoring to be "injectate" monitoring

Section G, page 20

\*added requirement to include "summary of closure operations" in quarterly reports

Section I, pages 24-25

\*added requirement to commence closure within 90 days after mining a zone

\*changed "block" to "zone"

\*clarified restoration requirement to be MCLs, OR pre-mining background concentration

Section J, page 25

\*added 15-year audit

Section K, page 26

\*added clause that keeps UIC permit under authority of EPA