Exhibit 65

From: Edwin Pond
To: Bunkers, Mel; Casey, Robert
Date: 10/15/2003 4:29:26 PM
Subject: BHP Copper Cities Sampling Report

Gentlemen:

I noticed while reviewing the sampling report that the Copper Cities deep pit was not a hydrologic sink at the time of the sampling and report preparation. BHP even admits such in the text of the report. Therefore, we should add an additional requirement for them to continue water level monitoring of the pit and surrounding wells, and to develop a plan for bringing down the pit water level to a point where a sink is re-established. I believe this could also be accomplished via a letter of agreement, and the NOV could still be closed out. This further confirms my suspicion that there is migration away from the pit and the issue needs to be dealt with. This can be accomplished via the WQARF program, as long as they will commit to our desires and a written agreement is obtained from BHP.

Give me a call if you have any questions or comments. I did not have time to conduct a thorough water quality review over time, but the current (or recent) data supports that conclusion as well. I'll see you at 10:00 AM tomorrow morning. What room are we meeting in?

Ed Pond

Exhibit 66

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us

Stephen A. Owens
Director

Notice of Administrative Deficiencies

August 4, 2004

Wayne Fuller
BHP Copper/Pinto Valley Operations
P.O. Box 100
Miami, AZ 85539

RE: Aquifer Protection Permit (APP) Other Amendment Application - Administrative Review, BHP - Copper Cities Deep Pit

Inventory Number	101888	LTF ID:	33308
USAS Number:	040042-01	Place ID:	1675

Dear Mr. Fuller:

ADEQ review of your application referenced above is subject to the requirements of the licensing time frames statute under Arizona Revised Statutes (A.R.S.) § 41-1072 through § 41-1079 and the licensing time frames rules under Arizona Administrative Code (A.A.C.) R18-1-501 through R18-1-525. During the course of review of your application, ADEQ has determined that your application is not administratively complete in accordance with the licensing time frames statute and rules and does not contain all application components required by statute or rule and necessary for ADEQ to grant the license you requested.

This letter is the written notification required under ARS § 41-1074 and A.A.C. R18-1-503(C). This determination causes the running of days within all time frames on your application to suspend until you respond with all information identified on the comprehensive list of specific deficiencies attached to this letter.

You may, in lieu of submitting some or all of the components identified on the list, submit whatever information you believe necessary to support the issuance of the permit you requested along with a timely written "notice of intent to rely on the application components as submitted" under A.A.C. R18-1-205(B) and R18-1-520. A timely notice is one submitted prior to ADEQ making a licensing decision on your application and submitted within two months of this letter. Upon receipt of such notice, ADEQ must either (1) rescind or modify its request for the application component or components objected to in your notice or (2) make a licensing decision. Also, if the running of days within the time frames is suspended, receipt of a timely notice by ADEQ will cause the running of days to resume.

Please respond to the attached deficiencies no later than November 2, 2004 so that we may proceed with our review. Please contact me at (602) 771-4385 if you have any questions regarding this notice or the status of your application.

Sincerely,

Jason D. Jones, Project Manager
Water Permits Section
Water Quality Division

attachment

cc: Eric Wilson, Manager, Mining Unit, Water Permits Section
Lynne Dekarske, Administrative Assistant III, Water Permits Section
Jennifer Widlowski, Hydrologist, Mining Unit, Water Permits Section
Kuldip Khunkhun, Engineer, Mining Unit, Water Permits Section
Ed Pond, Project Manager, Remedial Projects Unit, Superfund Section
Robert Casey, Manager, Enforcement Unit, Water Quality Compliance Section

MU04:0129

List of Specific Deficiencies

Attachment to the Notice of Administrative Deficiencies dated August 4, 2004

1. Hydrographs of all measured pit lake elevations for the Copper Cities Deep Pit (CC Deep Pit) for the last ten years.

2. Hydrographs of water levels in all wells on the south and east side of the CC Deep Pit over the last ten years or more and all wells monitored over the life of the Groundwater Quality Protection Permit (GWQPP) and the Aquifer Protection Permit (APP).

3. Hydrographs of key water quality parameters (pH, Al, Cd, Cu, F, Fe, SO_4, Zn, U, and TDS) for all of the wells on the east and south side of the CC Deep Pit and all wells monitored over the life of the GWQPP, the APP and for the WQARF investigations.

4. Hydrographs of key water quality parameters (pH, Al, Cd, Cu, F, Fe, SO_4, Zn, U, and TDS) for the CC Deep Pit and the tailings slurry monitoring conduced under the GWQPP, the APP and for the WQARF investigations..

5. Well construction diagrams showing screened intervals of all wells surrounding the CC Deep Pit, plotted on one page, at an appropriate scale, for comparison purposes.

6. Rainfall records and rainfall hydrograph records vs. time for the last ten years from the Copper Cities Mine or nearest rain gauge.

7. Un-contoured quarterly water level maps (plotted on an appropriate base map) over time for the time period covering 1994 to the present for all wells monitored under the GWQPP, the APP and for the WQARF investigations.

8. Installation of nested well groups on the south and east side of the CC Deep Pit that document the potentiometric relationships between shallow, mid, and deep screened wells. These wells can then serve as water level (and water quality) monitoring wells for the CC Deep Pit for the APP and WQARF programs in the future.

9. A hydrologic analysis and water balance of the CC Deep Pit that establishes, in conjunction with item H above, the maximum water level that the pit can be operated and still maintain a hydrologic sink.

10. A hydrologic analysis of the amount of storage required in the pit as a result of various design storms such as the 10-year, 24-hour; 25-year, 24-hour; 50-year, 24-hour; and the 100-year, 24-hour storm events, or some variation of storm events that might be likely to occur such as back-to-back storms that can dump several inches of rain in the area over short time periods.

11. A water management plan for the CC Deep Pit that includes the details and methods to

reuse pit waters, consumptively use pit waters, enhance evaporation of pit water and/or water inflows into the pit, pumping capabilities, and the details of pumping equipment used to control pit lake levels. The plan should also include estimates of the time required to bring the pit lake levels back to the level required to maintain the pit as a hydrologic sink (once that level has been determined) following periods when emergency storage is required. These estimates should be for the amount of inflows into the pit for the various design storms discussed above (10, 25, 50, and 100-year storm events or other possible scenarios).

13. Electronic copies of all data sets and all hydrographs in an Excel format.

14. Cross sections illustrating the horizontal and vertical extent of the fill material in the CC Deep Pit, which was indicated as a potential pathway for contaminants in the March 10, 2004 meeting with ADEQ. The cross sections should include nearby wells and the 3,780 and 3,760 foot MSL pit levels.

15. A water balance that demonstrates all sources and rates of inflow (such as the No. 6 Sump, Yellowhair Waste Rock Dump and BHP Miami), out flow (such as BHP Miami), precipitation and evaporation losses during normal and contingency conditions.

Exhibit 67

Applied Hydrogeology

C. W. FETTER, JR.
University of Wisconsin—Oshkosh

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Field and Computer Methodology

chapter 12

12.1 INTRODUCTION

The day is past when the only activity of the hydrogeologist was to locate and design a water well. Today, hydrogeologists are involved in many phases of resource management, including environmental impact analysis, as integral members of a multidisciplinary team. Hydrogeological studies are necessary and generally required by regulatory agencies for site studies prior to construction of such projects as sanitary landfills, land-treatment systems for wastewater, surface mines, power plants, artificial-recharge lagoons, nuclear-waste repositories, dams, and reservoirs.

In this chapter, we will introduce a number of techniques that can be applied to both the exploration for groundwater supplies and to various aspects of environmental hydrogeology. This includes the use of aerial photographs and other remote sensing data, as well as both surface and borehole geophysical methods. The methods of site evaluation will be examined.

One of the most powerful tools for the evaluation and management of groundwater resources is the digital-computer model. Both flow of groundwater and mass transport of contaminants can be modeled. These models are also a valuable adjunct to the site study in environmental hydrogeology. The use of numerical methods and computer models will be discussed.

12.2 FRACTURE-TRACE ANALYSIS

One technique that has been gaining acceptance among hydrogeologists is the use of **fracture-trace analysis.** As we discussed in Chapter 7, groundwater is known to be concentrated in fracture zones found in many different rock types. The fracture traces are located by study of linear features on aerial or satellite photographs. On air photos, natural linear features consist of tonal variation in soils, alignment of vegetative patterns, straight stream segments or valleys, aligned surface depressions, gaps in ridges, or other features showing a linear orientation (1). Some linear features may be visible on the ground; for instance,

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surface sags or straight stream segments. Others, such as variation in soil tone, or alignment or height of vegetation of a certain type, may not be noticeable except on aerial photographs (1). Many of these natural linear features consist of interrupted segments, which may be of different types. For instance, a straight stream segment in a flood plain may align with a row of trees in a nearby woods. Natural linear features from 300 meters to around 1500 meters in length are fracture traces. Those greater than 1500 meters are termed **lineaments** (1). Some lineaments are up to 150 kilometers long (2).

Fracture traces are surface expressions of joints, zones of joint concentration, or faults (3). It is generally believed that the joint sets tend to be nearly perpendicular (2). They are known to extend to a depth of 1000 meters at one Arizona location (3), although this is probably far deeper than is typical. Mapped fracture traces have been traced to cliffs where the fracture zone can be seen in cross section (2, 3). Under these observed conditions, the fracture zones dip at approximately 87 to 89 degrees. Figure 12.1 shows an exposure of a fracture in a cliff in central Pennsylvania.

FIGURE 12.1. Cross section of a zone of fracture concentration revealed by a fracture trace near Spring Creek in Centre County, Pennsylvania. Photo courtesy of R. R. Parizek.

These fracture zones are less resistant to erosion than rock, which is less fractured. Hence, valley and stream segments tend to run along them. They may be zones of groundwater drainage, so that soils over them have a deeper water table or are not as moist as soils in surrounding areas. The soil color or vegetation may appear to be different from that of surrounding soils. If they are zones of concentrated groundwater discharge, there may be a line of springs or seeps. Fracture traces in carbonate rocks are typically areas of solution. Aligned sinkholes or surface sags are typical surface expressions.

Fracture traces may be related to regional tectonic activity. They tend to be oriented at a constant angle to the regional structural trend; however, the orientation appears to be independent of local folds (3). Lineaments are known to cut across rocks of many ages and cross folds and faults (2). They have been observed to be parallel to the major joint sets in flat-lying or gently dipping strata, but this is not the case if the strata are steeply dipping. If surface areas are separated by major faults, the individual fault blocks may have fracture traces of different orientation (2). The majority of fracture traces in an area appear to be grouped into two subparallel sets that are approximately perpendicular. Streams developed in rocks where fracture control is evident have been described as having a "stair-step" pattern (4). In the area of central Pennsylvania shown in Figure 12.2, the valley development follows fracture traces. Most fractures are generally N-S or E-W, with lesser numbers running NW-SE and SW-NE.

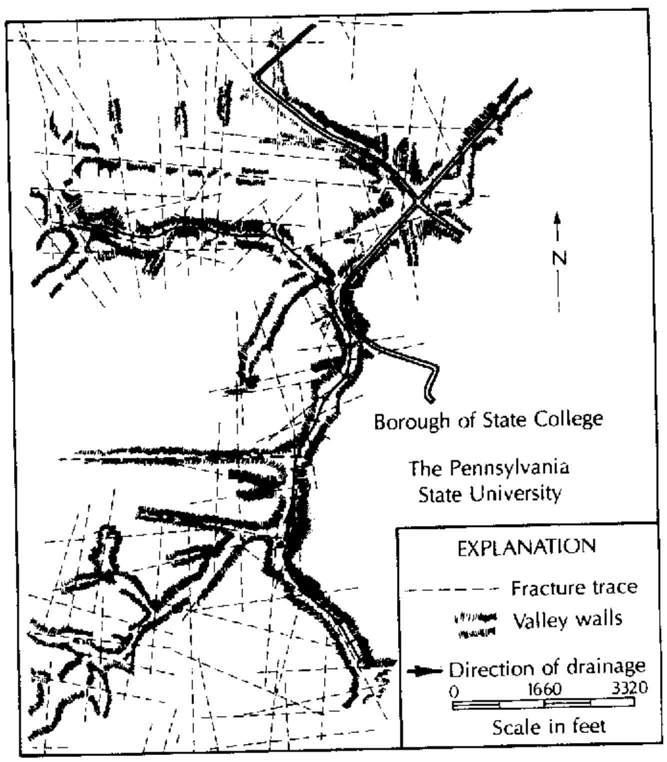

FIGURE 12.2. Valley development in an area of folded carbonate rocks in central Pennsylvania. The valleys tend to follow fracture traces. SOURCE: R. R. Parizek, *Hydrogeologic Framework of Folded and Faulted Carbonates—Influence of Structure*, Mineral Conservation Series Circular 82, College of Earth and Mineral Sciences, Pennsylvania State University, 1971, pp. 28–65.

Statistical studies of wells in carbonate terrain have shown that those located on fracture traces, either intentionally or accidentally, have a

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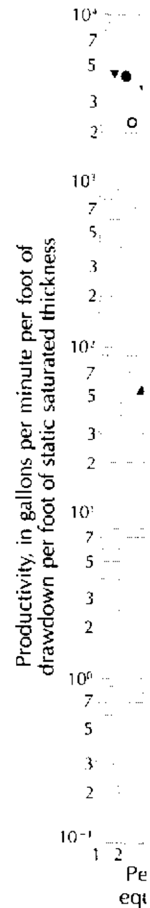

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greater yield than those not on fracture traces (5). Figure 12.3 illustrates that the productivity of fracture-trace wells is significantly above that of other wells, not on fracture traces. The use of fracture-trace analysis has resulted in a very successful location of well fields in areas where random location has yielded very erratic results (6). The greatest yields come from wells located at the intersection of two fracture traces. Caliper logs of wells on fracture traces in carbonate-rock terrain showed many more cavernous openings and enlarged bedding planes than logs of those wells drilled in interfracture areas (Figure 12.4).

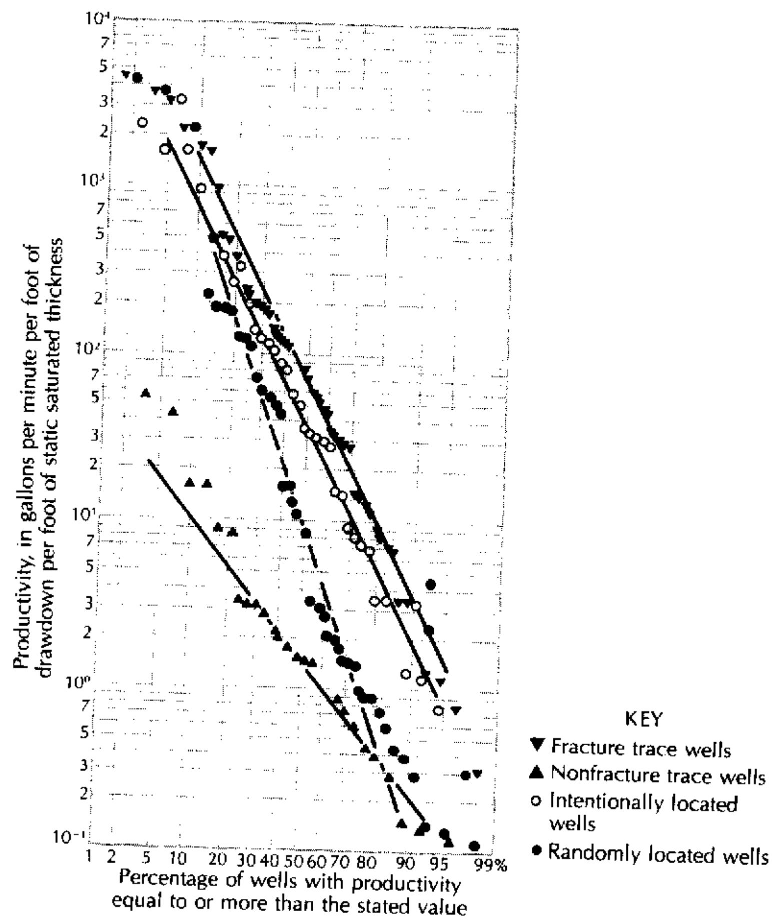

FIGURE 12.3. Production-frequency graph for water wells grouped according to whether or not they fall on a fracture trace. SOURCE: S. H. Siddiqui and R. R. Parizek, *Water Resources Research*, 7 (1971):1295–1312.

Many hydrogeologists are successfully using fracture-trace analysis to locate high-yield wells. The technique has been applied to carbonate-rock terrain (6) but is also applicable to most other rock types (2). It is

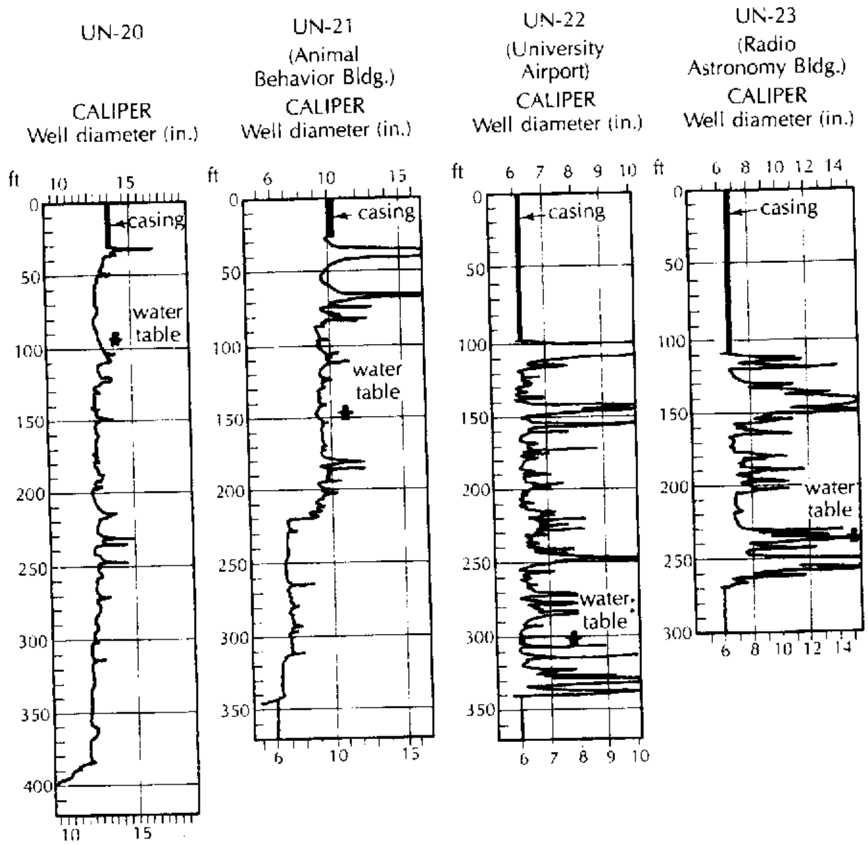

FIGURE 12.4. Caliper logs of wells in an area of carbonate rocks in central Pennsylvania. Wells UN-20 and UN-21 were drilled in interfracture areas; Wells UN-22 and UN-23 were located on fracture traces. SOURCE: L. H. Lattman and R. R. Parizek, *Journal of Hydrology* (Elsevier Scientific Publishing Company) 2 (1964):73–91. Used with permission.

reportedly usable even if the bedrock is mantled by up to 50 meters of glacial drift (7). Fracture-trace analysis is also widely used in selecting sites for sanitary landfills. Naturally, the landfill locations are most suitable if they fall in interfracture areas. Other uses include analysis of foundation and dam sites, evaluation of potential water problems in mines and tunnels, and control of mine drainage (2).

In the identification of fracture traces on aerial photographs, a low-magnification stereoscope is generally used (1). Possible fracture traces are indicated by drawing directly on the photograph. One problem in identification is the confusion of linear features of human origin (fences, cowpaths, roads, power lines, plow and harvest patterns, etc.) with natural linear features. There is also a tendency to map fracture traces at oblique angles to regular grid systems on the photographs. As section lines almost always appear on air photos, especially in cultivated areas, there is a tendency to preferentially map

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NW-SE and NE-SW features as fracture traces. Following the stereoscopic mapping, the photos should be checked without use of the stereoscope to see if any other features are noticed. A typical air-photo size for fracture-trace analysis is 1:20,000. Linear features that show up in more than one expression, and those crossing roads or fields, are more likely to represent fracture traces. In Figure 12.5, subtle fracture traces are indicated in an area of farmland in central Pennsylvania.

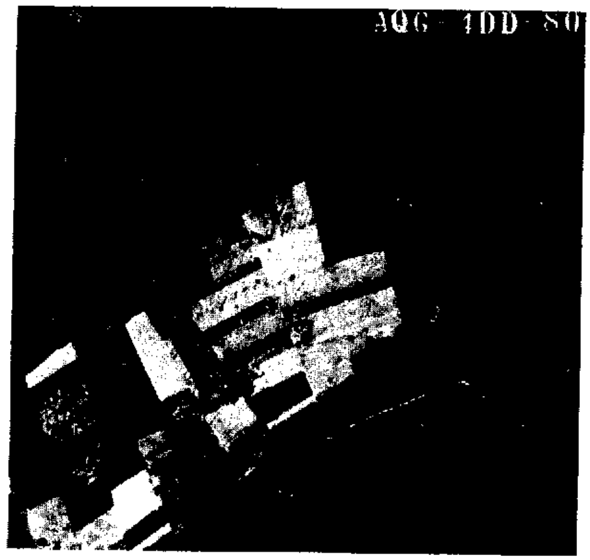

FIGURE 12.5. Aerial photograph of an area with 5 to 80 meters of transported sediments overlying folded and faulted dolomite, limestone, and sandy dolomite, Centre County, Pennsylvania. The line of each fracture trace is indicated by arrows at both ends. Photo courtesy of R. R. Parizek.

Following the mapping of linear features on air photos, it is necessary to make a field check. Some mapped features will usually turn out to be due to man. The more inexperienced the geologist, the more likely it is that this will occur. If a suspected fracture trace has a surface expression, it will be easier to locate in the field. Those without obvious surface expression must be located by virtue of their spatial relation to individual trees or buildings which are visible on the photographs and can be identified on the ground. In urbanizing areas, it may be possible to use older photographs taken before extensive development to map fracture traces. This makes the field location of the fracture traces even more difficult.

The ready availability of satellite photographs has made the mapping of lineaments a feasible part of fracture-trace analysis (8). Aerial imagery from the LANDSAT satellite can be used to locate major lineaments. These may be 100 kilometers or longer. Figure 12.6 is a LANDSAT image of central Pennsylvania in which two major lineaments are indicated. One of them has a series of water gaps, as a river crosses the ridges. Sulfide mineralization is also known to occur along this lineament. The relationship of lineaments and groundwater is expected to be similar to that of fracture traces (8).

FIGURE 12.6. LANDSAT image of a section of the Valley and Ridge Province and the Appalachian Plateau Province in Pennsylvania. Two major lineaments are shown. Sulfide mineralization is concentrated along the Tyrone-Mt. Union lineament with known locations indicated by the black dots. There are also several water gaps along this feature, where the river has cut across ridges. Photo courtesy of R. R. Parizek.

12.3 SURFICIAL METHODS OF GEOPHYSICAL INVESTIGATIONS

Geophysical surveys have been used by the mining and petroleum industries for many decades. Groundwater geologists soon discovered the usefulness of these surveys in exploring the shallow subsurface (within a few hundred meters) where groundwater supplies are usually found (9, 10, 11). A number of different techniques are used, the most common of which are direct-current resistivity, seismic refraction, and gravity and magnetics methods. Seismic reflection is less widely used, although it is the preferred method in petroleum exploration.

Geophysical methods may be used to determine indirectly the extent and nature of the geologic materials beneath the surface. The thickness of unconsolidated surficial materials, the depth to the water table, the location of subsurface faults, and the depth of the basement rocks can all be determined. In some instances, the location, thickness, and extent of subsurface bodies, such as gravel deposits or clay layers, can also be evaluated. The correlation of geophysical data with well logs or test-boring data is generally more reliable

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than either type of information used by itself. As with all hydrogeological investigations, a careful definition of the problem and determination of the best type of information to solve the problem should be made before geophysical work is done. The geophysical survey should then be planned to yield the greatest amount of useful data for the budgeted cost.

12.3.1 DIRECT-CURRENT ELECTRICAL RESISTIVITY

Of the several electrical geophysical methods, **direct-current electrical resistivity** has found the greatest application to hydrogeology (12). A commutated direct current or a current of very low frequency (less than 1 cycle per second) is generated in the field or provided by storage batteries. It is introduced into the ground by means of two metal electrodes. If the soil is dry, water may be needed around the electrodes to establish a good connection. The voltage in the ground is measured between two other metal electrodes, also driven into the ground. By knowing that current flowing through the ground and the potential differences or voltage between two electrodes, it is possible to compute the resistivity of the earth materials between the electrodes. The resistivity of earth materials varies widely, from 10^{-6} ohm-meter for graphite to 10^{12} ohm-meters for quartzite. Dry materials have a higher resistivity than similar wet materials, as moisture increases the ability to conduct electricity. Gravel has a higher resistivity than silt or clay under similar moisture conditions, as the electrically charged surfaces of the fine particles are better conductors.

Electrical resistivity, R, is equal to the expression

$$R = \frac{A}{L}\frac{\Delta V}{I} \qquad \textbf{(12-1)}$$

where

- A is the cross-sectional area
- L is the length of the flow path
- ΔV is the voltage drop
- I is the electrical current

Electrical resistivity is measured in units of ohm-meters or ohm-feet. The four electrodes used can be designated as follows:

- A is the positive-current electrode
- B is the negative-current electrode
- $\left.\begin{matrix} M \\ N \end{matrix}\right\}$ are the potential electrodes

If $\overline{XY}$ indicates the distance between Electrode X and Electrode Y, Equation (12-1) can be expressed as (12)

$$\overline{R} = \left(\frac{2\pi}{\frac{1}{\overline{AM}} - \frac{1}{\overline{BM}} - \frac{1}{\overline{AN}} + \frac{1}{\overline{BN}}} \right) \frac{\Delta V}{I} \qquad \textbf{(12-2)}$$

As earth materials are almost never homogeneous and electrically isotropic, the resistivity found by Equation (12-2) is an apparent resistivity, $\overline{R}$.

There are two electrode configurations in common usage. The **Wenner array** consists of the four electrodes spaced equal distances apart in a straight line: $\overline{AM} = \overline{MN} = \overline{NB} = a$. A current electrode is on each end (Figure 12.7A). In using the Wenner array, the apparent resistivity, $\overline{R}$, may be found from the expression

$$\overline{R} = 2\pi a \frac{\Delta V}{I} \qquad \textbf{(12-3)}$$

which is solved from Equation (12-2).

The second configuration is the **Schlumberger array**. It is a linear array, with potential electrodes placed close together (Figure 12.7B). Typically, $\overline{AB}$ is set equal to or greater than five times the value of $\overline{MN}$. The apparent resistivity is given by

$$\overline{R} = \pi \frac{(\overline{AB}/2)^2 - (\overline{MN}/2)^2}{\overline{MN}} \frac{\Delta V}{I} \qquad \textbf{(12-4)}$$

Geophysical instruments are available to measure the value of ΔV for a known I. The appropriate formula for the electrode array is used to compute the apparent resistivity.

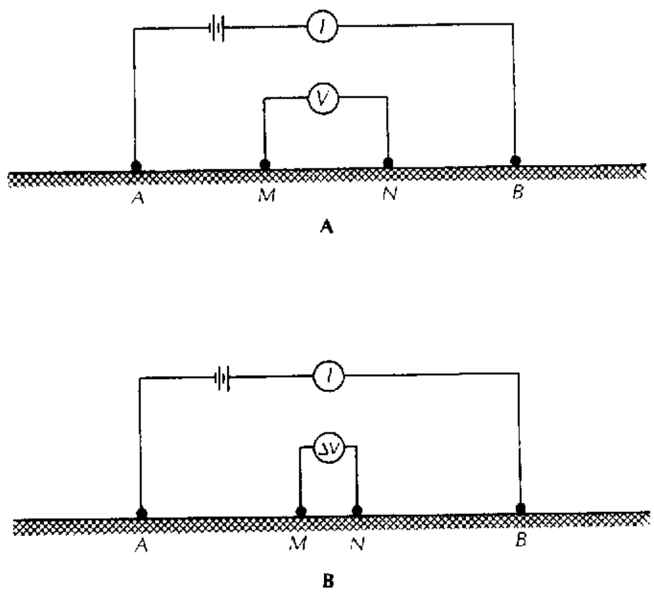

FIGURE 12.7. **A**. Wenner electrode array; **B**. Schlumberger electrode array. These are the two most widely used configurations for electrical resistivity surveys.

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Resistivity surveys are made in two fashions. An **electrical sounding** will reveal the variations of apparent resistivity with depth. **Horizontal profiling** is used to determine lateral variations in resistivity. When the electrode spacing is expanded in making an electrical sounding, the distance between the potential electrodes and the current electrodes increases. This means that the current will travel progressively deeper through the ground, and will measure apparent resistivity to greater depths. Either the Wenner or the Schlumberger array may be used; however, the latter is more convenient for electrical sounding. This is because, for each incremental measurement, only the outer current electrodes must be moved every time. The inner electrodes are spread only occasionally. In the Wenner array, all four electrodes must be moved for each incremental measurement. The sounding is begun with the electrodes close together. After each reading, the electrodes are repositioned with *a*, or $\overline{AB}/2$, increased and a new measurement made. The apparent resistivity is plotted as a function of electrode spacing on logarithmic paper. For a number of reasons (12), the Schlumberger array is superior to the Wenner array for electrical soundings. There is, however, a set of theoretical type curves of Wenner apparent resistivity for two-, three-, and four-layer earth models (13). This could be helpful in interpreting the results of a Wenner-array electrical sounding.

For a homogeneous earth, there is a definite relationship between the electrode spacing and the percent of the current that penetrates to a given depth. For a nonhomogeneous and layered earth, the exact relationship cannot be easily determined. It is safe to assume that the greater the electrode spacing, the deeper the stratum influencing the apparent-resistivity curve. There are a number of possible earth models which could produce a given curve. In Figure 12.8, there are three possible theoretical interpretations ex-

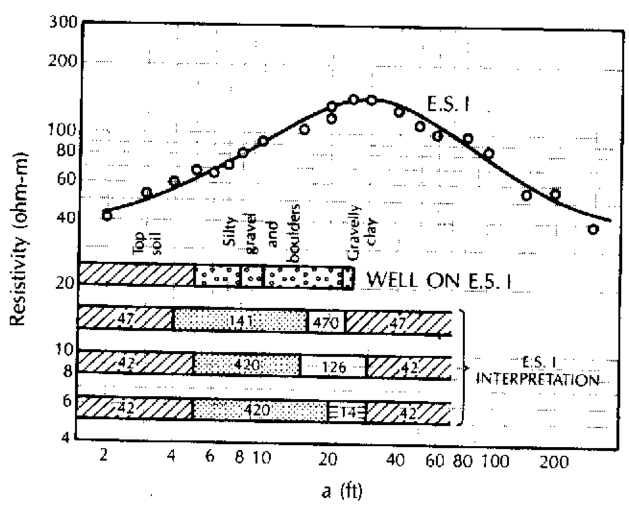

FIGURE 12.8. Wenner electrical-sounding curve of apparent resistivity as a function of electrode spacing. Three possible interpretations and a test boring are also given. SOURCE: A. A. R. Zohdy, *Ground Water,* 3, no. 3 (1965):41–48.

pressed as resistivity and a test-boring log. The rise in apparent resistivity indicates a shallow zone of high resistivity. The test boring shows this to be a layer of silty gravel and boulders from 5 to 23 feet. It should be noted that the apparent-resistivity curve peaks at 30 feet. An interpretation that the layer of maximum resistivity lay at 30 feet would have been wrong.

In horizontal profiling, the electrode spacing is kept at a constant value. The electrodes are moved in a grid pattern over the land surface. The apparent resistivity of each point on the grid is marked on a map and isoresistivity contours are drawn. Figure 12.9 shows an apparent-resistivity map based on a large number of horizontal resistivity measurements. An area of buried stream-channel gravels is delineated where the apparent resistivity exceeds 80 ohm-meters (14). A geologic cross section based on test borings and electrical resistivity soundings is shown in Figure 12.10. The location of the cross section is indicated in Figure 12.9 as line *AB*.

Geoelectrical methods are useful in groundwater studies for such purposes as defining buried stream channels and areas of saline versus fresh

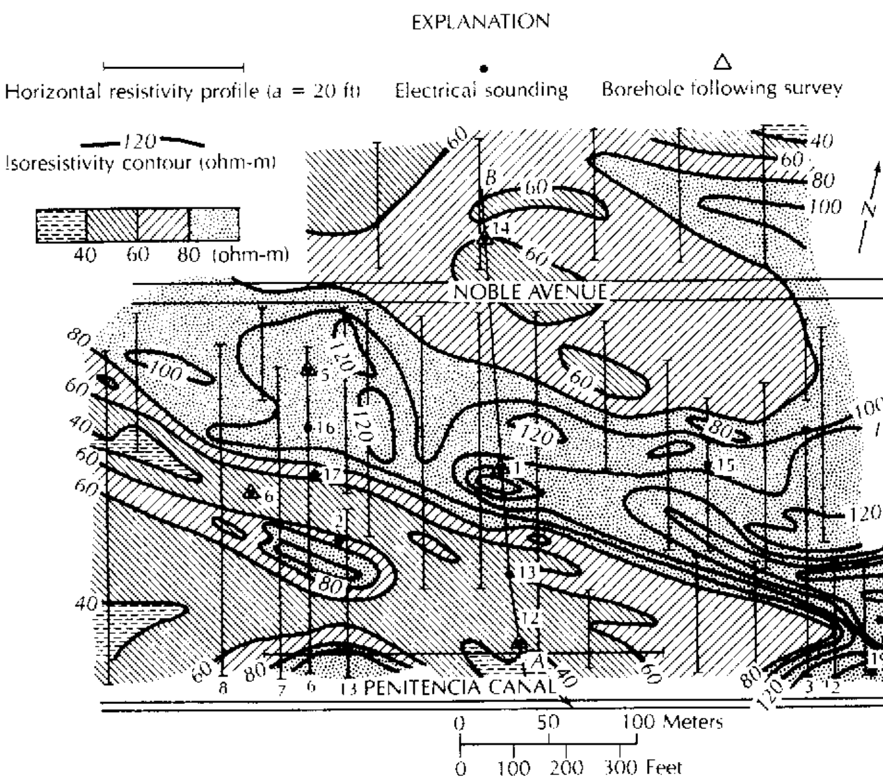

FIGURE 12.9. Apparent-resistivity map of Penjtencia, California. Locations of resistivity profiles, soundings, and boreholes are shown. The location of Borehole and Electrical Sounding 1 is in the center of the high-resistivity zone. SOURCE: A. A. R. Zohdy, *Ground Water,* 3, no. 3 (1965):41–48.

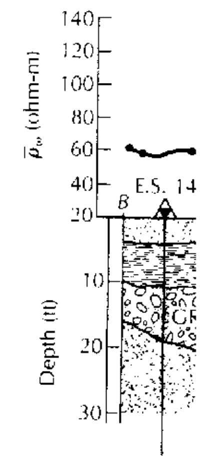

FIGURE 12.10. (
The position of the
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groundwater. Sal
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detailed analyses

12.

Seismic methods
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must be made in

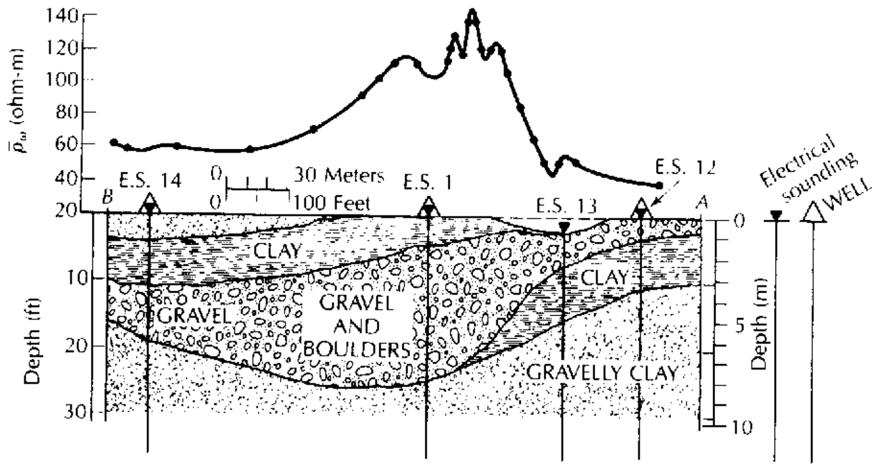


FIGURE 12.10. Geologic cross section based on test borings and electrical soundings. The position of the cross section is shown as line *AB* on Figure 12.9. SOURCE: A. A. R. Zohdy, *Ground Water*, 3, no. 3 (1965):41–48.

groundwater. Saline water has a much lower resistivity, as it is a better electrical conductor. Interpretation for such cases is relatively simple and may be done qualitatively. Layers of very low resistivity, such as clay, can also be discerned on sounding curves. It is often impossible to pick out the water table on an electrical sounding (12), although it is frequently attempted. In many respects, detailed analyses of resistivity data are best left to the experienced geophysicist.

12.3.2 SEISMIC METHODS

Seismic methods using artificially created seismic waves traveling through the ground are quite commonly employed in hydrogeology. These methods are useful in determining depth to bedrock, slope of the bedrock, depth to water table and, in some cases, the general lithology. Applied seismology has been highly developed in the petroleum industry, where the **seismic reflection method** is used almost exclusively. Structural and formational boundaries can be indicated to great depth.

Hydrogeological studies often involve finding the thickness of unconsolidated material overlying bedrock. For this purpose, the **seismic refraction method** is superior. The loose material transmits seismic waves more slowly than consolidated bedrock. By studying the arrival times of seismic waves at various distances from the energy source, the depth to bedrock can be determined.

The energy source can be a small explosive charge set in a shallow drill hole. One or two sticks of dynamite is sufficient for depths to bedrock in excess of 30 to 50 meters. Of course, explosives should be handled only by persons trained and licensed to do so. A judgment of how large a charge to use must be made in each case. For shallower work, 5 to 15 meters, a sledge

Exhibit 68

Well	X	Y	Distance to T3A1 ft
WWDW	22078.9	7281.4	522
T3A1	22694.5	6955.31	
KBUP-31	25760.08	7411.72	3031

SampleDate	Aluminum (mg/L)	Copper (mg/L)	Iron (mg/L)	Manganese (mg/L)	Zinc (mg/L)	SumOf5 (mg/L)	Fe/Al
Aug-97	170	102	*1760*	43.9	11	2086.56	
Oct-97	162	97.2	*1677*	42.1	12	1990.152	
May-98	129	88.4	*1335*	41.7	9.67	1604.041	
Oct-98	90	105	*932*	38.7	*9.975814*	1175.26	
Dec-01	101	105	1070	39.5	12.3	1327.8	10.59406
Apr-03	109	130	1130	34.4	14.1	1417.5	10.36697
May-03	109	130	1130	34.4	14.1	1417.5	10.36697
Aug-03	91.8	115	965	33	10.9	1215.7	10.51198
Nov-03	93.8	115	930	33.3	10.8	1182.9	9.914712

Concentrations in mg/l
Blue italics denotes interpolated

10.35094
ave Fe/Al

SampleDate	K (ft/d)	Area (ft2)	Gradient	Flow (gpm)	Sum5Metals	Load lbs/day
Aug-97	280	7029	0.018	179	2087	4485
Oct-97	280	7398	0.017	188	1990	4484
May-98	280	9220	0.014	185	1604	3559
Oct-98	280	9761	0.014	192	1175	2709
Dec-01	280	5635	0.021	176	1328	2798
Apr-03	280	3161	0.026	119	1418	2028
May-03	280	2826	0.026	106	1418	1811
Aug-03	280	4913	0.023	167	1216	2441
Nov-03	280	4989	0.024	172	1183	2447

SampleDate	K (ft/d)	Area (ft2)	Gradient	Flow (gpm)	Sum5Metals	Load lbs/day
Aug-97	140	7029	0.018	90	2087	2243
Oct-97	140	7398	0.017	94	1990	2242
May-98	140	9220	0.014	92	1604	1779
Oct-98	140	9761	0.014	96	1175	1354
Dec-01	140	5635	0.021	88	1328	1399
Apr-03	140	3161	0.026	60	1418	1014
May-03	140	2826	0.026	53	1418	906
Aug-03	140	4913	0.023	84	1216	1220
Nov-03	140	4989	0.024	86	1183	1223

SampleDate	T3A1 water level	Sat Area (ft2)	Gradient	Sum5Metals	140 ft/day Load	280 ft/day Load lbs/day
Aug-97	3264.72	7029	0.018	2087	2243	4485
Oct-97	3265.62	7398	0.017	1990	2242	4484
May-98	3269.85	9220	0.014	1604	1779	3559
Oct-98	3271.05	9761	0.014	1175	1354	2709
Dec-01	3261.22	5635	0.021	1328	1399	2798
Apr-03	3254.53	3161	0.026	1418	1014	2028
May-03	3253.58	2826	0.026	1418	906	1811
Aug-03	3259.33	4913	0.023	1216	1220	2441
Nov-03	3259.53	4989	0.024	1183	1223	2447

Date	WWDW0	WWDW1	WWDW2	WWDW4	WWDW5	WW avg	T3A1	KBUP31	WWDW:T:	T3A1:KB31-UP	Ave Gradient
Aug-97	3282.24	3280.38	3280.39	3278.76	3268.10	3277.97	3264.72		0.025	*0.010*	0.018
Oct-97	3283.99	3279.44	3280.12	3281.15	3269.25	3278.79	3265.62		0.025	*0.010*	0.017
May-98	3283.83	3278.67	3279.97	3280.58	3271.96	3279.20	3269.85		0.018	*0.010*	0.014
Oct-98	3285.01		3280.13	3278.25	3277.15	3280.13	3271.05		0.017	*0.010*	0.014
Dec-01	3281.74			3275.35		3278.55	3261.22		0.033	*0.010*	0.021
Apr-03	3281.86			3271.36		3276.61	3254.53	3225.56	0.042	0.010	0.026
May-03	3280.89			3270.30		3275.60	3253.58	3224.35	0.042	0.010	0.026
Aug-03	3281.83			3274.51		3278.17	3259.33	3226.79	0.036	0.011	0.023
Nov-03	3281.92			3276.13		3279.03	3259.53	3228.72	0.037	0.010	0.024

orange highlight interpolated

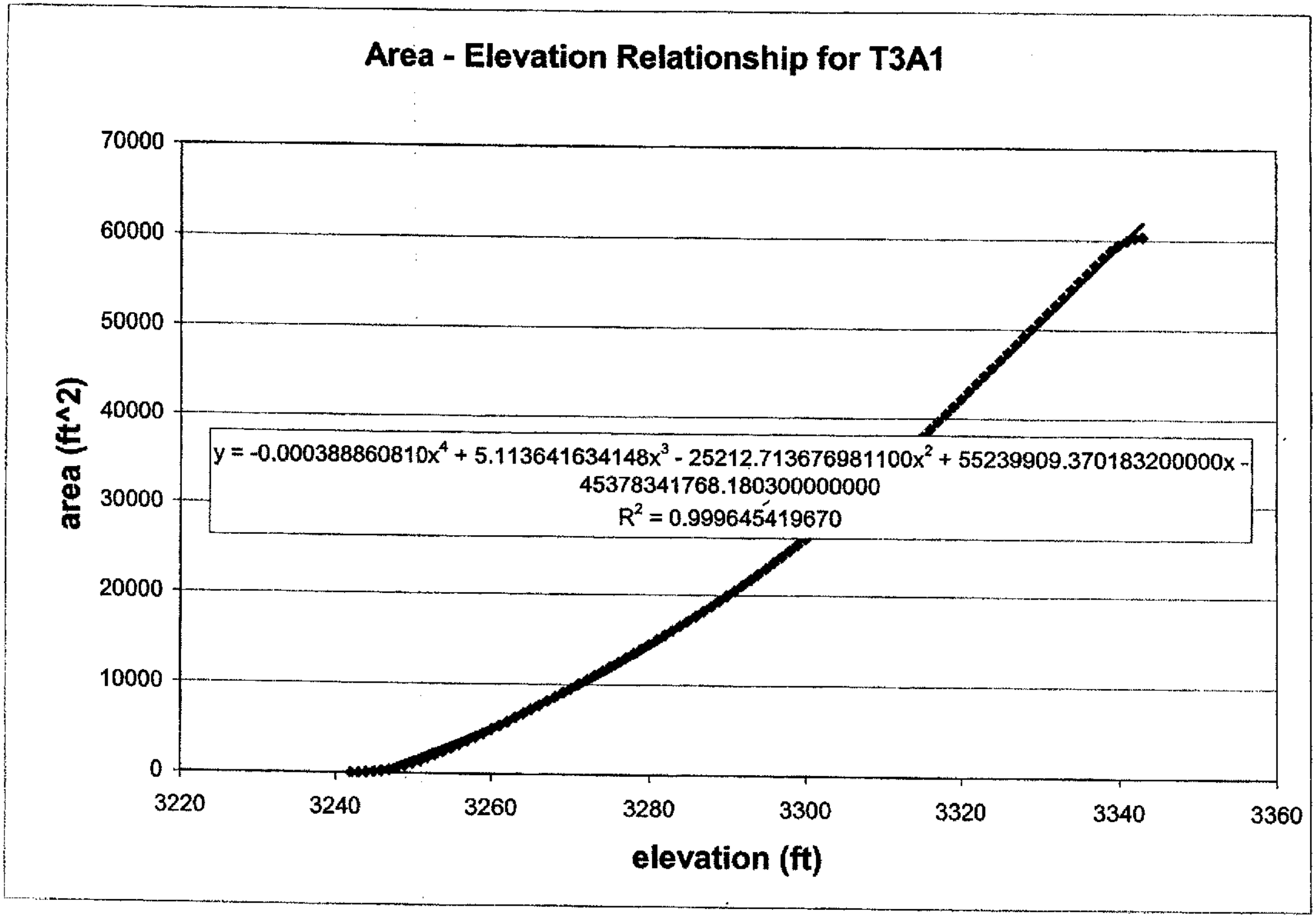
Green Italics average value

SampleDate	Aluminum (mg/L)	Copper (mg/L)	Iron (mg/L)	Manganese (mg/L)	Zinc (mg/L)	SumOf5 (mg/L)
Aug-97	170	102	*1760*	43.9	11	2087
Oct-97	162	97.2	*1677*	42.1	12	1990
May-98	129	88.4	*1335*	41.7	9.67	1604
Oct-98	90	105	*932*	38.7	*10.0*	1175
Dec-01	101	105	*1070*	39.5	12.3	1328
Apr-03	109	130	1130	34.4	14.1	1418
May-03	109	130	1130	34.4	14.1	1418
Aug-03	91.8	115	965	33	10.9	1216
Nov-03	93.8	115	930	33.3	10.8	1183

Concentrations in mg/l

Blue Italics denotes Interpolated

Black italics denotes Fe value calculated from Fe/Al ratio



T3A1 Loading Spreadsheet.xls:T3A1 Area Formula Chart 1

Exhibit 69

Affidavit of Craig M. Bethke, Ph.D.

I, Craig M. Bethke, Ph.D., being first duly sworn, state the following:

1. At no time have I been involved in any plan, project or proposal for testing or implementing the experimental Accelerated Metals Attenuation technology ("AMA") at the Pinal Creek groundwater contamination site ("Pinal Creek"), or its environs.

2. I first learned of the existence of a 2005 report by Golder Associates, Inc. ("Golder") scoping the possibility of a laboratory study of AMA at Pinal Creek in a Business Plan submitted to me in April 2006, after the idea had been set aside. To the best of my recollection, I have never seen a copy of this report.

3. At no time has anyone at Phelps Dodge Miami, Inc. ("PDMI"), Golder, or their counsel suggested I remove or conceal information about a business relationship with Golder from any expert report I have prepared.

4. As I was preparing my Second Supplemental Report, PDMI counsel suggested I clarify and expand information I presented in an early draft about my involvement in developing AMA, originally under the rubric "Conflict of Interest." I did so and merged the information into the previous section of the Report. No version or draft of the Report mentioned a business relationship with Golder, so no such information could have been removed from the Report.

5. At no time have Golder and I marketed or considered marketing the AMA technology to a single client, PDMI, or otherwise.

6. I have reviewed my May 2006 deposition testimony in light of BHP's allegations and reaffirm that my responses were accurate and correct.

Dated: June 18, 2007.

Craig M. Bethke, Ph.D.

On this 18th day of June, 2007, before me, a Notary Public in and for the State of Illinois, appeared Craig M. Bethke, Ph.D., who is personally known to me to be the same person whose name is subscribed to the foregoing instrument, and he acknowledged that he signed, sealed and delivered this instrument as his free and voluntary act for the uses and purposes therein set forth.

Notary Public

My Commission Expires:

01-31-08

OFFICIAL SEAL
JODI L. BECKHART
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 1-31-2008

Exhibit 71

Medlin, Monica

Subject: FW: Second Request for Bethke Documentation - CF/CT Matt Wickham

---

From: Pearson, William W. [mailto:wwpearson@BryanCave.com]
Sent: Wednesday, June 21, 2006 12:36 PM
To: Cooper, Leslie; Wallwork, Nicholas
Cc: SSwindle@phx.perkinscoie.com; michael.romey@lw.com; Gates, Pamela S.
Subject: Second Request for Bethke Documentation

Leslie and Nick,

This e-mail responds to Nick's letter dated June 1, 2006 and repeats BHP's request made on May 23, 2006 that PDMI and Inspiration provide the details of Dr. Bethke's (and Aqueous Solutions) business relationship with Phelps Dodge, Inc. and any of its subsidiaries or related entities related to Bethke's Accelerated Metals Attenuation (AMA) technology for which Dr. Bethke has applied for a U.S patent and an international patent.

Regarding the patent itself I understand that Dr. Davis and Geomega have reviewed Dr. Bethke's patent application and concluded that Dr. Bethke's process is virtually the same remediation process Dr. Davis and Geomega presented to BHP more than a year before Dr. Bethke applied for his patent. The remediation process Dr. Davis and Geomega presented to BHP was provided to PDMI and Inspiration (and presumably to Golder Associates, Inc. and Dr. Bethke) as part of BHP's discovery disclosures which are subject to the restrictions in the court's two protective orders. I understand Dr. Davis and Geomega are considering their legal options given these circumstances and may be contacting the patent attorneys for Dr. Bethke and Aqueous Solutions directly through other counsel. I would expect that it might be advantageous to Dr. Bethke and Aqueous Solutions to provide to BHP, Dr. Davis and Geomega more information on the genesis of the AMA process in terms of timing, prior art, creative factors, etc. to demonstrate the independence of Dr. Bethke's claimed original intellectual property.

Separate from the legitimacy of Dr. Bethke's claims for his patented process Dr. Bethke was not forthcoming in disclosing his business relationship with Phelps Dodge, Inc. and Golder Associates, Inc. Dr. Bethke's business relationship with Phelps Dodge, Inc. and Golder Associates, Inc. is undoubtedly relevant to Dr. Bethke's credibility in this matter and the weight to be given to his opinions on behalf of PDMI and Inspiration. Dr. Bethke was only partially forthcoming in disclosing the details of his contractual relationships, his licensing relationships, his existing and planned future projects, etc. with Phelps Dodge, Inc. and Golder Associates, Inc. Without reviewing the relevant documentation of Dr. Bethke's business relationships to Phelps Dodge, Inc. and Golder Associates, Inc. BHP has no way to evaluate the truthfulness or accuracy of Dr. Bethke's representations. Furthermore Dr. Bethke's AMA process directly addresses the termination of contamination at mining sites. The fact that Dr. Bethke represents that he is not considering his AMA process for the Pinal Creek Site is interesting but not conclusive on the nature and degree to which Dr. Bethke may have hinged his financial future on Phelps Dodge, Inc. or whether Dr. Bethke is actually considering the use of his AMA process at the Pinal Creek Site. These facts are discoverable through document productions as they go directly to the credibility, bias and prejudice of Dr. Bethke and the weight to be given to his opinions. All such information would be protected by the confidentiality provisions of the court's protective orders. Therefore, BHP repeats its request for additional details and documentation of Dr. Bethke's significant business relationships with Phelps Dodge, Inc. and Golder Associates, Inc. If PDMI and Inspiration have some case law they consider supportive of their position in refusing to produce this information and documentation please provide it to BHP. If you believe meeting and conferring will assist us in resolving this matter please let me know and we can set up a meeting or telephone conference to discuss. Time is of the essence so please respond to this e-mail at your earliest convenience. Thank you.

Regards, Wink

Exhibit 72

Base Metals

bhpbilliton

BHP Copper Inc.
Pinto Valley Operations
P.O. Box 100
Miami, AZ 85539
Tel: 928-473-6211
Fax: 928-473-6387
bhpbilliton.com

Request For Proposal

Date: 2 December, 2002

To: Andy Davis
President
Geomega
2995 Baseline Road
Suite 202
Boulder, Colorado 80303

From: Rob Krohn, Chief Engineer
Tel: (928) 473-6372
Fax: (928) 473-6371
Email: rob.c.krohn@bhpbilliton.com

Miami Unit No. 2 Tailings Remediation Project
Proposal Review

Prepared under the direction and guidance of legal counsel -- CONFIDENTIAL AND PRIVILEGED

Purpose

The purpose of this RFP is to contract services to analyse and evaluate Remediation Proposals as submitted by three bidders as requested in a previous RFP. The text of that RFP is included herein to illuminate the scope of the project that was envisioned and from which the proposals were generated.

Evaluation Scope of Work

The project consists of analysis and evaluation of the proposals submitted by the bidders as requested in the following sections of the RFP "Project Objective and Goal, Scope of Work, Project Schedule and Proposal Request" as seen below. The conditions of satisfaction with regard to a successful remediation plan have been amended as follows:

"The successful remediation proposal shall eliminate the groundwater impact of RAQ metals from the #2 Tailings Project Alluvium on Bloody Tanks Wash (BTW), such that no measurable degradation of water quality is detectable between the PCG monitoring wells upstream and downstream of the site." This outcome is more specific than the RFP initially set forth and was devised in an effort to yield a measurable outcome. The analysis should consider the following factors:

1. Technical Feasibility
    a. Is the method practical?
    b. Has the method been demonstrated?
    c. Is the laboratory and pilot scale work well defined and sufficient to deliver a workable remediation plan?
2. Degree of Permanence
    a. Will the proposed method limit the future metal loading in BTW to non-action levels?
    b. Does the proposal reasonably account for fluctuating water tables and the effect on the treatment zone?
    c. Will the treated area likely require re-treatment or continuing treatment, and if so, at what cost?
3. Permitting Issues
    a. Will the process trigger USCoE 404 regulation, ADEQ permitting, ADWR permitting, EPA injection well permitting?
    b. Will there be a downstream effect on the Kiser Basin well field?
    c. Will the method result in an initial increase in RAQ metals detected downstream from the site?
    d. Will the method result in plugging of the treated alluvium?
        i. Will the resulting plugging cause a negative impact on the alluvial carrying capacity or cause surface water flow?
4. Costs
    a. Are the proposed costs reasonable with regard to the proposal presented?
    b. Do the phased approaches as presented make sense technically and practically?
    c. Have the costs changed since the proposals were generated?
5. Schedule
    a. Are the work schedules as proposed reasonable and sequenced properly?

In summary, the final report should include the following items:

- Strengths and weakness of each proposal.
- Potential synergies between proposed methods that could be combined to yield an optimum course of action.
- What is the optimum Phase 1 Action Plan that will most likely yield the conditions of satisfaction, what will it cost and how long will it take?
- Which proposal is acceptable and what will the Phase 1 and Phase 2 budgetary requirements be to complete the preliminary and pilot work.

Proposal Request

The proposal should include the following:

The proposal should include a detailed Scope of Work, a detailed schedule including a list of meetings with bidders to review proposals and the degree to which BHP personnel will be required to assist and a detailed breakdown of the costs to implement the work.

For purposes of this RFP and the work to be carried out hereunder, the bidder is to be retained by BHP through BHP's legal counsel because the subject matter addressed in this RFP and the Scope of Work is involved in litigation in one form or another. The bidder must agree that all communications in any form and all data in any form developed or in any way received through the RFP process or proceeding with any part of the scope of work ("Information") will remain BHP's property and are privileged and confidential. Bidder agrees that all Information will be used only with respect to the described project and will not be divulged in any other scenario or to any other individual or entity.

Information provided with this RFP

BHP, 2002. *Request for Proposal, Miami Unit No. 2 Tailings Remediation Project.* Miami Arizona. Dated 2 May 2002.

Arcadis, 2002. *Miami Unit No. 2 Tailings Remediation Project.* Phoenix, Arizona. Dated 31 May 2002.

ERM, 2002. *Technology Evaluation and Implementation, Miami Unit No. 2 Tailings Remediation Project.* Scottsdale, Arizona. Dated 31 May 2002.

MWH, 2002. *Miami Unit No. 2 Tailings Remediation Project.* Salt Lake City, Utah. Dated 31 May 2002

CC: Jesse Gage w/o enclosure
Evelyn Bingham w/o enclosure
Wayne Fuller w/o enclosure
Dave Unger w/o enclosure
Wink Pearson-Bryan Cave w/o enclosure

Scope of Work

The first step in the process is to review the original proposals. and summarize the basic elements of each. Based on this initial review, we will meet with each of the three groups and clarify any questions or concerns that need to be addressed including discussion of necessary modifications to the proposals to address the amended RFP statement:

> "The successful remediation proposal shall eliminate the groundwater impact of RAO metals from the #2 Tailings Project Alluvium on Bloody Tanks Wash (BTW), such that no measurable degradation of water quality is detectable between the PCG monitoring wells upstream and downstream of the site."

Following the meetings with the individual companies, we propose (in collaboration with BHP) to integrate the approaches and develop a unified "best approach" RFP on which the three companies will bid. The "best approach" RFP will include more specific information regarding the desired phases, favored remedial technology/result, and the degree of permanence required. The RFP will have been screened to determine if the approach will meet permitting requirements for local, state, and federal governments, and identify whether permitting issues could impede the process.

Upon response of the companies to the revised RFP, Geomega will evaluate and comment on the three documents and render an opinion on the merits and downsides of each proposal including,

- technical feasibility,
- expected degree of permanence,
- permitting issues, costs, and
- proposed schedule.

Schedule

Initial review of the three original proposals has already been conducted. A.Davis and S.Helgen can meet with the 3 companies in Phoenix in early February, and then prepare a unifying concept document to form the basis of the revised RFP by mid-February.

Geomega will review the revised proposals in the beginning of March (or when available). Dr. A Nicholson and S. Helgen will examine the technical feasibility and expected degree of permanence of each proposal's implementation of the RFP goals, and C. Moomaw will analyze the practicality of the proposed engineering, schedule, and costs. The results of the evaluations will be presented to BHP by mid-March.

Budget

Staff	Title	Hours	Rate	Total
A. Davis, Ph.D.	Director of Geochemistry	40	$140.00	$ 5,600.00
A. Nicholson, Ph.D.	Senior Geochemist	40	$100.00	$ 4,000.00
S. Helgen	Senior Geochemist	40	$85.00	$ 3,400.00
C. Moomaw, P. E.	Senior Environmental Engineer	40	$100.00	$ 4,000.00
L. Mellor	Graphics	24	$60.00	$ 1,440.00
	Labor Costs			$ 18,440.00
	Shipping/Misc			$ 200.00
	Travel			$ 2,000.00
	Total			**$ 20,640.00**

Post-Contractor Selection Geomega Involvement (Not budgeted at present)

Following contractor selection, we anticipate a meeting with the selected contractor in Phoenix with the goal of coordinating design and implementation of bench-scale and pilot-scale testing in an efficient manner that will provide data relevant to estimating future loading from the site as a function of time and identifying whether the planned closure alternative is susceptible to increased releases during high water events in BTW.

With an estimate of operational costs of the Kiser Basin groundwater recovery system, an estimation of the capital and operating costs of each proposal, and an estimation of the continued release of metals and acidity from BTW alluvium, we will then develop a cost-function for the preferred and any optional remedial schemes that may arise. Working with attorneys at Bryan Cave and with BHP staff, we will then identify any qualitative litigation issues that closure would entail.

Figure 1. Lower MU Monthly Loading

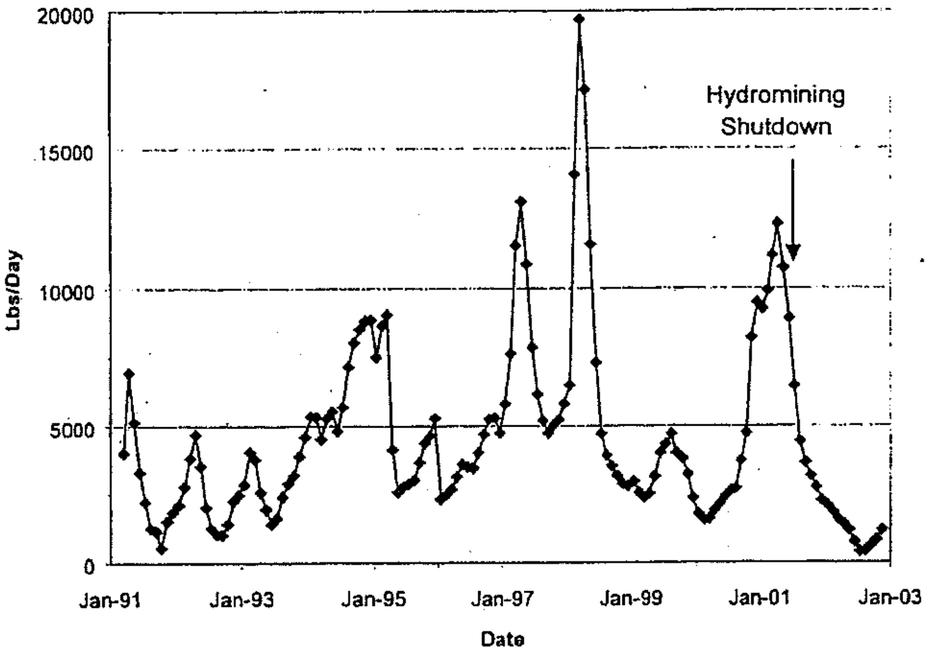


Exhibit 73

Memorandum

To: Wink Pearson

From: Andy Davis, Andrew Nicholson, Steve Helgen

Date: 7/2/2002

Re: Remediation Technology Proposals

1.0 Executive Summary

Our review of the three proposals to remediate MU#2 alluvium has highlighted distinct differences in approach, knowledge and philosophy of each company. Arcadis focuses on biotechnology, while MWH proposes an *in situ* flow through wall and ERM a percolation approach. In summary, 1) we do not believe that the Arcadis bio approach is tractable, 2) the infiltration only approach suggested by ERM is expensive, without clear definition, and based on our earlier column tests not viable, and 3) the MWH reactive wall will suffer problems with regards to plugging. All three proposals engender unanswered questions. We propose that each company meet with BHP to present their approach and answer outstanding questions, after which the best course of action will be clearer.

2.0 Synopsis of the Proposals

2.1 Arcadis

This proposal focuses on a patented metal stabilization technology. Arcadis wants to create a reducing environment and stabilize the metals as sulfides in the alluvium. However, introducing their patented solutions will increase loading in the short term. on what basis
The proposal puts little emphasis on the need for neutralization/pH increase, and also doesn't address how they plan to keep the system reducing in the future.

2.2 ERM

While their explicit approach is unclear, it appears to incorporate pH increase but apparently using an infiltration only strategy. However, based on the results of our column experiments, infiltration would not on its own provide a rapid reduction in loading to BTW. In addition, their costs seem excessive and duplicate much of the existing knowledge base.

2.3 Montgomery Watson

This proposal focuses on reactive wall technology, with the intention of fixing metals as sulfides and hydroxides. The proposal puts little emphasis on the need for neutralization/pH increase, and also doesn't address how the system will be maintained

2995 Baseline Road, Suite 202, Boulder, CO 80303 ! Tel 303-443-9117 ! Fax 303-938-8123

reducing in the future, nor how plugging of the reactive wall by reaction precipitates will be avoided.

In our opinion, there are major technical problems that need to be addressed by each respondents prior to selection of the best option:

1. Maintaining an anoxic system (Arcadis, MWH and ERM).
Sulfide stabilization of metals (either biotically or abiotically) is a central tenet of the Arcadis proposal. However, at MU#2, much of the metal mass is precipitated in the oxic unsaturated zone where the substantial variation in groundwater elevation draws air into the system as groundwater rises and then falls causing the system to "breathe." Based on the regular induction of oxygen into the system and the low system pH, sulfate-reducing conditions are unlikely to be sustainable. This limitation also affects the efficacy of abiotic sulfide precipitation proposed by MWH and ERM.

2. Increased short-term loading to BTW (Arcadis and ERM).
Injection of solutions will result in leaching of metals from solid materials and increased loading to the system during initial system innoculation (Arcadis) or infiltration (ERM).

Both arcadis and ERM also anticipated the need to use injection wells

3. Solution Delivery to Target Zones (Arcadis and ERM)
Metal precipitation can only occur at neutral pH (5-6) requiring a 2 order of magnitude increase in system pH. Based on our recent bench scale tests, the volume of base required to effect this change is substantial. The efficacy of both long-term passive percolation (ERM), or transmittal of solutions through a "treatment passageway" (Arcadis) are dubious.

4. Clogging of the Reactive Barrier Wall (MWH)
The efficacy of the reactive barrier wall is contingent on its permeability. However, in reality, the reactions identified in the proposal are likely to clog pore space converting the flowthrough wall to an impermeable barrier system.

Summary.
The ideal solution for MU#2 would combine acid neutralization and interdiction of flow off the property. None of these three proposals are likely to result in a long-term exit strategy with immediate cessation of mass transport. The MWH approach is most likely to fulfill these goals, but more as a result of serendipity as the reactive wall plugs up, rather than due to a conscious technical approach.

Vagary: an erratic, unpredictable, or extravagant manifestation, action or notion from Latin Vagari to wander.

Clearly there are issues that need to be addressed by all three respondents prior to endorsement of any one, and there are vagaries in all the proposals. Therefore we propose that BHP invite each company to provide a 20 minute synopsis of their proposal followed by 30 minutes of questions to clarify uncertainties. Following that review, it will be easier to select the company (or companies) that can best fulfill BHP expectations.

Serendipity: finding valuable or agreeable things not sought for from the Persian Fairy Tale The Three Princes of Serendip

Draft
#2 Tailings Remediation Project
Bid Evaluation,
Comments and Conclusions
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Methodology:

Injection: All of the proposals suggested pressure injection as a likely requirement to obtain significant perfusion of reagent into the alluvium. Some of the alternative proposals suggested gravity infusion from the surface as a possibility, but kept pressure injection as the likely alternative. One of the risks associated with gravity infusion is the creation of a reagent depleted fluid front moving in front of the treatment zone carrying metals down stream. Geomega observed this in their last column tests.

In order to manage the creation of a metal rich, reagent depleted fluid front, MWH and Geomega suggest creating a barrier wall in the alluvium to limit downstream losses of RAO metals. MWH describes a permeable "reactive wall or geochemical barrier" through which water could pass but with which migrating metals would react. This is a concept that appears to minimize cost while insuring that failures in the treatment of the alluvium as a whole would have a minimal impact on the migration of metals downstream as conditions change over time. Even with a comprehensive reagent injection program that covered the alluvial area, variations in permeability and porosity in the alluvium due to gradation of materials and deposition would make uniform treatment difficult. Hence, the concept of treating the perimeter and working inward appears to satisfy the goal of eliminating metal migration while minimizing the risks of missing some areas.

Chemistry: With the exception of Arcadis, all the proposals questioned the efficacy of utilizing a strategy of bio-remediation of the alluvium. This is due to the difficulty in establishing and maintaining the anaerobic conditions necessary to allow conversion of the metal oxides to metal sulfides. Bacteria are potentially vulnerable to changing conditions within the alluvium and may not prove to be effective in sequestering all RAO metals. Multiple treatment steps may be required to foster the growth of different bacteria in an effort to isolate and immobilize metals.

In all cases, the goal is to reduce metal oxides to metal sulfides and stable oxide precipitates in the alluvium and create an environment where re-oxidation and mobilization does not occur, or occurs at an extremely slow rate. Additional characterization and pilot testing should reveal the rate and extent of treatment required, and some of the proposals will likely require additional drilling to determine metal loading to a much finer resolution than is presently available. Further analysis will indicate whether the proposed methods are capable of achieving a rapid reaction and stabilization of RAO metals. Slow reaction rates could result in a multi-phased final implementation resulting in higher costs to treat.

Water Table Variations: The annual and cyclical fluctuations in the water table elevation will make the maintenance of reducing conditions in the area problematic, with the possible consequences of extending the time for metals to flush from the alluvium with continuing treatment required to sequester metals. The commitment to an insitu treatment program may therefore have the un-intended consequence 'he long-term maintenance of an unstable system. The ERM and MWH proposals acknowledge this risk with alternative treatment scenarios and the use of a "geochemical barrier" respectively. Arcadis offers an option to accept liability. However, the cost of these options have to be considered against the operating costs of the interceptor system at Kaiser Basin, and consideration should be given to simply flushing the alluvium and utilizing the existing method of metal removal. The question remains, can we treat part of the alluvium without treating the whole.

Conclusions: The nature of the alluvial environment at #2 Tailings carries with it considerable risks in attempting to immobilize metals in place.

1. Annual and cyclical variations in the water table will facilitate the reintroduction of oxygen and an oxidizing environment that is potentially far in excess of any previously encountered by the companies making the proposals.
2. The initial planning and pilot phases of the project may take a year to complete.
3. It may be necessary to carry out pilot testing on several methods of treatment at considerable cost in order to determine effectiveness.
4. Pilot testing may not be able to indicate long term results of the treatment method(s) selected due to the difficulty in simulating the effects of water table variations and rapid ground water flow in the alluvium.
5. An attempt to sequester the metals in the alluvium may lead to a long-term commitment to maintain treatment of the alluvium in order to prevent re-mobilization of the metals.
6. It may not be possible to prevent or reduce metal re-mobilization under certain flow conditions.
7. Isolating the area using the MWH "geochemical barrier" proposal might prove to be the least onerous long term method if the barrier was installed with the facilities to maintain it long term as treatment progressed.
8. The effects of upstream metals moving downstream through the zone need to be considered for loading. Future chemical changes upstream could significantly impact the treatment of the #2 alluvium.
9. The effectiveness of a final treatment plan would not likely be known until several years of observations had been completed.
10. In order to evaluate the alternative methods further, a clear objective needs to be established that delineates acceptable criteria for a successful remediation program.