HOMESTAKE
GRANTS OFFICE

Alan D. Cox
Project Manager

23 June 2004

U.S. Nuclear Regulatory Commission
Office of Nuclear Materials Safety and Safeguards
Division of Fuel Cycle Safety and Safeguards
Chief of Fuel Cycle Facilities Branch (Mailstop T8-A33)
C/o Document Control Desk
11545 Rockville Pike
Two White Flint North
Rockville, MD 20852-2738

Attn: Mr. Bill VonTill, Site Manager

Re: **Grants Reclamation Project**
Docket No. 40-8903 License No. SUA-1471
Response to New Mexico Environment Department (NMED) Comments on "Background Water Quality Evaluation of the Chinle Aquifers" – October, 2003

Dear Mr. VonTill:

Homestake Mining Company of California (HMC) received June 8, 2004 via FAX from your office the New Mexico Environment Department's (NMED) comments on the above referenced document. Enclosed please find our responses to the State comments; for ease in review, we have restated the NMED comments immediately prior to our comment response.

Enclosed please find our response to the State comments. It should be noted that we are in agreement with the NMED comment regarding Table 6-1 in the report with reference to method detection limits (MDL's). We have undertaken a review of the statistical analysis for all background water quality constituents of importance for the Grants site and will be transmitting, by separate cover, selected page revisions/errata sheets for the background water quality report and associated statistical analysis document.

We trust that our responses satisfy the questions or issues that were raised. We appreciate the careful review made by NMED and look forward to a continued and coordinated working relationship with the agencies involved in reviewing our ongoing and planned activities at the Grants site.

If you and/or NRC staff have questions or comments at this time, please contact me at your earliest convenience. I can be reached in the Grants office or via cell phone at (505) 400-2794.

Sincerely yours,

HOMESTAKE MINING COMPANY
Alan D. Cox

Cc: M. Purcell – Region VI, EPA
D. Mayerson - NMED

NMSS01

Responses to March 29, 2004 Comments from NMED

Section 4.2, Paragraph 5 and Section 4.3, Paragraph 2

NMED Comment: The assertion that "...Upper Chinle water discharges to the alluvium..." in southern Felice Acres and "Ground water flow in the Middle Chinle aquifer on the west side of the West Fault...eventually discharging to the alluvial aquifer in the subcrop area" would imply the existence of other categories of mixing zones. Is it possible to identify different types of ground water mixing zones (e.g. where alluvial ground water discharges into a Chinle aquifer, or where Chinle aquifer ground water discharges into alluvial aquifer water)?

Response: Alluvial water has entered the Chinle aquifers upgradient of these two discharge areas. The Chinle water quality in the two areas noted, where the Chinle water discharges to the alluvial aquifer, has been affected by alluvial water upgradient of these areas. The Upper Chinle receives water from the alluvial aquifer in its subcrop area as far north as well CW52. Alluvial water also enters the Upper Chinle in the tailings area, therefore, the Upper Chinle water that is discharging to the alluvium in Felice Acres has been previously affected by the alluvial water quality.

The Middle Chinle aquifer west of the West Fault has also been affected by mixing with alluvial water upgradient of this area located in the SE ¼ of Sec. 22. This affected Middle Chinle water then discharges back to the alluvium in Section 27. The high calcium concentration in the northern-most of the Middle Chinle wells west of the West Fault (well CW35) shows the affects of the alluvial water on this shallow sandstone in this area.

Section 5.3, Paragraph 3 and Figures 5-3 and 5-4

NMED Comment: The Stiff diagram for CW-52 appears to be very similar to that of non mixing zone well CW3, as well as to those presented for the east side wells CW13 and CW18 (except for HCO_3 concentrations). HMC should explain what "other characteristics" of this Stiff diagram have led to the conclusion that it is within the mixing zone, and therefore not usable for background determination.

Response: The Stiff diagram for well CW52 is between the typical mixing zone and Upper Chinle non-mixing zone Stiff diagrams. This indicates that well CW52 is in the transition zone between the mixing zone and the non-mixing zone. It, therefore, could be placed in either zone without affecting the results significantly. We placed well CW52 in the mixing zone because its calcium concentration was greater than 30 mg/l. The location of well CW52 near the Upper Chinle subcrop area makes it likely that this well is affected by the alluvial water that enters the Upper Chinle in this area.

Section 5.3, Paragraph 5

NMED Comment: HMC should note that well 934 shows elevated bicarbonate, similar to that of well CW18, which is probably attributable to the injection of San Andres water into CW13.

Response: The higher bicarbonate concentration in well 934 has also been observed in upgradient well CW52. Therefore, bicarbonate cannot be used as the sole indicator that the Upper Chinle water has been affected by San Andres water injection activities.

Section 5.3, Paragraph 9

NMED Comment: HMC should provide data that supports the assertion that "[C]alcium concentrations in the Upper Chinle water near CE2, CW4R, CW5 and CW25 were believed to be elevated prior to the tailings deposition due to historical flow of alluvial water through this mixing zone portion of the tailings deposition due to historical flow of alluvial water through this mixing zone portion of the Upper Chinle aquifer" such that these wells are interpreted to be within the mixing zone.

Response: The hydrogeologic characteristics that have created what is now designated as the mixing zone undoubtedly predated the tailings. The combination of proximity to the Upper Chinle subcrop and the elevated calcium concentration is considered strong evidence that wells CE2, CW4R, CW5 and CW25 are within the mixing zone. Although there is no data to confirm that elevated calcium concentration in these wells predates the tailings, the chemical character of the water is similar to that of upgradient mixing zone well CW50. In addition, the tailings are not a major source of calcium so the presence of elevated calcium concentration is independent of tailings seepage and reflects the natural mixing of alluvial and Upper Chinle water in this area. Since the general piezometric surfaces and the regional ground water flow have not been significantly altered by the presence of the tailings, it is logical to conclude that the mixing zone existed before the tailings facility was constructed.

Section 5.4, Paragraph 1

NMED Comment: The Middle Chinle Stiff diagrams are most similar to the Stiff diagrams of Upper Chinle wells CW52 and CW3. HMC should evaluate the potential reasons for the similarity.

Response: The Upper and Middle Chinle Stiff diagrams in the non-mixing zones are very similar. These two Chinle sandstones are similar in characteristics and both subcrop against the alluvial aquifer and, therefore, receive alluvial ground water. The Upper Chinle sandstone between the two faults receives alluvial water upgradient of the tailings area. There is also some capacity within both sandstones to alter the alluvial water thereby maintaining the Chinle water quality type.

Figure 5-8

NMED Comment: The Stiff diagrams for CW1 and CW2 are dissimilar to Stiff diagrams of the other wells presented here; which are themselves similar to the Stiff diagrams for the alluvial wells. HMC should evaluate this difference.

Response: Wells CW1 and CW2 are between the two faults in the Middle Chinle aquifer, while wells CW17, CW24, CW35 and WR25 are located west of the West Fault in the mixing zone. Wells CW1 and CW2 are in the non-mixing zone of the Middle Chinle aquifer and, therefore, are very dissimilar to the Stiff diagrams for the four mixing zone wells west of the West Fault.

Figure 5-9

NMED Comment: The Stiff diagram for CW41 is unlike the Stiff diagrams for other wells in this figure, all of which are similar. CW41 is shown to be just outside of the mixing zone. Stiff diagrams for the other wells are similar to the Stiff diagrams for alluvial wells, except for calcium concentrations. Therefore, well CW41 may be the only well representative of Lower Chinle background geochemistry. HMC should evaluate these observations.

Response: The Stiff diagram for well CW41 is the only Lower Chinle well that is similar to the Upper and Middle Chinle non-mixing zone Stiff diagrams. The Lower Chinle aquifer occurs mainly as a shale unit with secondary permeability while the Upper and Middle Chinle are sandstone aquifers. Therefore, the natural water in the Lower Chinle aquifer is subject to more dramatic and rapid changes in quality as the ground water moves downgradient from the subcrop area. Calcium in the Stiff diagrams for the Lower Chinle alone cannot be used to distinguish which wells are in the non-mixing zone. Distance from the subcrop area and other water quality parameters were used to select the boundary between the mixing zone and non-mixing zone in the Lower Chinle aquifer.

Section 6.3.1, Paragraph 3 and Figure 5-4

NMED Comment: HMC should evaluate the chemistry of wells CW13, CW18, and CW3 as they are probably most representative of original Upper Chinle water quality.

Response: HMC used the chemistry of wells CW13, CW18 and CW3 and wells 931 and 934 to evaluate the background water quality for the non-mixing zone for the Upper Chinle water quality. We believe that the water quality for each of these wells is useful in representing the original water quality in the non-mixing zone of the Upper Chinle aquifer. Water quality in well CW50 shows that the natural water quality in the Upper Chinle in the mixing zone is significantly different than the natural water quality in the non-mixing zone.

Table 6-1

NMED Comment: The detection limit for vanadium is higher than the NRC water quality standard for this constituent. In general, HMC must ensure that the method detection limit for all analytes is at least as low as the proposed background value for a given constituent.

Response: A few older samples with higher detection limits were used for vanadium in the calculation of the background values. The background values for the Chinle mixing and the non-mixing Upper Chinle and Middle Chinle aquifers have been recalculated after the removal of these higher detection values along with the addition of 2003 data values to increase the data set size. Revised pages for the supplemental Chinle Background Report and associated statistical analysis support document will be transmitted by separate cover to reflect changes due to the recalculation for vanadium. The remainder of the constituents have been reviewed to ensure that no detection limits above the proposed background values were used in the calculations. Minor adjustment in three of the thorium-230 values in Table 6-4 were made as well based upon the review.

Table 6-4

NMED Comment: The proposed mixing zone background concentrations for uranium, molybdenum, vanadium and thorium-230 are actually higher than the proposed alluvial and Chinle background concentrations. How can the mixing zone background concentrations be higher than water that contributes to this mixing zone? NMED would accept these calculated mixing zone concentrations if HMC can provide verification that a geochemical reaction has caused the background values in the mixing zone to be higher than the waters that contribute to this zone. Otherwise, NMED would accept the concentrations from the alluvial or Chinle waters (whichever is higher) to be used as the background value for these four constituents.

Response: The alluvial water that enters the Chinle aquifers in the mixing zone flows through a significant amount of Chinle formation, which is dramatically different than the alluvial material. The geochemistry of the Chinle Formation results in ion exchange as the water moves through the Chinle Formation; this changes some of the water chemistry concentrations for some major constituents. These geochemical changes can result in the modest changes in the trace constituent concentrations that were noted by the reviewer. In the case of uranium, molybdenum, vanadium and thorium-230, the background concentrations are similar to the highest levels observed in the source aquifers. The background values should not be limited to water that has moved only through alluvial material.

Figure 6-3

NMED Comment: The mixing zone boundary seems unusually "straight". HMC should determine the mixing zone boundary using data from all wells and not just those included in the statistical analysis, bases on calcium concentrations.

Response: HMC used all wells for which reliable construction and completion records were available to determine the contact between the mixing and non-mixing zones. The boundary on

Figure 6-3 east of the West Fault was derived from information /data related to wells 493, CW28 and CW30. These wells were used to define the limits of the mixing and non-mixing zone in the Middle Chinle aquifer in this area. Little reliance can be placed on use of private wells in the subdivisions due to incomplete or questionable information relating to well completion.

General Comments

NMED Comment: There are many statements included in the report regarding the naturally occurring water quality of the Chinle Formation (e.g. Section 2-1, Paragraph 4: "[T]he Chinle rock units also contain naturally elevated uranium and selenium concentrations."). This sort of information is not referenced at the appropriate places in the text as they correspond to the list included in Section 7.0. HMC should reference these documents appropriately whenever statements regarding background quality are presented. A regional evaluation of published Chinle water quality data should be included for comparison purposes.

Response: Section 5.2 discusses our evaluation of the regional Chinle water quality. The regional reports do not present uranium and selenium data. Gamma logs are useful in defining uranium mineralization. Gamma values generally decrease in the Chinle sandstones relative to the value of the Chinle shale. Some spikes in gamma values in the Chinle sandstones have been measured in several gamma logs for Chinle drill holes at HMC (unpublished data). These gamma increases indicate that uranium mineralization does exist in the Chinle Formation in the general Grants site area.