July 10, 2006

Mr. Al Cox
Project Manager
Homestake Mining Co. of CA
P.O. Box 98
Grants, NM 87020

SUBJECT: HOMESTAKE MINING COMPANY- GRANTS, NEW MEXICO - LICENSE AMENDMENT NO. 39 TO MATERIALS LICENSE NO. SUA-1471 (TAC LU0122)

Dear Mr. Cox:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of your December 5, 2005 request to revise several existing ground water protection standards (GWPSs) and establish several new GWPSs for the alluvial aquifer, Chinle mixing zone, and Chinle non-mixing zones at Homestake Mining Company's (HMC's) uranium mill site near Grants, New Mexico.

The NRC staff has reviewed your proposed amendment with respect to relevant regulatory criteria (10 CFR 40, Appendix A, paragraph 5B(5)) of Criterion 5 and NRC guidance (NUREG-1620, Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978) and has determined that the proposed amendment meets appropriate regulatory criteria. With respect to the NRC staff's technical evaluation, an assessment of the hydrogeologic and statistical basis for the proposed GWPSs indicated that the technical submittals related to your request contained a rigorous and computationally accurate analysis. The NRC staff's technical evaluation is provided in Enclosure 1. As a result of the staff's review, the NRC has determined that your request to revise License Condition (LC) 35 of Source Materials License SUA-1471 is acceptable. Consequently, the HMC license has been modified to change wording in LC 35 to reflect the proposed revisions to the GWPSs. The amended license is provided as Enclosure 2.

The NRC staff evaluated the potential impact of implementation of the proposed license amendment and prepared an Environmental Assessment (EA). A copy of the final EA was sent to you on June 6, 2006. The EA indicates that the staff concluded that there would be no significant environmental impact from the requested licensing action. A notice to this effect has been published in the *Federal Register* (June 22, 2006).

If you have any questions regarding this letter or the enclosures, please contact the NRC Project Manager for your facility, Ron Linton, at (301) 415-7777, or via email, to rcl1@nrc.gov.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: 40-8903
License No.: SUA-1471

Enclosures: 1. Technical Evaluation Report
2. License Amendment No. 39

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(CLOSES TAC LU0122)

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TECHNICAL EVALUATION REPORT
HOMESTAKE MINING COMPANY
REQUEST TO AMEND LICENSE SUA-1471
CONDITION 35

DATE:	July 6, 2006
DOCKET NO.	40-8903
LICENSE:	SUA-1471
LICENSEE:	Homestake Mining Company Highway 605 P.O. Box 98 Grants, New Mexico 87020
FACILITY:	Cibola County, New Mexico
PROJECT MANAGER:	Ron Linton
TECHNICAL REVIEWER:	Paul Michalak
ISSUE:	Revision to Ground Water Protection Standards

SUMMARY AND CONCLUSIONS:

Homestake Mining Company (HMC) has proposed to amend License Condition 35 of License SUA-1471 to:

1) Establish revised ground water protection standards (GWPSs) for selenium, uranium and molybdenum for the alluvial aquifer; no change is proposed in the GWPSs for vanadium, combined radium-226 and radium-228, and thorium-230 for the alluvial aquifer;

2) Add GWPSs for nitrate, total dissolved solids (TDS), sulfate and chloride for the alluvial aquifer; and,

3) Establish GWPSs for a number of constituents for the Chinle mixing and non-mixing zones.

A review of HMC's proposed amendment with respect to relevant regulatory criteria (10 CFR 40, Appendix A, paragraph 5B(5) of Criterion 5 and Nuclear Regulatory Commission (NRC) guidance (NUREG-1620, Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978) (NRC 2003) indicates that the proposed amendment meets appropriate regulatory criteria. An evaluation of the licensee's hydrogeologic and statistical basis for the proposed GWPSs indicated that the licensee had performed a rigorous and computationally accurate analysis to derive the values.

The existing ground water compliance monitoring system for the Homestake site consists of three wells installed within the San Mateo alluvium. At present, no compliance monitoring wells have been designated for the Chinle Mixing Zone or the Upper, Middle or Lower Chinle Non-Mixing Zones. HMC has agreed to propose compliance monitoring wells for the Chinle Mixing Zone and the Upper, Middle and Lower Chinle Non-Mixing Zones in a revised Corrective Action Plan to be submitted to the NRC no later than December 31, 2006. NRC will evaluate the proposed compliance monitoring wells and, if acceptable, will incorporate them into the license as compliance locations for the newly established GWPSs. NRC will notify HMC and request new proposed compliance monitoring well locations, if any of the well locations are determined to be unacceptable

BACKGROUND:

The Site is located in Cibola County, New Mexico, approximately 5.5 miles north of the Village of Milan. It is bordered on the east by State Highway 605. County Road 63 runs adjacent to the northern boundary of the Large Tailing Pile (LTP), the most prominent feature on the Site. The nearest residential area (Murray Acres) is approximately 3,000 feet from the Site. Four other residential subdivisions (Broadview Acres, Felice-Acres, Pleasant Valley Estates, and Valle Verde) are located to the south or southwest, within 2 miles of the Site.

Uranium milling began at the Site in 1958 and continued through 1990 under NRC License SUA-1471. A total of 22 million tons of ore were milled at the Site using a conventional alkaline leach process. From 1993 to 1995, the mill was decommissioned and demolished (US EPA 2001). The demolition debris was placed in several repository trenches adjacent to the Site, and the material was covered by clean soil and rock for stability. The Site has two solid tailings piles (LTP and Small Tailings Pile (STP)), a collection pond, and two synthetic lined evaporation ponds. An EA was prepared for the Site in 1993 to document NRC staff's evaluation of alternatives for tailings reclamation and mill decommissioning (NRC 1993). The staff concluded that reclamation of the tailings and decommissioning of the mill as proposed by the licensee would not have a significant impact on the environment.

Hydrogeology

The Site is directly underlain by the San Mateo alluvium. Ground water flow in the San Mateo is generally north to south. HMC's ground water restoration program, however, has substantially altered ground water flow in the area immediately down gradient of the site. The program, which includes significant ground water withdrawal and injection, has created a large hydraulic cell which appears to impede the migration of site related contaminants. Southwest of the Site, the San Mateo alluvial aquifer eventually flows into the Rio San Jose Alluvial aquifer.

The Chinle Formation, which is comprised mainly of a massive shale interspersed with some sandstone (approximately 800 feet thick), exists below the alluvium. Three saturated zones within the Chinle Formation have been defined in the Site area (Upper, Middle and Lower). Complicating matters is the fact that all three Chinle zones subcrop (i.e., intersect) with the alluvial aquifer at different locations in the vicinity of the Site (defined as a single Chinle mixing zone). Within the Chinle saturated zones, in areas away from the subcrops (i.e., where the alluvium has no influence), each zone is defined respectively as the Upper, Middle, or Lower

Chinle non-mixing zone.

Further complicating matters in the Chinle are two structural faults. These faults are identified in site-related documents as the East Fault and West Fault. The northeast/southwest trending East Fault extends under the eastern portions of the Large Tailings Pile and Small Tailings Pile and continues under the Broadview Acres and Felice Acres subdivisions. The West Fault, which also trends northeast/southwest, passes just west of the Large Tailings Pile and extends underneath the Murray Acres subdivision.

The Upper Chinle is the uppermost sandstone in the Chinle formation. In the immediate vicinity of the Site, the top of the Upper Chinle varies from 98 feet below ground surface (bgs) (well CE1 - south of the LTP) to 210 feet bgs (well CW3 - northest of the LTP) (HMC and Hydro-Engineering 2005). It is generally separated from the alluvial aquifer by shale; however, the western limit of the Upper Chinle subcrops with the alluvial aquifer (i.e., Chinle mixing zone) along a northeast to southwest line that runs through the western portion of the Large Tailings Pile and Murray-Acres subdivision before turning southeast and passing through the southern portion of the Felice-Acres subdivision (Hydro-Engineering 2001). The portion of the Upper Chinle zone away from the subcrop area and not in hydraulic communication with the alluvial aquifer is defined as the Upper Chinle non-mixing zone. Like the alluvial aquifer, unaltered ground water flow is from north to south; however, withdrawal in the vicinity of the Large Tailings Pile and injection immediately north of the Broadview Estates subdivision has created some localized gradient reversals.

The Middle Chinle is another deeper sandstone and appears to be the thickest of the sandstones in the Chinle Formation. Due to the presence of the West Fault, the Middle Chinle is present as two separate systems in the vicinity of the Site (Hydro-Engineering 2001). Immediately west of the Site and the West Fault, the Middle Chinle non-mixing zone subcrops with the alluvial aquifer in an area located between the Large Tailings Pile and Pleasant Valley Estates subdivision. Ground-water flow in this portion of the Middle Chinle parallels the alluvial aquifer and is generally northeast to southwest, and the subcrop area is defined as a Chinle mixing zone. East of the West Fault, another Middle Chinle/alluvial aquifer subcrop occurs in the area south of Broadview Acres, trending southeast in the southern portion of Felice Acres. Depths to the Middle Chinle in this subcrop are approximately 90 to 100 feet bgs. This portion of the Middle Chinle is also defined as a Chinle mixing zone. East of the West Fault, the Middle Chinle unit dips toward the northeast and occurs underneath the LTP at between 275 and 350 feet bgs. Middle Chinle non-mixing zone ground water flow east of the West Fault is southwest to northeast. Ground-water injection immediately north of the Broadview Estates subdivision has created some localized gradient reversals.

The Lower Chinle is a permeable zone in the lower portion of the Chinle Formation. In general, the top of the Lower Chinle occurs approximately 225 to 313 feet bgs south of the Site (west of Felice Acres subdivision); however, west of the Site (Valle Verde subdivision) it occurs around 154 to 247 feet bgs (HMC and Hydro-Engineering 2001). Secondary permeability (i.e., fractures) is adequate in some locations to allow this zone to be considered an aquifer. The Lower Chinle also subcrops with the alluvial aquifer in a northwest to southeast trend south and west of the Valle Verde subdivision. This subcrop area is defined as a Chinle mixing zone. Like the Middle Chinle, the Lower Chinle dips to the north/northeast and non-mixing zone ground-water flow direction is generally from south to north.

The deepest producible aquifer in the area is the San Andres which underlies the Chinle formation. Depth to the San Andres is approximately 800 to 955 feet bgs in the immediate vicinity of the Site (HMC and Hydro-Engineering 2005). This aquifer appears to be unaffected by the Site (HMC and Hydro-Engineering 2001).

Ground Water Protection Standards

In 1989, the NRC established GWPSs for the Site as background concentrations from a single alluvial monitor well, well P (NRC 1989). These GWPSs were derived from a statistical analysis of three sets of split samples (i.e., samples were divided into two equal parts and sent to two different laboratories for analysis) collected from alluvial well P between December 13, 1988 and February 15, 1989 (HMC 1989). Table 1 contains the current GWPSs for the Site which are currently contained in License Condition 35 of Source Materials License SUA-1471.

TABLE 1
HMC's CURRENT GROUNDWATER PROTECTION STANDARDS

Constituents	
Selenium (mg/L)	0.10
Uranium (mg/L)	0.04
Molybdenum (mg/L)	0.03
Vanadium (mg/L)	0.02
Thorium-230 (pCi/L)	0.30
Ra-226 + Ra-228 (pCi/L)	5

Groundwater protection standards are applied at point of compliance wells D1, X, and S4.

Current point of compliance (POC) wells are located near the down gradient side of the tailings piles and include alluvial wells D1 and X (SUA-1471, Amendment 8, NRC 1990), and alluvial well S4 (SUA-1471, Amendment 10, NRC 1991).

Based on the fact that several of the current GPWS are derived from a small number of samples, over a short time period, taken from a single up gradient well, the licensee believes that several of the GWPSs established in 1989 are not representative of actual site background water quality.

HMC's initial license amendment request for changes in the GWPSs for the alluvial aquifer at the Site was submitted in December 2001 (HMC 2001). This initial request involved a reevaluation of the background concentrations for molybdenum, selenium, and uranium based on 23 years of data from 1976 through 1998. The staff requested additional information with respect to the amendment request and HMC provided a response dated July 7, 2003 (HMC 2003a). As a result of some of the staff's questions, HMC submitted a proposal and request for setting Chinle background water quality standards in October 2003 (Environmental Restoration

Group 2003, HMC 2003b, and HMC and Hydro-Engineering 2003). The staff requested additional information with respect to these site standards and the report was revised in June 2004 (HMC 2004a and 2004b).

In response to New Mexico Environmental Department (NMED) comments, HMC recalculated alluvial aquifer background concentrations using data from 1995 through 2004 (i.e., 10-year period) (HMC 2005a). A letter received from HMC dated December 5, 2005 (HMC 2005b) and revised January 19, 2006 (HMC 2006) requested that the NRC amend the Site license (SUA-1471) to incorporate HMC'c revised GWPSs.

Proposed Revisions to License Condition 35

HMC has proposed to amend License Condition 35 of License SUA-1471 to:

1) Establish revised GWPSs for selenium, uranium and molybdenum for the alluvial aquifer; no change is proposed in the GWPSs for vanadium, radium-226, plus radium-228 and thorium-230 for the alluvial aquifer;

2) Add GWPSs for nitrate, TDS, sulfate and chloride for the alluvial aquifer; and,

3) Establish GWPSs for the Chinle mixing and non-mixing zones.

The proposed GWPSs for the Site are listed in Table 2.

TABLE 2
HMC's PROPOSED SITE GROUND WATER PROTECTION STANDARDS

Constituents	Alluvial	Chinle Mixing Zone	Upper Chinle Non-Mixing Zone	Middle Chinle Non-Mixing Zone	Lower Chinle Non-Mixing Zone
Selenium (mg/L)	0.32	0.14	0.06	0.07	0.32
Uranium (mg/L)	0.16	0.18	0.09	0.07	0.03
Molybdenum (mg/L)	0.10	0.10	0.10	0.10	0.10
Sulfate (mg/L)	1,500	1,750	914	857	2,000
Chloride (mg/L)	250	250	412	250	634
TDS (mg/L)	2,734	3,140	2,010	1,560	4,140
Nitrate (mg/L)	12	15	*	*	*
Vanadium (mg/L)	0.02	0.01	0.01	*	*
Thorium-230 (pCi/L)	0.30	*	*	*	*
Ra-226 + Ra-228 (pCi/L)	5	*	*	*	*

* - site standards not proposed for the constituents in the indicated aquifer

TECHNICAL EVALUATION:

Regulatory

The regulatory basis for HMC's license amendment request is provided in 10 CFR 40, Appendix A, Criteria 5B(5), and discussed in Section 4.2.3 (page 4-23) of NUREG-1620, Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (NRC 2003). Three options for establishing GWPSs for hazardous constituents are provided:

- Commission-approved background concentrations;
- Maximum concentration limits as specified in 10 CFR 40, Appendix A, Criterion 5C; or
- Alternate concentration limits.

The proposed license amendment utilizes the first two options. For the alluvial aquifer, and Chinle mixing and non-mixing zones, selenium, uranium, sulfate, TDS, nitrate and chloride (Upper and Lower Chinle) standards are the 95th percentile (non-parametric) or the parametric upper tolerance limit at a 95% confidence limit concentration from their respective background data sets. As such, they are submitted under the first option and an evaluation of their hydrogeologic and statistical basis is discussed below. The vanadium standards for the Upper Chinle non-mixing zone and the Chinle Mixing zone represent the lower analytical detection limit for that metal (i.e., vanadium was not detected in either aquifer above its analytical detection limit). As such, it is analogous to a background standard and is an appropriate value. The alluvial and Chinle molybdenum standard is taken from 40 CFR 192, Subpart A, Table 1. Neither 10 CFR 40, Appendix A, Criterion 5C, nor the Safe Drinking Water Act maximum contaminant levels (MCLs) (US EPA 2004) contain a standard for molybdenum. The standards contained in 40 CFR 192, Subpart A, Table 1, actually apply to UMTRCA Title I sites; however, these Title I standards are maximum concentrations of constituents for ground water protection and are analogous to MCLs. Consequently, the application of the 40 CFR 192, Subpart A, Table 1 molybdenum standard as a GWPS at the Site is analogous to the second option and is acceptable. Finally, the alluvial, Middle Chinle non-mixing, and Chinle mixing zone chloride standard is a secondary drinking water standard taken from US EPA (2004). As such, it is analogous to an MCL and is the second option and is acceptable.

Hydrogeologic

The hydrogeologic component of the present technical evaluation has four primary elements:

- Are there a sufficient number of wells in each aquifer/saturated unit to properly characterize ground water quality?

- Have the wells been evaluated over a sufficiently long time period and are the corresponding data sets large enough?

- Are the wells actually located within the aquifer/saturated zone for which they are designated?

- Are the wells truly hydraulically upgradient of the Site or, correspondingly, are they located in areas that represent ambient water quality conditions (i.e., locations uninfluenced by historical or current Site activities)?

Alluvial Aquifer

The San Mateo alluvial aquifer at the site flows from north to south. Originally, HMC selected 15 alluvial wells located north of the Site to represent upgradient ground water quality conditions. HMC divided the 15 upgradient alluvial wells into two groups: DD, ND, P, P1, P2, P3, P4, Q, and R, which were defined as "near upgradient wells," and 914, 916, 920, 921, 922, and 950, which were defined as "far upgradient wells." As a result of comments by NMED, the far up gradient wells were eliminated from consideration and background water quality conditions were derived solely from the near upgradient group (HMC 2005a). The water quality data from the near upgradient group were evaluated over a 10-year sampling period from 1995 through 2004. This data set, corrected for non-detects and duplicates, totaled between 72 and 80 samples, depending on the constituent of interest.

Based on ground water flow information for the alluvial aquifer (Hydro-Engineering 2001), the locations of near upgradient wells are consistent with HMC's definition of upgradient locations. Furthermore, evaluating ten-years of water quality data totaling between 72 to 80 sample results (depending on the constituent) from nine upgradient wells is a sufficient number and time period to properly develop a GWPS. Moreover, it is far superior to the one well/two-month time period analysis used in developing the current standard.

Chinle Non-Mixing Zones - Upper Chinle

Ground water flow in the Upper Chinle formation is complex. Ambient Upper Chinle ground water flow (i.e., flow not influenced by current Site Corrective Actions) underneath most of the Site is north to south. East of the East Fault, Upper Chinle ground water flow is parallel to the East Fault and generally in an easterly direction some distance from the fault. Five wells are utilized by HMC to evaluate background water quality: 0931, 0934, CW3, CW13, and CW18. Data from January 1982 through July 2003 was used to evaluate background water quality in the Upper Chinle aquifer (HMC and Hydro-Engineering 2003). This data set, corrected for non-detects and duplicates, totaled between 124 and 167 samples, depending on the constituent of interest (Environmental Restoration Group 2003).

Upper Chinle Non-mixing Zone wells 0931, 0934, CW13, and CW18 are all located east of the East Fault. The elevation of the top of the Upper Chinle aquifer east of the East fault appears to dip to the east (HMC and Hydro-Engineering 2003). Moving west to east, the Upper Chinle is intercepted at 6,381 feet (mean sea level) msl (well CW18), 6,344 feet msl (well CW13), 6,302 feet msl (well 934), and 6,281 feet msl (well 931). Data presented in HMC and Hydro-Engineering (2003) indicates that the Upper Chinle also dips to the east, west of the East Fault, albeit at higher elevations due to the offset caused by the East Fault. Well CW3, located west of the East Fault and northeast of the LTP, intercepts the Upper Chinle at about 6,377 feet bgs. Despite the variation in depths, all five wells appear to be consistent with their designations as Upper Chinle aquifer wells.

Water quality trend analyses for the Upper Chinle non-mixing wells (HMC and Hydro-Engineering 2003, Appendix C) generally support the finding of no long-term tendencies indicating influence from Site contamination. Consequently, the well locations, depths and number (five); and sampling period (over 21 years) and samples collected (124 to 167) are sufficient to properly develop a GWPS.

Chinle Non-Mixing Zones - Middle Chinle

Like the Upper Chinle, ground water flow direction in the Middle Chinle is not uniform. Between the East and West Faults (underlying most of the Site), flow is south to north, while west of the West Fault and east of the East Fault, Middle Chinle ground water flow is north to south. Six Middle Chinle Non-mixing Zone wells are used to define background water quality: ACW, CW1, CW2, CW14, CW28 and WCW. Data from January 1982 through July 2003 were used to evaluate background water quality in the Middle Chinle aquifer (HMC and Hydro-Engineering 2003). This data set, corrected for non-detects and duplicates, totaled between 138 and 192 samples, depending on the constituent of interest (Environmental Restoration Group 2003).

Similar to the Upper Chinle, the Middle Chinle generally appears to dip to the east; however, the offset caused by the East Fault results in the dip occurring at different elevations on each side of the East Fault. Moving west to east, Middle Chinle Non-mixing Zone wells CW1 and CW2 are located on the west side of the East Fault, directly north of the LTP. The Middle Chinle is intercepted at these two locations at 6,313 feet msl and 6,279 feet msl, respectively, which is consistent with an eastern dip. Wells ACW, WCW, and C14 are Middle Chinle non-mixing zone wells located in relative close proximity, south of the Site within or adjacent to the Murray-Acres subdivision. All three wells are located west of the East Fault and interception with the Middle Chinle occurs at 6,299 feet msl, 6,313 feet msl and 6,253 feet msl, respectively. These elevations are consistent with a northeast trending dip in the Middle Chinle. Well CW28 is located east of the East Fault, east of Felice-Acres subdivision. It intercepts the Middle Chinle at 6,276 feet msl. Middle Chinle elevation data from several other wells located east of the East Fault indicate an eastern dipping unit. For all six wells, reported Middle Chinle aquifer interception depths appear to be consistent with their Middle Chinle designations.

No significant (i.e., long term) trend supporting an influence from Site contamination was evident in HMC's water quality trend analyses (HMC and Hydro-Engineering 2003). Consequently, the well locations, depths and number (six); and sampling period (over 21 years) and samples collected (138 to 192) are sufficient to properly develop a GWPS.

Chinle Non-Mixing Zones - Lower Chinle

Ground water flow direction in the Lower Chinle is generally south to north, with a northwestern component, west of Felice-Acres between the East and West Faults. Six Lower Chinle Non-mixing Zone wells are used to define background water quality: CW26, CW29, CW31, CW32, CW33, and CW41. Data from April 1995 through July 2003 were used to evaluate background water quality in the Lower Chinle aquifer (HMC and Hydro-Engineering 2003). This data set, corrected for non-detects and duplicates, totaled between 27 and 60 samples, depending on the constituent of interest (Environmental Restoration Group 2003).

The Lower Chinle generally appears to dip to the east; however, the offset caused by the West Fault causes the dip to occur at different elevations on each side of the West Fault. Lower Chinle Non-mixing zone wells CW31, CW32, and CW33 are west of the west fault, north and west of Pleasant Valley Estates subdivision. The elevation of the top of the Lower Chinle at these wells are 6,304 feet msl, 6,409 feet msl, and 6,301 feet msl, respectively. Although the CW31 data are somewhat anomalous, data from several other Lower Chinle Non-mixing zone wells located west of the west fault support an eastern dipping unit (HMC and Hydro-Engineering 2003 and 2005).

Wells CW41 and CW29 are located south and west of Felice-Acres subdivision, just west of the East Fault. Interception with the Lower Chinle at these wells occurs at 6,416 feet msl and 6,323 feet msl, respectively, and are consistent with a northeast trending dip. Well CW26 is located just east of the East Fault, directly south of Felice-Acres subdivision. Depth to the Lower Chinle occurs at 6,330 feet msl. The Lower Chinle non-mixing zone background wells appear to be consistent with their aquifer designations.

Several of the trend analyses for these wells, presented in HMC and Hydro-Engineering (2003) Appendix C, are somewhat inconclusive; however, the analyses for both uranium and molybdenum generally support the finding of no long-term trends indicating influence from Site contamination. Consequently, despite some ambiguous water quality data, the well locations, depths, and number (six); and sampling period (over 8 years) and samples collected (27 to 80) from the designated Lower Chinle wells are sufficient to properly develop a GWPS.

Chinle Mixing Zone

All three Chinle aquifers subcrop with the overlying alluvial aquifer. In the areas where the Chinle subcrops with the alluvium, the subcrop has been defined as the Chinle Mixing zone. Subcrops for all three Chinle zones fall within the single Chinle mixing zone definition. The thirteen Chinle mixing zone wells used to define background water quality are CW9, CW10, CW15, CW17, CW24, CW35, CW36, CW37, CW39, CW43, CW50, CW52 and WR25. Data from April 1987 through July 2003 were used to evaluate background water quality in the Chinle mixing zone (HMC and Hydro-Engineering 2003). This data set, corrected for non-detects and duplicates, totaled between 58 and 96 samples, depending on the constituent of interest (Environmental Restoration Group 2003).

Mixing zone wells are distinguished from their non-mixing zone counterparts by their location within the subsurface (i.e., stratigraphic evidence that they are located within a subcrop area) and by a significant increase in calcium concentrations versus non-mixing zone wells.

Virtually the entire Upper Chinle mixing zone in the vicinity of the Site occurs between the East and West Faults. Mixing zone wells CW9, CW10, CW50, CW52 are all located east of their Upper Chinle non-mixing zone counterparts. Their interception of the top of the Upper Chinle (between 6,421 feet msl and 6,462 feet msl) is shallower than their non-mixing zone counterparts and consistent with an eastern dipping Upper Chinle. Further supporting their identification as a mixing zone well are calcium concentrations that are approximately 10 to 20 times greater than their non-mixing zone counterparts. Calcium concentration ranges for the Chinle mixing and Upper Chinle non-mixing wells are listed in Table 3.

TABLE 3
CALCIUM RANGES - CHINLE MIXING VERSUS NON-MIXING ZONES

Upper Chinle			
Mixing	Ca range (mg/L)	Non-mixing	Ca range (mg/L)
CW9	24 - 56	CW3	13 - 127
CW10	168 - 233	931	3 - 48
CW50	203 - 223	934	6 - 51
CW52	66 -180	CW13	10 - 22
		CW18	14 - 20
Middle Chinle			
WR25	224 - 561	CW14	6 - 9
CW24	347 - 357	WCW	15 - 16
CW35	184 - 321	ACW	3 - 27
CW17	349 - 418	CW1	8
CW15	31 - 88	CW2	6 - 36
		CW28	5 - 9
Lower Chinle			
CW36	87 - 126	CW29	57 - 80
CW37	177 - 196	CW41	46 - 110
CW39	141 - 166	CW31	54 - 137
CW43	103 - 132	CW32	120 - 679
		CW33	367 - 606
		CW26	53 - 134

Source (Environmental Restoration Group, Inc. 2003)

The two Middle Chinle mixing zones occur in the vicinity of the Site. West of the LTP and the West Fault, mixing zone wells CW17, CW24, CW35, and WR25 are located within a Middle Chinle subcrop with the San Mateo alluvial aquifer. This is consistent with a conceptual geologic model that holds the absence of an Upper Chinle unit west of the west fault (i.e., the Middle Chinle is the shallowest Chinle unit west of the West Fault). Calcuim concentrations in these wells, which are generally 20 to 50 times greater than Middle Chinle non-mixing zone concentrations, support the mixing zone designation.

Another Middle Chinle subcrop with the San Mateo alluvial aquifer occurs south of the Murray-Acres and Broadview-Acres subdivisions, and east of the West Fault. The elevation of the Middle Chinle in mixing zone well CW15 is consistent with a northeast dipping unit. In addition, calcium concentrations in CW15, although not as high the other Middle Chinle mixing zone wells, are between approximately 2 to 10 times greater than its non-mixing zone counterparts. Calcium concentration ranges for the Chinle mixing and Middle Chinle non-mixing wells are listed in Table 3.

The Lower Chinle subcrop with the San Mateo alluvial aquifer occurs west of the West Fault within the Valle Verde subdivision. Lower Chinle mixing zone wells CW36, CW37, CW39, and CW43 are all located within this subcrop area. Their shallower interception of the Lower Chinle (6,396 feet msl to 6,468 feet msl) versus their non-mixing counterparts supports HMC's model of an eastern dipping Lower Chinle. With the exception of non-mixing wells CW32 and CW33, calcium concentrations are generally higher in the Lower Chinle mixing wells versus their non-mixing counterparts. Calcium concentration ranges for the Chinle mixing and Lower Chinle non-mixing wells are listed in Table 3.

Based on the material reviewed, the well locations, depths and number (13); and sampling period (over 16 years) and samples collected (58 to 96) are sufficient to properly develop a GWPS for the Chinle mixing zone.

Statistical

For the alluvial aquifer, the proposed GWPSs for selenium, uranium, sulfate, TDS, and nitrate are based on a statistical analysis of a large set of upgradient spatial (nine wells) and temporal (10-year period from 1995 through 2004) ground water quality data (HMC 2005a). The statistical basis for these alluvial aquifer GWPSs are presented in Environmental Restoration Group (2001) and revised per HMC (2005a).

For the Chinle mixing and non-mixing zones, selenium, uranium, sulfate, TDS, nitrate and chloride (Upper and Lower Chinle) standards are the 95th percentile concentrations from their respective background data sets. Background data considered for the Chinle zones were collected between 1979 and 2003. The basis for the statistically derived proposed Chinle mixing and non-mixing zones GWPSs are presented in Environmental Restoration Group (2003) and revised per HMC (2004a).

HMC's statistical analysis for the alluvial aquifer, Chinle mixing zone, and Chinle non-mixing zones utilized a series of methods described in US EPA (1989, 1992, and 1998). Distribution analyses included:

- Rejection of Outliers - an *a priori* screening test was applied to all data sets (non-transformed), eliminated maximum values greater than three times the next highest value.

- Determination of percent of non-detects - if percentage of non-detects was less than 15%, the non-detect was replaced by the detection limit divided by two. Data sets with percent of non-detects greater than 15% were considered non-parametric and a distribution analysis was performed.

- Coefficients of variation (CV) - a unitless measure that can be used to determine whether or not a data set is normally distributed by comparing the value to 1. Data sets with CVs greater than one are not considered normally distributed.

- Studentized range test - the test evaluates the ratio of the range of the data set to the set's standard deviation against a critical value found in a standardized table.

- Geary's test (testing data to determine if it is normally distributed) - uses the ratio of the mean deviation of the data set to the set's standard deviation. This ratio is then adjusted to approximate a standard normal distribution and compared to a critical value found in a standardized table. Although the test does not perform as well as the Shapiro-Wilk test (see below) or studentized range test (see above), it is based on the normal distribution and critical values for all possible sample sizes are available.

- Coefficient of Skewness - a measure for the degree of symmetry in the data set. An acceptable range of -1 to 1 was used for comparison with the calculated coefficient.

- Shapiro-Wilk (n<50) or Shapiro-Francia (n$50) Test of Normality - a measure of normality where the test statistic tends to be close to one when the data set is normally distributed and conversely, relatively small if the data set deviates significantly from normality. The test statistic can be compared to critical values found in a standardized table.

- Filliben's Statistic - also referred to as the probability plot correlation coefficient, it measures the linearity of the points on the normal probability plot. The test statistic can be compared to critical values found in a standardized table.

- Histograms - visual determination of whether data is skewed (i.e., deviating from normality).

- Probability Plots - visual determination of whether data is deviating from normality.

In addition, the T_n Statistic Test, an outlier test where the test statistic (calculated using a suspected outlier) is compared to a critical value found in a standardized table, was performed on each data set following *a priori* screening. Depending on the distribution, the 95% upper tolerance limits (normally distributed data sets) or the 95th percentiles (non-parametric data sets) were evaluated.

Analysis of the alluvial data sets also included comparison tests between near and far up gradient alluvial data sets to determine whether the data sets were similar and application of the Wilcoxon Rank Sum Test, a non-parametric test used to determine if data sets are statistically similar.

The statistical methods utilized by HMC are classical techniques and they appear to be suitable for HMC's analyses. Based on the review of Environmental Restoration Group (2001 and 2003) and related documents, it appears these methods were rigorously and appropriately applied to the data sets in question.

For the alluvial aquifer near upgradient data set, no *a priori* outliers were identified for uranium, selenium, sulfate, TDS, or nitrate. The results of HMC's distribution analysis for the near upgradient selenium, uranium, sulfate, TDS, and nitrate water quality data sets determined all five constituents as non-parametric distributions. Applicaiton of the 95th percentile is consistent with U.S. Environmental Protection Agency (US EPA) guidance (US EPA 1992). Consequently, their respective 95th percentile concentrations were used as their proposed background GWPSs.

For the Chinle mixing and non-mixing zones, no *a priori* outliers were identified for uranium, selenium, sulfate, TDS, nitrate, or chloride. HMC's distribution analysis indicated non-parametric distributions for uranium, selenium, sulfate, (Middle and Lower Chinle non-mixing and Chinle mixing zones), TDS, nitrate and chloride (Upper and Lower Chinle non-mixing zone). Consequently, all their proposed GWPSs are the 95th percentile concentrations from their respective background data sets. The exception was the Upper Chinle non-mixing zone sulfate data set, which tested parametric; consequently, the parametric upper tolerance limit at a 95% confidence limit concentration was used as its proposed GWPS. Both applications appear to be consistent with U.S. EPA guidance (US EPA 1992).

Compliance Monitoring for Chinle Zones

Per 10 CFR 40, Appendix A, Criterion 7A, "Once ground water protection standards have been established pursuant to paragraph 5B(1), the licencee shall establish and implement a compliance monitoring program. The purpose of the compliance monitoring program is to determine that the hazardous constituent concentrations in ground water continue to comply with the standards set by the Commission." The current NRC license contains three POC wells for the San Mateo alluvium. These wells will be defined as compliance monitoring wells in the amended license; however, HMC's current proposal does not contain any compliance monitoring wells for the Chinle mixing and non-mixing zones.

HMC is currently preparing a revised Corrective Action Plan (Per 10 CFR 40, Appendix A, Criterion 7A) that will detail current remedial efforts at the Site and which potentially may address down-gradient areas that have been impacted by Site-related constituents. HMC has verbally suggested that they would prefer to propose compliance monitoring wells for the Chinle zones as part of revisions to their Corrective Action Program. They have verbally proposed December 31, 2006 as a submittal deadline for the revised Corrective Action Plan.

The staff believes that the revised Corrective Action Plan is an important document which can tie together present and future remedial efforts in a cohesive record. Given the hydrogeological complexity of the Site and the comprehensive nature of the Corrective Action Program, staff believes this document would be an appropriate avenue for the licensee to propose compliance monitoring wells for the Chinle zones.

PROPOSED LICENSE CONDITIONS:

Based on HMC's license amendment submittals concerning their proposed revision to San Mateo alluvium GWPSs and newly proposed GWPSs for the Chinle mixing and non-mixing zones, and subsequent conversations concerning point of compliance wells in the Chinle zones, the following changes should be made to License Condition 35.

<u>License Condition 35 - EDIT</u>

35. The licensee shall implement a ground water compliance monitoring program to assess the performance of the ground water restoration program. This program is separate from the requirements in License Condition 15. The Licensee shall:

A. Unchanged.

B. ~~Comply with the following groundwater protection standards at the point of compliance wells D1, X, and S4 with background being recognized in well P~~.

~~molybdenum = 0.03 mg/l, selenium = 0.10 mg/l, vanadium =0.02 mg/l, uranium = 0.04 mg/l, radium-226 and -228 = 5.0 pCi/l, and thorium-230 =0.30 pCi/l.~~

The following ground water protection standards are established for each designated aquifer/zone as described in Ground-Water Hydrology for Support of Background Concentration at the Grants Reclamation Site (Hydro-Engineering, December 2001) and Background Water Quality Evaluation of the Chinle Aquifers (Homestake Mining Company and Hydro-Engineering, October 2003):

Constituents	Alluvial Aquifer	Chinle Mixing Zone	Upper Chinle Non-Mixing Zone	Middle Chinle Non-Mixing Zone	Lower Chinle Non-Mixing Zone
Selenium (mg/L)	0.32	0.14	0.06	0.07	0.32
Uranium (mg/L)	0.16	0.18	0.09	0.07	0.03
Molybdenum (mg/L)	0.1	0.1	0.1	0.1	0.1
Sulfate (mg/L)	1500	1750	914	857	2000
Chloride (mg/L)	250	250	412	250	634
TDS (mg/L)	2734	3140	2010	1560	4140
Nitrate (mg/L)	12	15	*	*	*
Vanadium (mg/L)	0.02	0.01	0.01	*	*
Thorium-230 (pCi/L)	0.3	*	*	*	*
Ra-226 + Ra-228 (pCi/L)	5	*	*	*	*
* - ground-water protection standards not necessary for the constituents in the indicated zones					

The constituents listed above for the alluvial aquifer must not exceed the specified concentration limit at compliance monitoring wells (former point of compliance wells) D1, X, and S4. At present, no compliance monitoring wells have been designated for the Chinle Mixing Zone or the Upper, Middle or Lower Chinle Non-Mixing Zones for the purpose of implementing the ground water protection standards listed above for these zones. The licensee shall propose compliance monitoring wells for the Chinle Mixing Zone and the Upper, Middle and Lower Chinle Non-Mixing Zones in a revised Corrective Action Plan to be submitted to the NRC no later than December 31, 2006. NRC will evaluate the proposed compliance monitoring wells and, if acceptable, will incorporate them into the license as compliance locations for the ground water protection standards listed above. NRC will notify the licensee and request new proposed compliance

monitoring well locations from the licensee, if any of the well locations are determined to be unacceptable.

C. Unchanged.

D. Unchanged.

E. Unchanged.

[Applicable Amendments: 3, 4, 5, 7, 8, 10, 11, 16, 21, 28, 30, 31, 33, 34, 39]

ENVIRONMENTAL REVIEW:

During its review of the amendment request, the NRC staff performed an environmental assessment (EA) as required under 10 CFR 51.21, for this licensing action. The requested activity does not meet any of the criteria in Part 51.20 requiring an environmental impact statement.

The draft EA was provided to the New Mexico Environment Department and the U.S Environmental Protection Agency on April 10, 2006. Comments received were addressed in the final EA that was approved on June 6, 2006. The notice of a finding of no significant impact was published in the *Federal Register* on June 22, 2006.

REFERENCES:

Environmental Restoration Group, Inc. (2001) Statistical Evaluation of Alluvial Ground Water Quality Upgradient of the Homestake Site Near Grants, NM. December 31, 2001. [Adams Accession Nos. ML020080071, ML020080076, ML020080104, and ML020350348]

Environmental Restoration Group, Inc. (2003) Statistical Evaluation of Chinle Aquifer Quality at Homestake Site Near Grants, NM. October 31, 2003. [Adams Accession No. ML033140226]

HMC (1989) Correspondence from Edward E. Kennedy to Harry Pettengill, NRC, concerning License No. SUA-1471, Condition Number 35. March 15, 1989. [Adams Accession No. ML060400046]

HMC (2001) Correspondence from R. R. Cellan to M. N. Leach, NRC, concerning Request to Change Background Concentrations at Homestake Grants Reclamation Site. December 15, 2001. [Adams Accession No. ML020080006]

HMC (2003a) Correspondence from Alan D. Cox to R. W. VonTill, NRC, concerning Response to Comments on Site Background Water Quality Document (9/02 EPA Comments, 6/03 NRC Comments). July 7, 2003. [Adams Accession No. ML031950335]

HMC (2003b) Correspondence from Alan D. Cox to R. W. VonTill, NRC, forwarding Reports on Grants Reclamation Project - Chinle Aquifers - Background Water Quality Evaluation and Water Quality Statistical Evaluation Support Document Response. October 22, 2003. [Adams

Accession No. ML033140203]

HMC (2004a) Correspondence from Alan D. Cox to Gary Janosko, NRC, concerning follow up to May 17, 2004 meeting with NRC staff concerning Grants Reclamaiton Site. June 21, 2004. [Adams Accession No. ML041770456]

HMC (2004b) Correspondence from Alan D. Cox to R. W. VonTill, NRC, concerning Homestake's response to New Mexico Environmental Department (NMED) Comments on "Background Water Quality Evaluation of Chinle Aquifers." June 23, 2004. [Adams Accession No. ML041770276]

HMC (2005a) Correspondence from Alan D. Cox to Jerry Schoeppner, NMED, concerning Homestake's response to NMED 1/20/05 Comments on Proposed Ground Water Background Concentrations for HMC Grants Millsite. June 9, 2005. [Adams Accession No. ML060790062]

HMC (2005b) Correspondence from Alan D. Cox to Gary Janosko, NRC, concerning Grants Mill Site Reclamation Project - Aquifer Site Standards. December 5, 2005. [Adams Accession No. ML053550352]

HMC (2006) Correspondence from Alan D. Cox to Paul Michalak, NRC, concerning Grants Mill Site Reclamation Project - Aquifer Site Standards. January 19, 2006. [Adams Accession No. ML060250273]

HMC and Hydro-Engineering (2003) Background Water Quality Evaluation of Chinle Aquifers. October 31, 2003. [Adams Accession Nos. ML033140212, 215, 218, 223, 239, and 242; and ML033160201, 203, 207, and 213]

HMC and Hydro-Engineering (2005) 2004 Annual Monitoring Report/Performance Review for Homestake's Grants Project. March 23, 2005. [Adams Accession Nos. ML050970160, ML050970162, ML050970166, ML050970167, ML050970170, and ML050970174]

Hydro-Engineering (2001) Ground-Water Hydrology for Support of Background Concentration at the Grants Reclamation Site [Adams Accession Nos. ML020090223 and ML020350329]

U.S. EPA (1989) Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance, Office of Solid Waste, Waste Management Division, U.S. EPA, Washington, D.C.

U.S. EPA (1992) Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance, Office of Solid Waste Permits and State Programs Division, U.S. EPA, Washington, D.C. July 1992

U.S. EPA (1998) Guidance for Data Quality Assessment - Practical Methods for Data Analysis EPA QA/G-9, QA97 Version. January 1998

U.S. EPA (2001) First Five-year Review Report for Homestake Mining company superfund Site, Cibola County, New Mexico. September 2001. [Adams Accession No. ML013230044 and ML013230074]

U.S. EPA (2004) 2004 Edition of the Drinking Water Standards and Health Advisories. Winter

2004. www.epa.gov/waterscience/criteria/drinking/standards/dwstandards.pdf

U. S. NRC (1989) Memorandum from Gary R. Konwinski concerning Establishment of Ground-Water Protection Standards. May 18, 1989. [Adams Accession No. ML060400039]

U. S. NRC (1990) Correspondence from R. E. Hall to Homestake Mining Company concerning Amendment 8 (License Condition 35) to SUA-1471. July 20, 1990 [Adams Accession No. ML060400040]

U. S. NRC (1991) Correspondence from R. E. Hall to Homestake Mining Company concerning Amendment 10 (License Condition 35) to SUA-1471. January 16, 1991 [Adams Accession No. ML060400041]

U. S. NRC (1993) Environmental Assessment for Decommissioning and Reclamation of Grants Mill and Tailings Ponds for May 1993. May 31, 1993 [Adams Accession No. ML060310523]