UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BLVD
ARLINGTON, TEXAS 76011-4511

September 10, 2012

Alan D. Cox
Project Manager
Homestake Mining Co.
P.O. Box 98
Grants, NM 87020

SUBJECT: NRC INSPECTION REPORT 040-08903/12-001

Dear Mr. Cox:

This refers to the routine announced inspection conducted on August 21-22, 2012, at the Homestake Mining site in Grants, New Mexico. The inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. The inspection determined that you were conducting operations in accordance with regulatory and license requirements. No violations were identified, and no response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Dr. Gerald Schlapper, Health Physicist, at 817-200-1273 or the undersigned at 817-200-1191.

Sincerely,

***/RA/***

D. Blair Spitzberg, PhD, Chief
Repository and Spent Fuel Safety Branch

Docket: 040-08903
License: #SUA-1471

Enclosure:
NRC Inspection Report
040-08903/12-001

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| Publicly Avail | ☑ Yes ☐ No | Sensitive Value: | | | |
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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

| | |
|---|---|
| Docket: | 040-08903 |
| License: | SUA-1471 |
| Report: | 040-08903/12-001 |
| Licensee: | Homestake Mining Co. |
| Facility: | Former Grants Mill |
| Location: | Grants, Cibola County, New Mexico |
| Dates: | August 21-22, 2012 |
| Inspector: | Gerald A. Schlapper PhD, CHP, Health Physicist<br>Repository and Spent Fuel Safety Branch |
| Approved and Accompanied by: | D. Blair Spitzberg, PhD, Chief<br>Repository and Spent Fuel Safety Branch |
| Attachment: | Supplemental Inspection Information |

## EXECUTIVE SUMMARY

Homestake Mining Company's Former Uranium Mill
NRC Inspection Report 040-08903/12-001

This inspection included a review of site status, management organization and controls, radiation protection, operator training, effluent control and environmental protection, and transportation and radioactive waste management. In summary, the licensee was conducting decommissioning operations safely and in accordance with regulatory and license requirements.

Management Organization and Controls

- The organizational structure and staffing levels were sufficient for the work in progress. Site procedures were established and were being maintained up-to-date. Annual audits were being conducted by third-party contractors, and the audits were thorough reviews of site radiation protection activities (Section 1).

Radiation Protection

- The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. Occupational exposures were small fractions of the regulatory limits. Bioassay sampling results suggested that no individual had experienced an intake of uranium in recent years (Section 2).

Operator Training and Retraining

- Radiation protection training was provided to licensee employees and contractors as required by the license (Section 3).

Effluent Control and Environmental Protection

- The licensee had established groundwater and environmental monitoring programs as required by the license. Doses to members of the public were below the regulatory limit. The environmental and groundwater monitoring reports were submitted to the NRC as required by the license (Section 4).

Inspection of Transportation Activities and Radioactive Waste Management

- The licensee was conducting transportation and waste disposal operations in accordance with license requirements (Section 5).

## Report Details

### Site Status

The Homestake Mill operated from 1958 until 1990. The conventional uranium mill was decommissioned during 1993-1994. All mill buildings have been removed and the wind-blown tailings cleanup was completed in 1995. Two tailings piles remain onsite. The side slopes of the main tailings pile and the mill yard have a permanent radon barrier and an erosion protection cover. An interim cover is being maintained on top of the large tailings pile and that portion of the small tailings pile that is not covered by the two lined evaporation ponds. In addition, two water collection ponds were installed adjacent to the small tailings pile.

Continuing activities at the site since the previous inspection include the operation of a reverse osmosis unit that supports the groundwater restoration program, drilling additional wells on the large tailings pile, operating and maintaining the dewatering system for the large tailings pile, and maintaining the groundwater restoration system. Work continues with flushing the large tailings pile which involves injecting water in to wells and removing water from nearby collection wells. The groundwater restoration consists of pumping the groundwater collection wells, operating the evaporation ponds, injecting clean water into the contaminated aquifer, and operating the reverse osmosis plant. A sprinkler system is used in the evaporation ponds to enhance the evaporation rate. Enhanced evaporation was being conducted on a seasonal basis. During the period of the inspection the reverse osmosis unit was not in operation. Modifications and system repairs were completed and the unit returned to service on August 24, 2012.

The licensee completed construction of Evaporation Pond 3 (EP-3) to enhance its water evaporation capabilities. The pond, approximately 25 acres in size, is located north of County Road 63, the main entry road into the site and was placed into operation in 2011. The evaporation pond has no spillway or external runoff. The pond has a double high density polyethylene liner system with a leak detection layer. The NRC approved the construction and operation of the third evaporation pond through amendment of the license on August 7, 2008. Construction of the pond began in 2010. The inspector visited the third pond and found it to be constructed and operating as approved. The pond has a planned life of 10 to 12 years at which time it will be decommissioned. Closure will include moving remaining sediments, pond liners, and any other contaminated materials to Evaporation Pond 1 for final disposal. Soils will be surveyed to ensure that the area is suitable for release and the footprint will be regarded and revegetated to provide long-term stability.

The licensee noted that the groundwater corrective action plan and the decommissioning plan have been submitted to the NRC for review.

During the last inspection, it was determined that the heavy rains resulted in surface water runoff that damaged several tailings pile berms and drainage pathways. The licensee repaired these areas but the work was continuing On the small tailings pile, the licensee reconstructed the berm and installed high density polyethylene drains on the south end of the small pile to better collect runoff. The licensee was also testing the application of soil stabilization material to further limit soil erosion.

## 1 Management Organization and Controls (88005)

### 1.1 Inspection Scope

Determine if the licensee had established an organization to administer the technical programs and a program to perform internal reviews, self-assessments, and audits.

### 1.2 Observations and Findings

The licensee provided the inspector with a current site organization chart. Site staffing had not changed since the last inspection. The ranking site manager was the project manager. The project manager also filled the position of radiation protection administrator and was responsible for the implementation of the radiation safety program. The manager was assisted in management of the radiation protection program by a consultant. Other full-time site workers included the site supervisor, senior project engineer, environmental technician, senior accountant, the utility operator/radiation manager, and three additional utility operators. Contractors were used on an as-needed basis and included dirt movers, drillers, and security staff personnel. The inspector concluded that the licensee had sufficient staff to conduct the work in progress, including license compliance activities.

License Condition 23 requires, in part, that standard operating procedures be established for all operational activities involving radioactive materials. In addition, written procedures must be established for environmental monitoring, bioassay analysis, and instrument calibrations. The inspector reviewed the licensee's procedure list and selected active procedures and determined that the procedures had been adequately established and implemented. The radiation protection administrator conducted annual procedure reviews, the review for 2010 conducted during the period December 13-14, 2010, and the 2011 review during the period September 13-19, 2011.

A third-party contractor was used to conduct the annual As Low As Reasonably Achievable (ALARA) audits. The inspector reviewed the ALARA audits for 2010-2011. The auditors reviewed the radiation protection program for trends and for potential non-compliances. The inspector concluded that the annual ALARA audits were comprehensive, independent reviews of the licensee's radiation protection program.

An independent contractor was also utilized to perform the annual inspection of the tailings impoundments and evaporation ponds at the site. The inspection consisted of a visual inspection of the tops and out slopes of both tailings impoundments and of the dikes, slopes, and liners of the evaporation ponds. These reviews are required annually to ensure stability and functionality of the impoundments. The independent review by a registered professional engineer found that the tailings impoundments and evaporation ponds are in good condition and are being maintained within operating limits.

### 1.3 Conclusions

The organizational structure and staffing levels were sufficient for the work in progress. Site procedures were established and were being maintained up-to-date. Annual audits were being conducted by third-party contractors, and the audits consisted of thorough reviews of site radiation protection activities.

## 2 Radiation Protection (83822)

### 2.1 Inspection Scope

Determine if the licensee's radiation protection program was in compliance with license and 10 CFR Part 20 requirements.

### 2.2 Observations and Findings

External occupational exposures were monitored using optically stimulated dosimeters that were exchanged quarterly. The inspector reviewed selected licensee records for 2009 through the first quarter of 2012. Dosimetry data for 2009 showed that 8 personnel from Homestake Mining Corporation and 18 contractor personnel were monitored, with the maximum individual receiving 26 mrem per year. The number of dosimeters issued during 2010 increased due to the construction of EP-3. The individuals associated with construction of EP-3 did not receive a measurable dose as would be expected. During the second quarter of 2010, a contractor employee's dosimeter indicated a dose of 154 mrem. The licensee investigated this unanticipated level and determined that the badge was probably exposed during air travel. During 2010, quarterly maximum exposures continued to be approximately 10 to 20 mrem, with shallow and eye dose equivalents similar to deep doses. The maximum individual dose during 2011 was 59 mrem, continuing to be significantly less than the regulatory limit of 5,000 millirems. The inspector found that actual external exposures were small fractions of the regulatory limit.

The licensee did not conduct internal dose assessments because there was no dry, exposed tailings material. In addition, routine air sampling was not required because there was no exposed tailings material. However, the licensee voluntarily operated a high volume air sampler on top of the main tailings pile. The air was sampled for concentrations of airborne natural uranium, radium-226, and thorium-230. The air sample results were consistently below one percent of the respective derived air concentration values specified in Appendix B to 10 CFR Part 20. This is an indication that the average airborne particulate concentrations during work activities on top of the large tailings pile are low, supporting the assumption that the average airborne particulate concentrations during work activities on top of the pile are less than 10 percent of the derived air concentration limits, thus per 10 CFR 20.1502, worker monitoring for airborne particulate exposure is not required.

Urine bioassays were conducted to monitor for potential intakes of uranium. The samples collected included baseline, termination, and semiannual samples. Special samples were collected as required by radiation work permits (RWPs). Approximately 150 samples are submitted annually. The bioassay results through the second quarter of 2012 were reviewed by the inspector. Of all results reviewed, only one sample result that was from 2011 exceeded the detection limit of 5 micrograms of uranium per liter of urine. The individual was tested again with a result of less than the detection limit. These low bioassay sample results confirm that site workers' intake of uranium was effectively controlled by the licensee.

License Condition 14 specifies the criteria for release of equipment and packages from the restricted area. The inspector reviewed the equipment release survey records from 2010 through the second quarter of 2012. Based on the licensee's records that were

selected for review, nothing was released from the radiologically restricted area with contamination greater than the NRC-approved contamination limits.

Routine surface contamination surveys of clean areas are not required by the license. However, the licensee conducted area spot checks once a year. No contamination control problems were identified in 2010, 2011, or to date in 2012.

All work involving tailings material, such as drilling into the large tailings pile, required an RWP. During this work, spot checks were performed to verify contamination control and to measure actual exposure rates. The inspector reviewed the RWPs issued during 2010 through the second quarter of 2012. The RWPs provided sufficient guidance for protection of personnel from potential exposures to radioactive tailings material.

Ambient gamma radiation levels were measured by the inspector during site tours. The radiation levels were measured using a Ludlum Model 19 microRoentgen (μR) survey meter (NRC No. 33532, calibration due date 05/14/13). With a background of 8-10 μR per hr (μR/hr), the conference room in the administration building read 8 μR/hr. Measurements were made at locations on the top of the large tailings pond. Background levels were predominant, which indicates that sufficient shielding remains in place above the tailings. A measurement directly adjacent to a pipeline with flowing water indicated levels of approximately 40 micro-R per hour.

License Conditions 22 and 23 require, in part, that written instrument calibration procedures and calibration records be maintained. The inspector reviewed the licensee's records and determined that survey instruments and high volume air samplers were being routinely calibrated. The licensee used a calibration schedule to keep track of instrument calibration due dates. The reviewed survey meters in service during the inspection, and the survey meters appeared operable with up-to-date calibrations. The inspector also reviewed a quality assurance performance audit of the meterological tower components that was conducted by a third-party auditor. Components of the tower met requirements as specified in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, March 2008. As part of the annual ALARA audit, the contracted independent auditor reviewed the maintenance and calibration records. No compliance problems were identified during the annual ALARA audits for calendar years 2010 and 2011.

### 2.3 Conclusions

The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. Occupational exposures were small fractions of the regulatory limit. Bioassay sampling results suggested that no individual had experienced an intake of uranium in recent years.

## 3 Operator Training and Retraining (88010)

### 3.1 Inspection Scope

Determine whether the licensee was complying with regulations and license requirements related to the training of employees.

3.2 Observations and Findings

Site worker training requirements are provided in License Conditions 10, 22, and 32. Initial and annual refresher training is required for people working with groundwater or physical work with tailings material. Training for licensee employees was conducted by a third-party contractor in conjunction with the annual ALARA audit. The licensee's records indicated that refresher training was conducted during December 2010 and December 2011. Training for contractors is provided by the radiation protection administrator or the radiation manager and includes recorded videos and an examination. The radiation protection administrator's U.S. Department of Transportation training had expired. However, the licensee has not shipped any radioactive material in several years. The licensee noted that, should shipments resume, a qualified individual would supervise future shipments.

3.3 Conclusions

Radiation protection training was provided to licensee employees and contractors as required by the license.

## 4 Effluent Control and Environmental Protection (88045)

4.1 Inspection Scope

Determine if the environmental and effluent monitoring programs were effective to monitor the impacts of site activities on the local environment.

4.2 Observations and Findings

a. Environmental Monitoring

License Conditions 10, 15, and 23 specify, in part, the environmental monitoring program requirements. The program consists of air particulate, radon gas, and direct radiation sampling. The inspector compared the program in operation at the time of the inspection to the requirements specified in the license. The inspector confirmed that the licensee was implementing the environmental monitoring program as required by the license.

The inspector reviewed the dose calculations to members of the public, as required by 10 CFR 20.1301. The important pathways for assessing the dose to the individual with maximum exposure are inhalation of airborne particulate from the site, exposure to radon generated at the site, and the exposure to direct gamma radiation originating from the site. The licensee sums the airborne particulates (uranium-238, uranium-234, radium-226, and thorium-260), radon gas, and direct gamma monitoring results from monitoring stations located approximately 100 yards from the nearest resident. Stations HMC#4 and HMC#5 are located on the southwestern perimeter of the site. The use of this data to predict the dose to the nearest member of the public is conservative in that the exposure at the residences should be less than that at the site perimeter. For calendar year 2011 and location HMC#4, the total effective dose equivalent for a member of the public was shown to be 71 millirem. For location HMC#5 during the same year, the total effective dose equivalent for a member of the public was shown to be 66 millirem. The NRC annual limit for an individual member of the public from a licensee's operation is 100 millirem.

License Condition 36E states, in part, that the licensee is to verify compliance with the radon flux standard of 20 picoCuries per meter squared second (pCi/$m^2$-sec) by performing an annual radon flux survey on tailings piles. Reports for 2010 and 2011 indicated that this criteria was met. Prior to the inspection, the licensee had deployed canisters for the measurement of Radon-222 flux. The charcoal canister consists of a 10-inch diameter right circular cylinder open on one end and enclosed on the other end, except for a vent hole. Measurements are made by placing the open end of the canister on the area to be characterized and allowing the collected radon to adsorb onto the activated charcoal contained in the canister. Upon retrieval, the entire canister is sealed in a plastic bag and transported to the laboratory for gamma spectral analysis and to determine the amount of Radon-222 adsorbed on the charcoal. Activity on the charcoal is converted to average flux through calculations that incorporate parameters such as canister area, area weighting, collection time, time from end of collection to the beginning of counting, and counting time. The inspector observed the retrieval process and found the licensee to be complying with applicable procedures. Due to the fact that the site experienced a significant rainfall after placement of the canisters, the licensee determined that the deployed canisters did not meet all criteria established for use and thus determined that the canisters would be dried and redeployed to complete the radon flux measurements. Results of the measurements will be included in annual reports.

b. Environmental Groundwater and Surface Water Sampling

License Condition 15 states that the results of all effluent and environmental monitoring required by the license shall be reported to the NRC. The licensee was found to be sampling and reporting the data from point of compliance wells as required by the license. The licensee was accurately reporting the groundwater data to the NRC in these routine reports.

c. Groundwater Restoration Program

A reverse osmosis (RO) plant is authorized for groundwater remediation under License Condition 35C. The RO plant was constructed in 1999 and is used to treat water from the large tailings pile and the alluvial aquifer. The RO plant was not in operation during the inspection due to modifications to the system that were in progress at the time. The modifications that improve system performance were completed on August 24, 2012, and the RO plant was returned to service.

Licensee Condition 35D authorizes the licensee to operate Evaporation Ponds EP-1, EP-2 and EP-3, including the enhanced evaporation systems located in each pond. During the inspection, evaporation ponds EP-1, EP-2 and EP-3 were in service.

4.3 Conclusions

The licensee had established groundwater and environmental monitoring programs as required by the license. Doses to members of the public were below the regulatory limit. The environmental and groundwater monitoring reports were submitted to the NRC as required by the license.

## 5 Inspection of Transportation Activities and Radioactive Waste Management (86740 and 88035)

5.1 Inspection Scope

Determine if transportation and waste disposal activities were being conducted in compliance with license requirements.

5.2 Observations and Findings

License Condition 26 specifies, in part, that the licensee shall keep records of transfers of all mill tailings. The licensee stated that, since the previous inspection, there were no outgoing shipments of tailings material and no incoming shipments of waste material for disposal. Further, the licensee does not expect to ship any mill tailings or receive material for disposal at any time in the future.

License Condition 41 specifies, in part, the reporting and documentation requirements for unplanned releases, spills, leaks, and excursions. Based on the licensee's records and employee interviews, the inspector determined that no spills, leaks, or excursions have occurred since the last inspection.

5.3 Conclusions

The licensee was conducting transportation and waste disposal operations in accordance with license requirements.

## 6 Exit Meeting Summary

The inspector presented the inspection results to the licensee's representatives at the conclusion of the onsite inspection on August 22, 2012. During the inspection, the licensee did not identify any information reviewed by the inspector as proprietary.

## ATTACHMENT

## PARTIAL LIST OF PERSONS CONTACTED

Licensee

A. Cox, Project Manager, Radiation Protection Administrator
D. Kump, Senior Project Engineer
A. Venable, Radiation Manager

## ITEMS OPENED, CLOSED, AND DISCUSSED

Open

None

Closed

None

Discussed

None

## INSPECTION PROCEDURES USED

| | |
|---|---|
| IP 88005 | Management Organization and Control |
| IP 83822 | Radiation Protection |
| IP 88010 | Operator Training and Retraining |
| IP 88045 | Effluent Control and Environmental Protection |
| IP 86740 | Inspection of Transportation Activities |
| IP 88035 | Radioactive Waste Management |

## LIST OF ACRONYMS USED

| | |
|---|---|
| ALARA | as low as is reasonably achievable |
| NRC | Nuclear Regulatory Commission |
| $pCi/m^2s$ | picoCuries per meter squared second |
| RO | reverse osmosis |
| RWP | radiation work permit |
| µR/hr | microRoentgens per hour |