

**Annual ALARA Audit**

**October 5, 1999**

**Grants Operations  
Homestake Mining Company  
P. O. Box 98  
Grants, New Mexico 87020**

**Prepared by:**

**Kenneth R. Baker, Ph. D.  
Environmental Restoration Group, Inc.  
12809 Arroyo de Vista NE  
Albuquerque, NM 87111**

## 1.0 Introduction

On October 5, 1998, Kenneth R. Baker, consultant to Homestake Mining Company (HMC), conducted the 1999 Annual ALARA Audit for the Grants Uranium Mill site. The audit was conducted in accordance with the United States Nuclear Regulatory Commission (NRC) Regulatory Guide 8.31, "Information Relevant to Ensuring That Occupational Exposure At Uranium Mills Will Be As Low As Reasonably Achievable."

The following topics were covered in the audit:

- Follow up on prior ALARA audit
- ALARA policy
- Radiation exposures
- Bioassay results
- Self audits
- ALARA planning activities
- Worker training
- Radiation safety meetings
- Radiation surveys
- Overexposures
- Health physics staff
- Procedures, Data Collection, and Management

All mill buildings have been removed and the off-pile tailings cleanup was completed in 1995. The side slopes of the main tailings pile and the mill yard area have a permanent radon barrier and an erosion protection cover. An interim cover is being maintained on the top of the large tailings pile and that portion of the small tailings pile that is not covered with the evaporation pond.

Activities at the site during 1999 included the addition of an RO unit to the groundwater restoration program, some additional well drilling, and maintaining the groundwater restoration system. The groundwater restoration consists of the pumping the groundwater collection wells, operating the evaporation ponds, injecting clean water into the contaminated aquifer, and operating the RO plant.

The primary potential radiation exposure results from maintaining the pumps, valves, and piping associated with the groundwater collection systems.

## 2. Discussion

The audit process involved scoping the audit, gathering relevant information, review of information, interviewing appropriate personnel, and writing the report. The reviews are briefly summarized below.

### **2.1 Follow-up on Previous Audit Recommendations**

The last ALARA audit was conducted on September 15, 1998. No recommendations were made. The last NRC inspection occurred November 17-18, 1998. No findings were reported.

### **2.2 ALARA Policy**

The corporate ALARA policy statement is included in Standard Operating Procedure HP-6. This policy has been implemented as evidenced by the incorporation of ALARA in discussions in worker training and radiation work permits.

### **2.3 Radiation Exposures**

Data for the last half of 1998 and first half of 1999 were reviewed. A total of 50 badges were issued during the last two quarters of 1998. Only eight badges that were issued had a reported value other than zero, with most of those being slightly more than 10 mrem. The maximum value was 40 mrem deep dose and 131 mrem shallow dose. Many badges that were not issued also had doses of slightly more than 10 mrem.

The results for the first and second quarter badges showed that out of a total of 79 badges issued, only one badge had a reportable dose. The shallow dose was 40 mrem while the deep dose was reported as zero. Seven badges were lost during the first half of 1999, which is an exceptionally high rate. Doses were assigned by using the dose of similar workers. While the incidence was high, it is unlikely that these workers received measurable doses, based on the other badge results. The staff was concerned regarding the lost badges but since the badges were lost by contractor employees, no specific actions have been taken.

This low exposure reflects the effort that management and the workers have expended in maintaining exposures ALARA as well as the low radiation work environment.

HMC does not normally require airborne particulate monitoring since there are no exposed tailings. Invasive activities normally involve the use of water to suppress any dust that may be generated. HMC has a "spot check program" where the most exposed individual working under an RWP will be monitored for a day, normally one per month. No significant invasive activity involving tailings occurred during this period of time. Spot check reports were made but air samples were not taken.

A review of the environmental monitoring TLD, radioactive particulate, and radon data revealed that the results were similar to results from prior years when there was little site work involving tailings.

### **2.4 Bioassay Results**

Procedures call for a semi-annual routine urine sampling schedule which occurred in June 1998 and January 1999. Contractor employees were sampled at the beginning and end of

short-term projects. In addition, some HMC employees were sampled more frequently if they were involved in field activities.

Bioassay results are reflective of the uptake of radionuclides in the body. HMC's urine sampling program was reviewed. From July 1998-July 1999, 146 routine samples, 24 spiked samples, and 24 blank samples were analyzed. The vendor laboratory is required to have a lower limit of detection (LLD) of 5  $\mu\text{g/l}$  for uranium. Any measured value of 15  $\mu\text{g/l}$  must be investigated and appropriate mitigation measures taken. Persons with urine samples exceeding 35  $\mu\text{g/l}$  must be placed on work restrictions to limit further intakes of uranium. No workers submitted samples that measured above 15  $\mu\text{g/l}$ , the level requiring an investigation. The spiked samples were within the tolerance limit.

The results for the bioassay program support the conclusion that the worker uptake of uranium is very low and probably insignificant. These results are also consistent with the perimeter air sample data.

### **2.5 Self Audits**

The RPA requires that the technicians (Venable/Vigil) prepare a monthly ALARA report. The report consists of radiation protection data reflective of the operations as well as an accounting of the major activities for the month. Any problems encountered are also presented. After reviewing several of the reports, the auditor concluded that the reports provide the RPA with adequate detail to assure that exposures are being maintained ALARA. The reports were initialed by the RPA or his designee to indicate that they were being read.

### **2.6 ALARA Planning Activities**

HMC conducts most work under an RWP. A few of the RWPs were evaluated and determined to be appropriate. Requirements in the RWP are explained to the workers in morning meetings. When contract laborers are used, spot checks are conducted to assure that the requirements are appropriate and being followed. These spot checks include frisking working personnel and equipment to determine the levels of contamination, if any, performing exposure rate measurements in the work area, and taking air samples. Monthly safety meetings are held where radiation protection problems are addressed. Since the levels of exposure have been demonstrated to be low, the ALARA planning activities are adequate.

Preliminary investigations of radiation exposures in the new RO building have been done although the building is not fully operational at this time. Of particular concern to the staff is the potential for elevated radon WL within the building. WL measurements were made on June 10, 1999 and October 5, 1999 with the results being 0.002 WL and 0.012 WL, respectively. A consultant recently conducted a staff training session on WLs and WL measurements. During the practicum, WL measurements for thoron and radon daughters were made. The staff plans to make additional measurements when the building is closed to fully characterize the work environment. If necessary, ventilation or

other steps will be taken to assure that exposures are ALARA. This effort is consistent with a good ALARA program.

### **2.7 Worker Training**

All radiation workers receive formal classroom radiation safety training. Workers must pass a written examination. Annual refresher training is required and generally is a repeat of the course and material given initially. Dr. Noel Savignac conducted that last annual training in December 3, 1998. For contractor employees, the training is normally given by the RPA or Adrian Venable. Use of video tapes developed for HMC by a consultant is incorporated into the contractor employee training.

### **2.8 Radiation Surveys**

A review of the instrument maintenance and calibration records was made. All instruments in use had been calibrated. A calibration schedule is prepared for use in tracking calibrations. The records were found in good order.

Radiation surveys are conducted on all personnel and equipment leaving the radiation control area. This has been defined as the boundary of areas where invasive work is being done. Work area radiation levels are reported in the RWPs and the spot checks reports.

Clean area surveys are being conducted in the office and laboratory semiannually. All surveys were well below the action level.

A review of a sampling of the release surveys was done. Release data for a tank returned to the site because of elevated surface contamination, during the previous audit period, was reviewed and found to be within limits for beta as well as alpha contamination. Procedures are being followed and all released items were within the release limits.

### **2.9 Health Physics Staff**

The current health physics staff consists of:

Roy Cellan, Radiation Protection Administrator  
Ron Waterland, Assistant Radiation Protection Administrator  
Adrian Venable, Senior Health Physics Technician  
Joe Vigil, Senior Environmental Technician

A review of the education and experience of the RPA, assistant RPA, and technicians indicated that all meet or exceed the requirements of NRC Regulatory Guide 8.31 for working in uranium mills. Mr. Waterland has had two weeks of specialized training in health physics although four weeks are suggested for a radiation safety officer. However, through knowledge from self-study, his background in regulatory compliance at other sites, his formal education (B. S. degree), and his duties and experience at the Grants Site in implementing the radiation protection program are considered by this auditor as equivalent to the two additional weeks of training.

## **2.10 Overexposures**

No personnel were overexposed to date during this audit period.

## **2.11 Procedures, Data Collection, and Management**

The RPA reviewed all procedures on August 19, 1999. A license condition requires this to be done at least annually. Procedures are currently being developed for making working level measurements and for sampling the product water at the R.O. plant. The groundwater procedures being currently being reviewed by the groundwater consultant, George Hoffman P. E.

A schedule of required tasks is maintained by the secretary, Joyce Gleadle. This is supplemented by an additional detailed plan for the groundwater restoration program, where well sampling frequencies and required analyses are listed for each well.

The data collection activities are shared by two senior technicians, Adrian Venable and Joe Vigil. Mr. Venable collects most of the groundwater samples while Mr. Vigil prepares most of the water and urine samples for shipment to the laboratory. Mr. Venable normally conducts release surveys and provides field coverage for personnel as well as prepares the monthly ALARA Report. The technicians are cross-trained in all tasks and support one another when needed. Joyce Gleadle enters data into the database from laboratory data sheets for the groundwater restoration and environmental monitoring programs.

The auditor reviewed the procedures and a sampling of the paperwork for collecting groundwater samples, air particulate samples, bioassay samples, and conducting release surveys. All paperwork had been completed properly. No management review of the paperwork is conducted other than in some cases, the paperwork is submitted along with the monthly ALARA Report.

Management relies on the senior technicians to complete their work according to plan and schedule. Required data were not obtained for one monitoring well in the past. This arose from an improperly prepared schedule by a consultant rather than an omission by the technicians. Since most of the monitoring data are generated by a regulatory requirement, the consequence of missing even one sample is significant. Schedule changes have recently been effected so that if quarterly groundwater data are missed, there will be opportunities to resample the well within the same quarter.

From the auditor's perspective, the system is working well due to the conscientious staff. The discovery of omissions by staff is likely due to the division of duties (collection of sample vs. sample preparation vs. data entry). However, there is no management tool in place that would provide additional assurance that all tasks have been completed. As long as HMC has responsible technicians and the work is divided into tasks that involve more than one person, a management check may not be needed.

### **3.0 Recommendations**

This radiation protection program is effective in reducing exposures to as low as reasonably achievable. There are no recommendations as a result of this audit.