APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

URANIUM RECOVERY FIELD OFFICE

NRC Inspection Report 40-8903/86-001 License: SUA-1471

Docket: 40-8903

Licensee: Homestake Mining Company
P.O. Box 98
Grants, New Mexico 87020

Facility: Milan Mill

Located In: Cibola County, New Mexico

Inspection Conducted: June 9-13, 1986

Inspectors: Pete J. Garcia Jr. 8/18/86
Pete J. Garcia, Project Manager Date
Team Leader

Candice C. Jierree 8/18/86
Candice C. Jierree, Project Manger Date

Randall F. Brich 8/18/86
Randall F. Brich, Project Manager Date

N. Michael Shopens 8/18/86
N. Michael Shopens, Project Manager Date

Lorenzo Wilborn 8/18/86
Lorenzo Wilborn, Radiation Specialist Date

Robert Doda 8/18/86
Robert Doda, Office of State Programs Date

Approved: Harry J. Pettengill 8/18/86
Harry J. Pettengill, Chief Date
Licensing Branch 2
Uranium Recovery Field Office, Region IV

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40-8903/PJG/86/07/15/0

AUG 18 1986

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

Homestake Mining Company
ATTN: Mr. Edward Kennedy
P.O. Box 98
Grants, New Mexico 87020

Gentlemen:

This refers to the announced radiation safety inspection and assessment conducted by Messrs. Garcia, Brich, Shopenn, Doda, Wilborn and Ms. Jierree of this office on June 9-13, 1986, of the activities authorized by NRC Source Material License SUA-1471 and to the discussion of our findings held by the inspectors and Messrs. Smith and myself with members of your staff at the conclusion of the inspection. The enclosed NRC Inspection Report 40-8903/86-001 documents this inspection.

The Nuclear Regulatory Commission reasserted authority to regulate your uranium processing facility on June 1, 1986. Our reassertion of authority was accomplished by the publication of a general order by the Commission in the Federal Register (51FR19432). As an initial step in the transfer of regulatory authority, the NRC staff met with you and other New Mexico licensees on May 29, 1986, in Albuquerque, New Mexico. The staff explained that within 90 days of reassertion of authority, we would conduct a comprehensive inspection and appraisal of radiation safety programs in effect at your facility. The basis for this inspection effort was to enable the NRC staff to familiarize themselves with the site and facilities, the licensee management personnel, and the content of your radiation safety program and policies including those activities not included as an obligation of your existing license.

The objective of this inspection effort was twofold. First, we would identify any areas where you were not in compliance with federal regulations and where comparable regulatory requirements were previously in force under New Mexico statutes. Items of this nature would be identified as apparent violations and would be accompanied by the issuance of a "Notice of Violation". Secondarily, we would identify those additional areas where it was felt your existing safety program was not in accord with federal regulations/policies but where no comparable

OFC						
NAME						
DATE	86/07/28					

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state regulation or previous license requirement had existed. Such items would be identified as licensee program deficiencies and would be accompanied by a "List of Necessary Program Elements." Also, any additional finding not in accord with accepted industry practices at other NRC licensed facilities but not necessarily required as part of your license would be noted as "Open Items" for consideration.

During this inspection we did not identify any violations. However, it was found that certain of your radiation safety program activities would not satisfy NRC requirements and accepted industry standards that are now aplicable as a result of our reassertion of authority. These items and reference to the standard or requirement are identified in the enclosed "List of Necessary Program Elements." You are requested to respond to these deficiencies in writing within the timeframes specified. We ask that you respond to each item of deficiency and propose a detailed modification in your existing safety program so that the entire updated radiation safety program may be incorporated into your license.

The NRC staff will be performing its own independent review in order to establish other regulatory requirements that must be incorporated into your license. The staff's efforts in this regard as well as your submittals in response to the enclosed Listing will enable the completion of a fully upgraded license within the next 90-120 days.

The response directed by this letter and the accompanying List is not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room.

Should you have any questions concerning this letter, we will be pleased to discuss them with you.

Sincerely,

/s/

Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office
Region IV

Enclosures: Appendix A - List of Necessary Program Elements
Appendix B - NRC Inspection Report No. 40-8903/86-001

cc: State of New Mexico

OFC	URFO	URFO	URFO	URFO		
NAME	PGarcia/rs	RBrich	NMShopenn	CJierree	RDoda per telecon	LWilborn per telecon
DATE	08/13/86	8/15	8/18	8/18	8/18	8/18

OFC	URFO	URFO	RIV	RIV		
NAME	HPettengill	RDSmith	DPowers	RBangart		
DATE	8/18/86	8/18	by telecon 8/15	by Telecon 8/15		

APPENDIX A

LIST OF NECESSARY PROGRAM ELEMENTS

Homestake Mining Company
Milan Mill

Docket No.: 04-8903
License No.: SUA-1471

During an NRC inspection conducted on June 9-13, 1986, it appears that certain of your radiation program elements were not conducted in conformance with NRC requirements and commonly accepted industry standards or practices at other similar facilities regulated by the Commission. Based on the results of our inspection, we have identified the following elements that should be incorporated into your program. The licensee should fully consider and provide a remedy to each of the significant findings listed below by modifying the existing radiation safety program and submitting it for incorporation into the license.

A. TAILINGS MANAGEMENT AND EFFLUENT CONTROL (Section 6)

1. 10 CFR 40, Criterion 8, requires, in part, that licensees shall control dusting from uncovered tailings by wetting or chemically stabilizing to prevent or minimize blowing or dusting of tailings to the maximum extent reasonably achievable.

   Contrary to this requirement, the licensee has not established an adequate program to minimize the blowing or dusting of tailings at the time of the inspection. This program should include considerations for inspections, surveys, and cleanup of contaminated soils when the measures do not successfully minimize the blowing of tailings.

2. 10 CFR 40, Criterion 8, requires, in part, that the licensee control dusting from diffuse sources such as tailings or ore pads and that written procedures be developed specifying the methods of controls which shall be utilized.

   Contrary to this requirement, the licensee has not developed such written procedures for inspections or corrective actions at the time of the inspection.

3. 10 CFR 40, Criterion 8, requires, in part, the licensee shall determine that yellowcake stack emission control equipment are operating consistently near peak efficiency.

   Contrary to this requirement, the licensee at the time of the inspection had not established a program or procedures to document the operating efficiency of the yellowcake stack emission control equipment.

In responding to this significant finding, the licensee should not only consider the specific deficiencies discribed above, but it is expected that the licensee will compile a complete submittal which is a full description of the licensee's radiation safety programs that cover those areas discussed in Section 6 of the Inspection Report.

B. ORGANIZATION, MANAGEMENT, AND TRAINING (Section 2)

Regulatory Guide 8.31 "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills will be As Low As Is Reasonable Achievable" states, in part, that an ALARA policy shall be established, an annual ALARA audit be performed, documented daily and weekly inspections be performed, annual approval of Standard Operating Procedures by the Radiation Protection Administrator (RPA) be accomplished, that the RPA should have formal training or retraining every 2 years, and that employees should be tested following radiation safety training.

Contrary to these recommendations, the licensee had not established an ALARA policy, had not conducted an annual ALARA audit, did not document daily and weekly ALARA inspections, the RPA had not annually approved the mill's Standard Operation Procedures, the RPA had not received refresher radiation safety training and no testing program for mill employees was in effect.

In responding to this significant finding, the licensee should not only consider the specific deficiencies discribed above, but it is expected that the licensee will compile a complete submittal which is a full description of the licensee's radiation safety programs that cover those areas discussed in Section 2 of the Inspection Report.

C. INTERNAL EXPOSURE CONTROL (Section 3)

1. 10 CFR 20.103(a)(3) requires, in part, that for the purposes of compliance, the licensee shall use suitable measurements of concentrations of radioactive materials in air for detection and evaluation of airborne radioactivity within restricted areas.

Contrary to this requirement, the licensee had not performed suitable measurements of the concentration of airborne radioactive materials during the period January 1984 through May 1985, due to (a) a failure to calibrate air sampling equipment during the period January 1984 through May 1985, (b) a failure to implement a quality assurance program for sample analysis, and (c) a failure to consider a collection efficiency factor for sample filters.

2. USNRC Regulatory Guide 8.22 "Bioassay at Uranium Mills" states, in part, that yellowcake workers shall submit urine samples for analysis to determine uranium uptake, that quality assurance practices be instituted for bioassay sample analysis, and that a Lower Limit of Detection (LLD) be established to substantiate the frequency for bioassay testing.

   Contrary to these recommendations, urinalysis for yellowcake workers had not been performed since August 31, 1985, quality assurance procedures for sample analysis had not been established, nor had LLDs been established to substantiate the frequency for bioassay testing.

In responding to this significant finding, the licensee should not only consider the specific deficiencies discribed above, but it is expected that the licensee will compile a complete submittal which is a full description of the licensee's radiation safety programs that cover those areas discussed in Section 3 of the Inspection Report.

D. EXTERNAL EXPOSURE AND CONTAMINATION CONTROL: FACILITIES AND EQUIPMENT (Sections 4 and 5)

Regulatory Guide 8.30 "Health Physics Surveys in Uranium Mills" states, in part, that yellowcake shipments shall be surveyed prior to shipment, survey instruments placed on routine calibration schedules to assure that calibrated instruments are available for use, samples analyzed within 2 working days after sample collection, a program established to verify that personnel contamination is being controlled, and that the maximum value for surface contamination on items to be released from the site for unrestricted use should be 15,000 dpm alpha/100 cm^2.

Contrary to these recommendations, surveys for yellowcake shipments had not been performed, survey instruments which had not been calibrated within the recommended timeframe were used to perform surveys, samples were not analyzed for periods exceeding 1 week after sample collection, a program for monitoring of mill workers for alpha contamination had not been established, and the licensee's

procedures specify a maximum value of 25,000 dpm alpha/100 cm^2 for items to be released for unrestricted use.

In responding to this significant finding, the licensee should not only consider the specific deficiencies discribed above, but it is expected that the licensee will compile a complete submittal which is a full description of the licensee's radiation safety programs that cover those areas discussed in Sections 4 and 5 of the Inspection Report.

The licensee is hereby requested to file a response to Items A and B in the form of a license amendment application within 60 days of issuance of this report. Response to items C and D are requested within 90 days. Although no specific program deficiencies were identified in our review of your environmental monitoring program (Section 7), you are requested to file full documentation on it for incorporation into your license in the form of an amendment within 90 days. Where good cause is shown, consideration will be given to extending the response time.

Dated at NRC, Region IV, Uranium Recovery Field Office, Denver, Colorado, this 18th day of August, 1988.

Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office
Region IV

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APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

URANIUM RECOVERY FIELD OFFICE

NRC Inspection Report 40-8903/86-001 License: SUA-1471

Docket: 40-8903

Licensee: Homestake Mining Company
P.O. Box 98
Grants, New Mexico 87020

Facility: Milan Mill

Located In: Cibola County, New Mexico

Inspection Conducted: June 9-13, 1986

Inspectors:

signed original HP — 8-18-86
Pete J. Garcia, Project Manager — Date
Team Leader

Candice C. Jierree — 8-18-86
Candice C. Jierree, Project Manger — Date

signed original HP — 8-18-86
Randall F. Brich, Project Manager — Date

N. Michael Shopenn — 8/18/86
N. Michael Shopenn, Project Manager — Date

signed original HP — 8/18/86
Lorenzo Wilborn, Radiation Specialist — Date

signed original HP — 8/18/86
Robert Doda, Office of State Programs — Date

Approved:

Harry J. Pettengill — 8/18/86
Harry J. Pettengill, Chief — Date
Licensing Branch 2
Uranium Recovery Field Office, Region IV

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Inspection Summary

Areas Inspected: Routine, announced inspection of uranium milling operations and radiation safety program including: Organization, Management and Training; Internal Exposure Control; External Exposure and Contamination Control; Facilities and Equipment; Tailings Management and Effluent Control; and Environmental Monitoring.

Results: Within the six areas inspected, the inspections identified significant weaknesses in licensee's radiation safety program elements which will require written response by the licensee. These specific deficiencies are as follows:

1. Failure to establish adequate programs and procedures for the control of blowing tailings and for documenting the operating efficiency of yellowcake stack emission control equipment.

2. Failure to establish an adequate ALARA program with regard to audits and inspections, written operating procedures, and appropriate training for radiation safety staff.

3. Failure to perform suitable measurements of radioactive materials in air.

4. Failure to establish an adequate bioassay program.

5. Failure to establish adequate programs for external exposure determinations and contamination control.

The inspectors also identified other weaknesses in licensee programs which will not require a written response. Corrective actions taken by the licensee in response to these items, identified in the report text as "open items," will be reviewed by NRC inspectors during the next inspection. These items are as follows:

1. Failure to establish a program for documenting specific information with regard to the collection of in-plant air samples.

2. Failure to perform a documented annual review of the respiratory protection program.

3. Failure to maintain compressed air cylinders at recommended pressures and to perform monthly inspections of the cylinders.

4. Failure to perform fit checks prior to respirator use.

5. Failure to establish a procedure to assure compliance with 10 CFR 20.202.

6. Failure to maintain current information on emergency plans.

7. Failure to establish adequately detailed instructions for transportation emergencies.

TABLE OF CONTENTS

1.0 INTRODUCTION

The Nuclear Regulatory Commission reasserted authority to regulate uranium recovery operations in the State of New Mexico on June 1, 1986. The reassertion of authority was accomplished by the publication of a general order by the Commission in the Federal Register (51FR19432). As an initial step in the transfer of regulatory authority, the NRC staff met with the New Mexico licensees on May 29, 1986, in Albuquerque, New Mexico. The staff explained that within 90 days of reassertion of authority, the staff would conduct a comprehensive inspection and appraisal of radiation safety programs in effect at the designated uranium mills. The basis for these inspection/appraisal efforts was to enable the NRC staff to familiarize themselves with the site and facilities, the licensee management personnel, and the content of the licensee's radiation safety programs and policies including those activities not included as an obligation of the existing license.

The objectives and goals of these comprehensive inspection efforts at each major New Mexico milling facility are as follows:

(a) The inspectors would inspect the licensee's facilities and radiation safety programs and would identify any areas where the licensee is in noncompliance with federal regulations and where comparable regulatory requirements were previously in force under New Mexico statutes or covered by the existing converted license. Items of this nature would be identified as apparent violations and would be accompanied by the issuance of a "Notice of Violation".

(b) The inspectors would evaluate the licensee's radiation safety program, and determine those additional areas where it was felt the licensee's program would not be in accord with federal regulations/policies but where no comparable state regulation had existed. Such items would be identified as licensee program deficiencies and would be accompanied by a "List of Necessary Program Elements." Also, any additional finding not in accord with accepted industry practices at other NRC licensed facilities would be noted as "Open Items" for consideration by the licensee.

In response to the inspection findings, the licensee is expected to formally respond to any findings listed in a "Notice of Violation" or those identified in a "List of Necessary Program Elements." It is expected that the licensee's proposed corrective measures to both would be in the form of a license amendment application, as appropriate.

In conjunction with this approach, the URFO licensing staff is currently performing an independent review to further identify areas where the existing license will require modification and upgrading to demonstrate conformance to all applicable federal statutes in a timely manner.

The actual inspection was conducted June 9-13, 1986, by a team of six (6) NRC inspectors.

The Homestake Uranium Mill is located about 10 miles northwest of Grants, New Mexico. The mill began operation in 1958 and is currently designed to process up to 3400 tons of ore per day through its alkaline leach circuit. The mill is currently operating at an extremely reduced rate, with stages of the mill circuit operated in sequence. The current operating rate is approximately 250 tons of ore per week.

The inspectors evaluated the licensee's radiation safety program against the requirements of 10 CFR Parts 19, 20, and 40, and also staff recommendations as specified in the following Regulatory Guides:

(a) Regulatory Guide 3.11 - "Design, Construction and Inspection of Embankment Retention Systems for Uranium Mills."

(b) Regulatory Guide 3.11.1 - "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings."

(c) Regulatory Guide 4.15 - "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."

(d) Regulatory Guide 8.15 - "Acceptable Programs for Respiratory Protection."

(e) Regulatory Guide 8.22 - "Bioassay at Uranium Mills."

(f) Regulatory Guide 8.30 - "Health Physics Surveys in Uranium Mills."

(g) Regulatory Guide 8.31 - "Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Mills Will Be As Low As Is Reasonably Achievable."

2.0 ORGANIZATION, MANAGEMENT AND TRAINING

2.1 Organization and Management

2.1.1 Licensee Program

The management at the Homestake Uranium Mill is comprised of the General Manager, who is the highest corporate official onsite, and the Director of Environmental Affairs. The Radiation Protection Administrator (RPA) reports to the Director of Environmental Affairs, but has an open door to the General Manager. Neither the RPA nor the Director of Environmental Affairs have production responsibilities. The RPA has three technicians who assist him in performing both the in-plant and environmental monitoring activities. Although Homestake has an organizational structure to follow for changing standard operations, the management assured that the RPA has the authority to stop an unsafe operation.

2.1.2 Program Evaluation

Since the Homestake Mill is operating at reduced capacity, the technical staffing level and the organizational structure are adequate and in accordance with Regulatory Guide 8.31.

2.2 ALARA Program and Management Audits

2.2.1 Licensee Program

Although there is a written policy statement from the management in the San Francisco office regarding protection of the environment dated July 3, 1980, there is no clear ALARA policy for control of exposures to mill and IX facility personnel. The management at the Homestake mill has not performed ALARA audits which would have provided a management review of the in-plant and environmental monitoring programs.

Written operating procedures were established for much of the monitoring programs, but annual review and approval by the RPA was not performed. Emergency Work Orders and Job Orders are used for all operations not covered by written operating procedures. The Orders are generally initiated by the shift boss or mill foremen, and are then reviewed by the Mill Manager. The Mill Manager makes a determination as to whether the job will result in a potential for significant exposure to radioactive materials. Orders for jobs with a potential for exposure are then sent to the RPA or the Director of Environmental Affairs for their review and decision as to the need for and extent of measures to minimize exposures and additional

sampling. Their approval of the Order and any additional measures necessary are indicated by their initialing the form, which is then returned to the Mill Manager for implementation. The RPA also periodically reviews all Orders to assure that the determinations of the potential for exposure are being properly made.

2.2.2 Program Evaluation

Homestake Mining Company needs to provide to their employees a written management commitment to ALARA. Additionally, annual ALARA audits need to be performed, documented and reviewed by the Homestake management. Written operating procedures need to be reviewed and approved by the RPA. These items were identified as deviations from regulatory positions as specified in Regulatory Guide 8.31, Sections 1.1 and 2.2. Other aspects of the program were adequate.

2.3 Mill Inspection Program

2.3.1 Licensee Program

The licensee stated that daily inspections of the mill were performed by the RPA. However, documentation was not available for any in-plant inspections performed by the RPA and no program for monthly summaries of the inspections of the mill to allow for management oversight of the inspection program had been implemented.

2.3.2 Program Evaluation

Homestake Mining Company needs to perform and document routine mill inspections in accordance with Regulatory Guide 8.31, Section 2.3, to assure that a consistently safe work environment is provided for mill employees. This was identified as a deviation from the regulatory position specified in Regulatory Guide 8.31.

2.4 Qualifications of the Radiation Safety Staff

2.4.1 Licensee Program

The RPA has a degree in physical sciences with mine/mill analytical experience. Although specialized training of the RPA has occurred in past years, no refresher training has been provided for him since 1980.

2.4.2 Program Evaluation

The qualifications of the RPA meet the minimum qualifications as specified in Regulatory Guide 8.31. The Homestake Mining Company would benefit by keeping the radiation safety staff current in the field of uranium health physics by providing refresher training in accordance with Section 2.4.1 of Regulatory Guide 8.31. The failure to provide refresher training was identified as a deficiency.

2.5 Operator Training and Retraining

2.5.1 Licensee Program

All personnel in the plant had been given initial training in radiation safety and plant operation when they were hired. Each year, all personnel are given refresher training in radiation safety and plant operations. All female employees working within the mill had been given training on the information in Regulatory Guide 8.13. The training program covered work in the process areas, storage and transfer of radioactive materials, and measures to minimize exposure to radioactive materials. The contents of the NRC-3 form are taught to all personnel as to the purpose and meaning of the posting and regulations. Operation malfunctions, emergency operations and warnings that could involve exposure to radioactive materials are also taught during the training. Employees are informed as to where the exposure records are maintained and that they are accessible for their review.

Classes are conducted by the RPA and the Mine Safety and Health Administration (MSHA) training officer. Records of training were located in each individual's personnel file. Visitors are also given a short class in radiation safety and hazards within the mill. In addition to the annual and refresher training, the monthly safety meetings have included additional training and information related to worker safety in working with radioactive materials.

2.5.2 Program Evaluation

Interviews were held with mill personnel to determine the extent of safety training given. The personnel interviewed stated they had radiation safety training in the past year and have had annual retraining since they have been employed at the facility. They also stated that they had respirator use and safety training when they were given their refresher training.

The inspectors reviewed the personnel training records and concluded that they were generally adequate. However, the inspectors

determined that written exams were not given to the employees after the training. The inspectors identified this as a deviation from the regulatory position specified in Regulatory Guide 8.31. The reason for this is that the training system does not have any feedback on what the employees learned and what needs to be emphasized.

The inspectors determined that the radiation safety training program in effect at the Homestake Mill was in accordance with recommendations contained in Regulatory Guide 8.31, with the exception of the deficiency discussed above.

3.0 INTERNAL EXPOSURE CONTROL

3.1 In-Plant Air Sampling Program

3.1.1 Licensee Program

Homestake's air sampling program consisted of sample collection and analysis to cover routine monitoring of radioactive particulate dust concentrations, non-routine employee exposure to airborne particulates, and exposure to radon daughters during normal operations of the mill. There were 22 routine air sample locations for airborne yellowcake, ore dust, and radon daughter measurements. Sampling was performed daily for airborne yellowcake and ore dust and quarterly for radon daughters.

Collection was accomplished utilizing portable air samplers and personnel samplers. The portable air samplers used for airborne yellowcake and ore dust were powered by 110 vac and typically set to draw 90 liters per minute. A 47 millimeter glass filter was used with a sampling period of 24 hours, or for the duration of the activity if less than 24 hours. The portable air samplers used for radon daughters was typically set to draw 2.5 liters per minute. A glass fiber filter was used with a 5-minute sampling period. Breathing zone samples were obtained in yellowcake areas for special tasks with low volume personnel samplers. Typically, these samples were taken for the duration of the task at 10 liters per minute.

3.1.2 Program Evaluation

The NRC inspector observed that the number and frequency of airborne samples for routine and non-routine monitoring during normal and reduced operations were adequate. Mill operational status was a major consideration in determining when to take an air sample. Discussions with the RPA revealed that air samples were taken in locations that were representative of the breathing zone of the workers. Air sample results for the period of reduced operations showed no areas which exceeded 25 percent of MPC.

The mid-volume air sampler (90 liters per minute) was not calibrated for flow rate during calendar years 1984 and 1985. This was not in conformance with 10 CFR 20.103(a)(3) which requires the use of suitable measurements of concentrations of radioactive materials in air for detecting and evaluating airborne radioactivity in restricted areas. However, at the time of the inspection the instruments were calibrated correctly. Therefore, the inspectors have identified this as a program element deficiency. The low-volume air samples were calibrated for flow rate semiannually

against a wet test meter. The methods, frequency, and documentation used in calibrating the low volume air samplers appeared adequate to meet the intent of NRC Regulatory Guide 8.25, "Calibration and Error Limits of Air Sampling Instruments for Total Volume of Air Sampled," August 1980.

The NRC inspector was concerned, however, that the collection of airborne samples was not documented to show the date, time, volume, location, serial number of the sample, and the name of the individual collecting the sample. This information should be documented to assure that the licensee is able to exercise better control over the sampling program.

Based upon the above findings, the sample schedule and sampling program was acceptable; however, the air sample data should be documented in an acceptable format to include all pertinent data. This was identified as an open item (40-8903/86-001-01).

3.2 Sample Analysis and Quality Assurance

3.2.1 Licensee Program

Analysis of air samples was accomplished in the laboratory facilities on site. Fluorometric analysis for uranium was used to evaluate the routine and non-routine samples for ore dust and yellowcake. Air samples drawn for radon daughter evaluations were performed utilizing a modified Kusnetz Method. An instrument working level meter was also used to evaluate radon daughters. Radon daughter evaluations were used to determine working levels.

The laboratory did not have a quality assurance program for air sample analysis to determine the precision and accuracy of the samples and establish the reliability of airborne radioactivity data.

3.2.2 Program Evaluation

The NRC inspector noted that after the collection of the in-plant air samples, the samples are sent to the analytical laboratory on site for evaluation. The individual performing air sample analysis appeared to be competent in doing such. In reviewing air sample assay data, the inspector noted that the collection efficiencies of the glass fiber filters used were not taken into consideration in calculating airborne concentrations. Further, air sample results had not been subjected to trend analysis.

The analytical laboratory had not implemented a quality assurance program in accordance with Regulatory Guide 4.15 to ensure the precision, accuracy, and reliability of airborne radioactivity data. In addition, the inspectors noted that samples were not analyzed for periods exceeding 1 week from the time they were taken. This does not allow for timely determination of employee exposures and does not allow the RPA to respond quickly to changing mill conditions.

Based upon the above findings, the sample analysis and quality assurance program included areas of weakness that need to be strengthened. The following items should be implemented to achieve an acceptable program.

- Air filter collection efficiencies should be determined or documentation obtained from suppliers as to correct efficiencies.

- A quality assurance program for in-plant air samples should be established to meet the intent of Regulatory Guide 4.15.

- Trend analysis should be performed for air sample data as part of the ALARA audit discussed previously, and sample analysis should be performed in a more timely manner as specified in Regulatory Guide 8.30.

The first two items were identified as deficiencies which must be rectified to enable the licensee to show compliance with 10 CFR 20.103(a)(3), while the third item was identified as a deviation from the regulatory position specified in Regulatory Guide 8.30.

3.3 Exposure Determination Program (Internal)

3.3.1 Licensee Program

The determination of internal exposure due to airborne radioactivity was accomplished by Homestake Mining Company utilizing airborne sample concentration data and timekeeping. Workers in specified areas are required to fill out a weekly time study report identifying the amount of time spent in individual areas. Weekly employee exposures were calculated as a percent of the maximum permissible exposure based on the airborne radioactivity concentration and the time spent in the area. Respiratory protection equipment was used by Homestake Mining Company; however, protection factors were not considered in the determination of internal exposures.

3.3.2 Program Evaluation

The inspectors determined that the mechanism for calculating employee exposures was acceptable. The NRC inspector reviewed exposure data for mill workers and determined that no worker had been exposed to levels in excess of regulatory limits. The NRC inspector observed that exposures on the average were 10-15 percent of the 40 MPC-hour limit and the maximum was 23 percent. However, the validity of the data was questioned because, as previously indicated, the accuracy of air sample data use to derive exposure data was questionable since (1) steps were not taken to assure accuracy of mid-volume sampler flow rates, (2) a collection efficiency factor was not considered for sample filters, and (3) a quality assurance program was not implemented for sample analysis.

Based upon the above, the exposure determination program was acceptable providing the issues discussed above are addressed.

3.4 Bioassay Program

3.4.1 Licensee Program

The licensee's bioassay program which was in effect during normal operations followed the procedures contained in Attachment No. 6 to Homestake Mining Company's "Monitoring and Surveillance Programs" document. These procedures required monthly urinalysis sampling of all mill workers exposed to yellowcake dust. The procedures did not require sampling of maintenance personnel. The program required that employees submit a specimen 48-96 hours after possible exposure to yellowcake material upon their return to work.

Results on workers that were in the 25-50 ug/l range would require resampling and if confirmed, then an investigation was conducted to determine the cause. If results were greater than 50 ug/l the individual would be placed on work restrictions and an investigation as to the cause would be conducted. Work restrictions would be continued until the individual's bioassay results measured less than 25 ug/l. Also, an attempt would be made to determine if other individuals were at risk and air sampling results reviewed to determine why the air concentrations in the area of concern were not indicative of the problem. Albuminuria tests are required for four consecutive samples greater than 50 ug/l or one sample greater than 150 ug/l.

All bioassays are analyzed in-house utilizing a double solvent extraction technique. Flourometer calibrations are performed before each use using two standards and two blanks. However, no quality

control procedures, such as analysis of blanks or spikes, were implemented at the Homestake Mill. The review of the data, by the RPA and the Director of Environmental Affairs, is required to be completed within 1 week of sample collection. The procedures do not address a lower limit of detection (LLD) or required baseline sampling for new hires. The bioassay program does not include in vivo lung counting.

The program described above was that in effect during the period the mill was in full operation. Due to the reduced mode of operation, Homestake ceased the urinalysis testing program in September, 1985.

3.4.2 Program Evaluation

Review of the licensee's records indicated that from April, 1985 through August 31, 1985 no samples exceeded 12 ug/l. The highest reported value was 11.89 ug/l, and the average on 85 samples was 2.6 ug/l for 14 individuals.

Review of the licensee's bioassay program indicates that the program is deficient in several areas. The deficient areas are outlined as follows:

(1) Action levels are inconsistent with Regulatory Guide 8.22.

(2) Maintenance workers who are exposed to yellowcake dust are not included in the sampling program, and baseline sampling for new hires is not performed.

(3) The licensee's sample analysis program does not utilize any quality control procedures, leading the inspectors to question results previously obtained.

(4) The frequency for urinalysis testing is not based on achieving a specific LLD as described in Regulatory Guide 8.11.

(5) Urinalysis testing is not being conducted during periods of yellowcake production under the current reduced state of operations.

The above items were identified as deficiencies.

3.5 Respiratory Protection

3.5.1 Licensee Program

A documented respiratory protection program has been in operation since 1979. The RPA is directly responsible for the program; however, the ultimate responsibility for the program resides with the Director of Environmental Affairs. The RPA and three technicians are actively engaged in the respiratory protection program. The RPA provides respiratory protection training for all individuals who wear respirators. The records of such instruction are contained in each individual's personnel file. These records were checked by the inspectors and were determined to be up to date. The records also showed that respirator users were given a spirometer test during their annual physical. The results were evaluated by the physician and the results relayed to the company. Personnel are fitted with the proper size respirator at the time of initial respiratory protection training and refitted each year.

Cleaning and maintenance is the responsibility of the RPA, with the technicians trained in the cleaning, maintenance and storage of the respiratory protection equipment. The respirators are cleaned and disinfected with a cleaner supplied by a respirator manufacturer. Washing temperatures range from 120° F to 140° F with the cleaning performed manually. The respirators are then air dried. The respirators are checked for deteriorating parts and if bad parts are found, they are replaced. They are checked for function, cleaned, checked for contamination, and sealed in a plastic bag. The inspectors noted that the respirators are returned on the day of issue and the high efficiency filters for radioactive dust and particles are not reused. A separate building near the mill is used for the storage and issuance of respiratory protection equipment. The self-contained breathing apparatus (SCBA) used for emergency use were checked by the inspectors. The SCBA were not inspected monthly; however, they are inspected before and after each use.

3.5.2 Program Evaluation

The overall evaluation of the respiratory protection program is as follows:

1. The policy statement for the program is adequate and has a commitment to engineering controls and the ALARA concept.

2. Training is carried out in an adequate manner by trained personnel.

3. The program generally follows MSHA and NRC regulations; however, it has weaknesses in the program that require remedial action.

There was not any documented annual review and/or revision to the program available at the time of the inspection. The annual review and/or revision is an essential part of the program. Without documentation of such reviews, the adequacy of the program cannot be fully established. This is considered an open item (40-8903/86-001-02) and will be evaluated at the next routine inspection. The latest respiratory protection policy statement was dated November 14, 1979. The inspectors did review the training program in respiratory protection for users of such devices. The inspectors reviewed the operating procedures on fitting, fit testing, cleaning, maintenance and selection and use of respirators. The licensee also had an SOP for inspection of the respirators in use at the facility. The procedures were adequate.

The inspectors observed that the two SCBA units had compressed air cylinders in place that registered 1500 and 1700 psi. The standard for these bottles to be ready for emergency use specifies that the pressure should be maintained between 2000 and 2200 psi. The inspectors did observe that the two spare compressed air cylinders were up to pressure. The cylinders on the equipment that is ready for emergency use in accordance with industry standards and good safety practices are to be ready for immediate use. The two units had not been inspected monthly for 1 year period. This also is not in accordance with good safety practice. Since both are related to the same situation, they are an open item (40-8903/86-001-03). The inspectors interviewed two mill personnel who were wearing half mask respirators. When questioned about how they donned, used and redonned their respirators, they stated that they did not smoke test and/or check the mask for proper fit each time they put the mask on. This is a weakness in the respirator training, use and surveillance of the respirator program and has been identified as an open item (40-8903/86-001-04). The air line respirators have not been used since the plant went on a curtailed operations status. The air was sampled quarterly and checked in-house for the contaminants.

4.0 EXTERNAL EXPOSURE AND CONTAMINATION CONTROL

4.1 Surveys for External Radiation

4.1.1 Licensee Program

The licensee's external radiation survey program during the period from April, 1985 to present consists of 9 monthly beta-gamma surveys which include the following areas: crusher building, yellowcake dryer, yellowcake drum storage area, yellowcake packaging room, yellowcake sample preparation room, filter building, and digester building. In addition, 71 additional areas are monitored quarterly.

The surveys are conducted with an Eberline Portable Scaler-2 and a HP 270 beta-gamma probe or an Eberline E-530 geiger counter. The instruments are calibrated by Eberline and are recalibrated on a frequency not greater than every 6 months. Two area TLD's are also utilized on a random basis. The dosimeters are exchanged monthly.

4.1.2 Program Evaluation

Review of the licensee's data indicates that typical exposure rates are less than 1 mR/h. The highest reported survey reading was 2.18 mR/h in the yellowcake storage area. During the inspection, measurements conducted by the inspectors indicated that at least one location within yellowcake storage area exceeded the criteria of 10 CFR 20.202 for posting a "Radiation Area". The yellowcake storage area was fenced and secured and did not exceed the posting criteria at the fenceline. This area was not posted at the start of the inspection, but at the inspector's recommendation was posted during the course of the inspection. Function checks were performed prior to use of the instrument but were not documented. The Eberline E-530 instrument serial number 903 was due for calibration on August 9, 1985, but was not calibrated until November 1, 1985. Review of the data indicated all monthly and quarterly surveys had been performed.

Based on review of the licensee's program the staff concludes that the program is adequate and in accordance with Regulatory Guide 8.30 with two exceptions. The inspectors conclude that function checks should be documented, and the licensee should establish a tracking system to assure that instruments used for surveys have been calibrated within the specified period. These items were identified as deviations from regulatory positions as specified in Regulatory Guide 8.30.

4.2 Exposure Determination Program (External)

4.2.1 Licensee's Program

The licensee's external exposure determination program consists of personal thermoluminescent dosimeters (TLDs) placed on the employee's hard hat for yellowcake precipitation building operating personnel. The licensee exchanges TLDs on a monthly frequency. Record of exposures are maintained on computer forms and records of worker's prior dose are maintained. Currently, six individuals are badged and two more will be added soon.

4.2.2 Program Evaluation

Review of the licensee's external exposure control program reveals that the highest annual exposure for 1985 was 0.602 rem. Typical exposures were less than 0.17 rem. During the first quarter of 1986 the highest exposure was 0.260 rem.

Program review indicates that there is no provision for visitors or contractor personnel to sign a statement of prior dose before entering a radiation area. A procedure to assure compliance with 10 CFR 20.202 should be established. This is identified as an open item (40-8903/86-001-05). With this exception, the inspectors conclude that the licensee's program is acceptable.

4.3 Surface Contamination Control Program

4.3.1 Licensee Program

The licensee's surface contamination control program consists of monthly gross alpha counts using an Eberline RM-19 and an AC-3-8 scintillation probe. The licensee measures the total gross alpha value in eight areas, and assures it to be less than the removable limit of 1000 dpm/100 cm^2. The areas surveyed are the lunchrooms and change rooms. The instrument is calibrated by a vendor laboratory quarterly. The instrument is not checked for operability prior to each use.

4.3.2 Program Evaluation

Review of the licensee's surface contamination control program indicates that the instrument's calibration frequency is adequate but the instrument was overdue on one occasion. As discussed previously, the licensee should establish a tracking system to assure that only instruments which have been properly calibrated are used for surveys. Function checks should be performed and

documented prior to each use. This was identified as a deficiency from staff policy as specified in Regulatory Guide 8.30.

The licensee's data indicates that no areas exceeded 700 dpm/100 cm^2. Independent smears of selected areas by the NRC inspectors reveals that no area exceeded the removable limit. The highest value was 440 dpm/100 cm^2.

4.4 Personnel Contamination Control Program

4.4.1 Licensee's Program

The licensee's personnel contamination control program consists of a protective clothing requirement for individuals working in the yellowcake area. Showering of all yellowcake workers is required before they exit the restricted area. All protective clothing is laundered on-site. The licensee does not provide an instrument accessible to the workers for self-monitoring. There are no procedures for spot checks. Occasionally, members of the radiation protection staff perform visual spot checks on personnel according to the RPA. Workers are not required to sign out after work.

4.4.2 Program Evaluation

Review of the licensee's personnel contamination control program indicates that no monitoring is being performed to verify that workers leaving the site are not contaminated. Based on this review, the inspectors recommend that a personnel contamination control program should be developed in accordance with Regulatory Guide 8.30. This was identified as a deviation from a regulatory position.

4.5 Release of Equipment and Materials to Unrestricted Areas

4.5.1 Licensee Program

The licensee's program for release of equipment or materials to unrestricted areas requires monitoring of all such items prior to release. The allowable limits are 5,000 dpm/100 cm^2 removable, 15,000 dpm/100 cm^2 average fixed, and 25,000 dpm/100 cm^2 maximum fixed.

4.5.2 Program Evaluation

The licensee's program is consistent with Regulatory Guide 8.30 except for the levels. These levels should be 1000 dpm/100 cm^2 removable, 5,000 dpm/100 cm^2 average fixed, and 15,000 dpm/100 cm^2

maximum fixed. Due to a prohibition placed on the licensee by the State of New Mexico 2 years ago, no equipment or materials have been released for unrestricted use.

The licensee's program is acceptable with one exception. The inspectors recommend that the maximum amount of total surface contamination be made consistent with Regulatory Guide 8.30. This was identified as a deviation from a regulatory position.

5.0 FACILITIES AND EQUIPMENT

5.1 Facility Adequacy and Process Controls

5.1.1 Licensee Program

There has been no circuit changes in the facility in the past year. The condition of the facility at the time of the inspection was fairly clean and appeared to be in reasonably good operating condition. The floors were noted to be old and worn down to the aggregate of the concrete with the rest of the mill in an average condition for a facility of that age. Pathways were noted to be clear within the mill area.

Yellowcake storage areas were observed to be secured and the access door locked. No shipments of yellowcake were observed during the inspection. The licensee stated there had not been any theft of material. The inspectors observed that the access of the mill is controlled through the gate where a security guard is posted or by access through the administration building through a secured door. The NRC inspectors observed that the restricted area fence was in good repair and properly posted.

The mill had change rooms for mill personnel and they were equipped with shower facilities and clothing hampers for used protective clothing prior to their washing and decontamination on site. The inspectors noted the posting of the USNRC-3 "Notice to Employees" form in the change rooms, guard shack and in the administrative office area. 10 CFR 19 and 20 were posted in the same locations.

5.1.2 Program Evaluation

The inspectors noted that mill facilities and process controls appeared adequate. No apparent violations or program deficiencies were identified by the NRC inspectors.

5.2 Fire Protection and Emergency Response

5.2.1 Licensee Program

The fire protection program in effect at the Homestake Mill consists of fire extinguishers and fire hose stations located throughout the mill building. Fire extinguishers are checked by in-plant personnel, State personnel, and by a service company. In addition, Homestake conducts monthly fire drills to assure personnel are adequately trained to fight fires. Annual inspections of the fire protection program are performed by an insurance underwriter, with

the most recent inspection documented in a report dated May 19, 1986. Written emergency plans have been established for mill tailings and for transportation of yellowcake. An annual drill is performed to test those plans. The most recent was an emergency transportation drill in April 1986. A consultant was used to develop the scenario, which included hired players, video taping, and an actual spill of simulated radioactive material.

5.2.2 Program Evaluation

An examination was made of the mill's fire protection program, including equipment, procedures, and warning devices. The licensee was found to have an adequate fire protection program. The licensee's emergency plans for the tailings impoundment and for transportation of yellowcake needed updating for NRC notifications and telephone numbers, but were otherwise adequate. The inspector identified the correct telephone numbers for Region IV notification and a later call by URFO verified that the correct notification numbers were marked into the emergency plan. The need to annually update the emergency plans was identified as an open item to be reviewed during the next inspection (40-8903/86-001-06).

5.3 Transportation of Radioactive Materials

5.3.1 Licensee Program

The licensee prepares shipping papers for the transport of yellowcake when shipping material off site. This includes a bill of lading, inventory of the barrels by number, and an NRC Form 741 that specifies the amount of material to be shipped. Included with the papers are the driver/carrier instructions for emergencies. The licensee uses new DOT Specification 17, 55 gallon barrels for shipping the yellowcake. Each barrel has its unique identification number and is marked as LSA material. The barrels are washed and air dried prior to shipment. However, the licensee's program does not include a provision for surveying barrels to be shipped.

5.3.2 Program Evaluation

The inspectors examined the records of 28 shipments made between July 9, 1985, and May 22, 1986. Each record of shipment had all the information described above and was determined to be adequate. The inspectors noted, however, that the survey recommendations of Regulatory Guide 8.30, Section 1.8, were not followed. This was identified as a deficiency. The inspectors determined that the individual who was responsible for shipping the barrels did not have a copy of DOT or NRC regulations available in his office. It was

determined, however, he had access to these regulations in a nearby office.

A review of the driver or carrier instructions issued with each shipment indicated that the information presented is very general. It states that the driver or carrier notify local authorities and contact the shipper after preliminary measures had been taken to secure the area around the shipment. The procedure lacks specific instructions to local authorities or passersby on what procedures or actions to take if the driver is incapacitated and is unable to answer questions and take any corrective action. It is a weakness in the instructions and is considered an open item (40-8903/86-001-07).

6.0 TAILINGS MANAGEMENT AND EFFLUENT CONTROL

6.1 Design of Tailings Management System

6.1.1 Licensee Program

The tailings management system at the Homestake Mill consists of a ring embankment constructed of tailings sands. A dike separates the embankment into two ponds. The embankment was raised continuously during periods of operation by cycloning the tailings and using the coarse fraction of the tailings to raise the dike by the upstream method of construction. Homestake has performed stability analyses, which are required by the State Engineer's Office (SEO), to show that the embankment meets the minimum factors of safety recommended in Regulatory Guide 3.11.

6.1.2 Program Evaluation

As discussed in Regulatory Guide 3.11, the staff considers the upstream method of construction to be the least preferred method of raising an embankment. This is because succeeding lifts are built on tailings which have not been systematically compacted. It is therefore very difficult to estimate the density, and the corresponding strength, of the tailings comprising the embankment.

The inspector's review of the stability analyses performed for the SEO showed that all calculated factors of safety exceeded the minimum values specified in Regulatory Guide 3.11. However, several cross-sections of the embankment consistently showed factors of safety which just barely exceeded the recommended minimum values for either the static or pseudo-static conditions. Further, the brief review of the analyses performed led the inspectors to question the conservatism employed in the analyses, especially in light of the marginally adequate values calculated.

The inspector concludes that the licensee should perform additional analyses to conservatively assess the stability of the embankment, and if the analyses indicate that the embankment does not conservatively meet the minimum factors of safety specified in Regulatory Guide 3.11, the licensee should propose measures to increase the stability of the embankment. The inspectors conclude that this issue is best addressed in a licensing context.

6.2 Dam Inspection Program

6.2.1 Licensee Program

The current dam inspection program consists of daily inspections conducted Monday-Friday by the Mill Manager. The inspection is conducted using a detailed check list approved by the SEO, and includes pond level measurements and visual evaluation of beach width to assure that a 50 foot beach is maintained as required by the SEO.

The inspection program also includes specified intervals for reading embankment instrumentation. A total of 45 piezometers are maintained within the embankment. The piezometers within 100 feet of the cyclones were read monthly during operations. All other piezometers were read quarterly unless a piezometer showed a change greater than 1 foot per month, in which case the frequency was increased to monthly. Piezometer readings were maintained in graphical form until fall, 1985, when the graphing was discontinued due to the cessation of operation and the fact that the readings showed very little variation. The licensee also maintains six cross-sections of three movement monuments each. The movement monuments are surveyed monthly for both vertical and horizontal movement.

The overall responsibility for the inspection program lies with the General Superintendent, who is a registered professional engineer. The General Superintendent submits a monthly report to the SEO which summarizes beach and freeboard levels and instrumentation data. The licensee also submits to the SEO a quarterly report prepared by a geotechnical engineering consultant which includes an analysis of embankment stability.

6.2.2 Program Evaluation

The inspector's review of the dam inspection program in effect at the Homestake Mill indicates that the program is generally compatible with the program recommended in Regulatory Guide 3.11.1. Further, the review of piezometer and movement monument showed no trends of concern. However, as discussed in the previous section, additional stability analyses will be required to adequately document the stability of the embankment.

6.3 Programs for Controlling Blowing of Ore and Tailings

6.3.1 Licensee Program

The licensee's program for controlling blowing of tailings consists of four impact sprinklers, rubber tires placed on the dike separating the two ponds, and an annual application of a chemical stabilizer to approximately half of the embankment. The licensee did not have a documented program for controlling blowing of ore dust.

6.3.2 Program Evaluation

The inspector's review of the licensee's program indicates that it is inadequate to control blowing of tailings, as was evidenced on June 9, 1986, when the inspectors observed extensive blowing of tailings. The problem is compounded by the fact that a large area of tailings is exposed to blowing since the entire embankment is composed of tailings. Further, the licensee does not have in effect written procedures for controlling blowing of ore piles or tailings. These items were identified as program deficiencies in regard to Criterion 8 of Appendix A to 10 CFR 40.

6.4 Mill Effluent Control Program

6.4.1 Licensee Program

The licensee's programs for controlling mill effluents consists of emission control devices located on stacks with the potential for significant emissions. Specifically, the emission control program consists of the following:

(a) A baghouse dust collector services the crushing area.

(b) The yellowcake roaster and dryer are each serviced by two-stage wet scrubbers.

(c) The yellowcake packaging area is serviced by a single stage wet scrubber.

The licensee indicated that the baghouse collector was checked once per week for proper operation, although the check was undocumented. The licensee stated that water flow and air pressure differential gauges on the wet scrubbers were checked often by operators, but again, these checks were not documented. The licensee also stated that the roaster and dryer were interlocked with the scrubbers, and that low water flow in the scrubbers would result in a shutdown of the equipment serviced by the scrubber.

6.4.2 Program Evaluation

The inspector's review of the effluent control program indicates that the emission control equipment in operation at the mill is state-of-the-art. The undocumented checks of the yellowcake emission control equipment were identified as a deficiency to Criterion 8 of Appendix A to 10 CFR 40.

7.0 ENVIRONMENTAL MONITORING

7.1 Environmental Monitoring Program

7.1.1 Licensee Program

The licensee has been monitoring the environmental impacts of their milling and tailings facilities since commencement of operations in 1958. The monitoring programs are periodically reviewed to assess adequacy and determine data requirements for the assessment of impacts. The licensee's environmental monitoring program is discussed below.

(a) Stack Sampling

Effluents from the yellowcake dryer, roaster, and packaging room stacks are isokinetically sampled quarterly and analyzed for natural uranium. The licensee utilizes EPA Method 5 for isokinetic stack sampling. Representative grab samples are collected from each of two Crusher Building stacks semiannually and are analyzed for natural uranium, radium-226, and thorium-230 and stack flow rates. Stack samples are collected during periods of normal operation, as well as during periods when no throughput of ore and yellowcake is being conducted.

(b) Particulate Air Sampling

The licensee continuously samples total suspended particulates at five locations. Three locations are situated at the restricted area's boundary expected to have the highest concentrations of airborne radioactive particulates based on the predominant wind direction at the site. One location was selected with an intent to represent background, while one site is located at the nearest residence. The samples are analyzed quarterly for U-nat, Ra-226, Th-230, and Pb-210.

(c) Radon Daughter Working Levels

Radon daughter working levels (WL) are determined on a quarterly basis at each of the five locations described above. Radon daughter concentrations are determined by the Kusnetz Method using a Bendix low volume sampling pump at 10 liters per minute (lpm), an Eberline PS2-2 scaler, and an Eberline RD-13 drawer counter, or the equivalent. The radon daughter samples are collected on Gelman 50 mm Type A/E fiberglass filters. This method is sensitive to 0.001 WL.

(d) Ambient Radon

Radon gas concentrations are monitored on a continuous basis at the five monitoring locations. Terra-dex Corporation's Type F track-etch passive radon monitors (PRM), or the equivalent, are used to continuously monitor radon gas at each sampling location. The alpha-particle sensitive detector is replaced and analyzed on a quarterly basis. A sensitivity of 1.0 pCi/liter-month is expected from this method.

(e) Ground Water Quality Monitoring

Three upgradient water quality monitoring wells were drilled by the licensee to substantiate background water quality. Three additional wells have been installed hydrologically downgradient, to determine the effects of the tailings impoundment on the regional ground water. An alluvial groundwater well has been drilled near the closest downgradient residence, just inside the restricted area. The wells are sampled quarterly and analyzed for natural uranium, Ra-226, Th-230, and Pb-210, as well as the chemical parameters sulfates, nitrates, molybdenum, selenium, fluorides, and total dissolved solids. Additional wells onsite are sampled quarterly for indicator parameters sulfates, molybdenum, selenium, and U-nat. All water quality wells are pumped for a minimum of 20 minutes prior to sample collection, to ensure the drawing of a representative sample of alluvial groundwater.

(f) Surface Water Quality Monitoring

There are no natural water courses at or near the site. The licensee's milling operation has no surface water discharge. The clarified tailings solutions are decanted and recycled back into the milling operation as process waters. Although discontinued in February 1986, the IX facility had been discharging approximately 550 gpm of treated mine water to a dry Arroyo. The discharge waters were treated by ion exchange, and by barium chloride coprecipitation and settling for removal of uranium and radium-226, respectively. This discharge was sampled quarterly and analyzed for dissolved and suspended natural uranium, radium-226, thorium-230, and lead-210. Due to the absence of surface water at the site, the licensee has no program for surface water sampling.

(g) Vegetation and Soil Sampling

Vegetation samples are collected on an annual basis at each of the five locations identified above. Vegetation samples are composited for each sample location and consist of species palatable to grazing animals that contribute to the human food chain. The sample size is approximately 500 grams. The composited samples are analyzed for Ra-226 and Pb-210.

Soil samples are collected annually at each of the five perimeter sampling locations. Representative composite samples of an area of 100 cm^2 to a depth of five centimeters are collected for each sample location and are analyzed for U-nat, Ra-226, and Pb-210.

(h) Direct Gamma Radiation

Gamma exposure rates are continuously monitored through the use of thermoluminiscent dosimeters (TLD's) at each of the five sample station locations. Each TLD badge consists of five chips in a plastic holder. The plastic provides adequate protection from weather in order for this badge to be used outdoors. The TLD's are exchanged on a quarterly basis and analyzed by an independent laboratory. The integrated levels of direct external radiation are recorded for each of the five locations. The TLD's are sensitive to 1.0 mrem gamma radiation.

7.1.2 Program Evaluation

The licensee's radiological effluent and environmental monitoring programs closely approximate programs as described in NRC Regulatory Guide 4.14. On a quarterly basis, the licensee summarizes the data obtained from the environmental monitoring and surveillance programs in compliance with effluent concentration limits in the radiation protection regulations. This information has been made available at the mill office upon request from the State's authorized representatives. The information contained in the quarterly summaries has normally not been submitted to a regulatory agency on a semiannual basis, unless requested. The NRC, pursuant to section 40.65 of 10 CFR Part 40, does require this report on a semiannual basis. The submitted report will include summaries of sample variability, the range of values observed and lower limits of detection.

There has been no documented determination of compliance with section 190.10 of 40 CFR 190 since September 30, 1984. Under NRC

requirement, Section 20.405(c) of 10 CFR Part 20, the licensee must report to NRC any levels of radiation or of radioactive material in excess of the limits specified by 40 CFR 190. In addition, it is recommended that the background location and the nearest resident location selected for use in these calculations be re-evaluated.

A question about ore disequilibrium was raised concerning differences in the Th-230 analyses by the licensee and the State. The staff will address these issues as part of its routine review of environmental monitoring data to be submitted by the licensee in accordance with 10 CFR 40.65.

7.2 Quality Assurance for Environmental Monitoring

7.2.1 Licensee Program

This environmental monitoring program provides for sample collection using specified sampling equipment in specified sampling locations under acceptable sampling procedures. The licensee also uses a program for ensuring the analytical quality of obtained results. To achieve an acceptable level of quality control, four individual procedures are included under the quality assurance program.

- Quarterly calibration of all sample collection pumps through a positive displacement method.
- Semiannual calibration of all radiation monitoring equipment by a licensed vendor laboratory.
- Semiannual review of all monitoring performed under standard practice to review monitoring location, equipment, and procedures for adequacy.
- Semiannual collection of duplicate splits of selected effluent samples for cross-check analysis with an independent laboratory. The samples collected for the laboratory cross-check are a random assortment of a fraction of the effluent samples collected.

7.2.2 Program Evaluation

The inspectors determined that the quality assurance program is generally in accordance with recommendations contained in Regulatory Guide 4.15.

8.0 EXIT INTERVIEW

The inspectors conducted an exit briefing with licensee personnel to discuss inspection findings. Homestake representatives present at the exit interview were as follows:

J. Parker - General Manager
E. Kennedy - Director of Environmental Affairs
T. Beck - Mill Manager
R. Farrell - Radiation Protection Administrator
D. Crouch - Corporate Representative

The inspectors summarized the finding of four significant program areas with deficiencies as specified in the accompanying List of Necessary Program Elements.