

40-8905



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION IV  
URANIUM RECOVERY FIELD OFFICE  
BOX 25325  
DENVER, COLORADO 80225

ML16113A370

JUN 02 1994

Docket No. 40-8905  
License No. SUA-1473

Quivira Mining Company  
ATTN: Bill Ferdinand  
6305 Waterford Blvd., Suite 325  
Oklahoma City, Oklahoma 73118

SUBJECT: NRC INSPECTION REPORT 40-8905/94-01

This refers to the inspection conducted by Messrs. Pete Garcia and Ray Gonzales of this office on May 9, 1994. The inspectors were accompanied during the inspection by Mr. Kenneth Hooks of NRC Headquarters and Messrs. Louis Carson and Robert Evans of NRC Region IV. The inspection included a review of activities authorized by the license for the Ambrosia Lake Mill. At the conclusion of the inspection, the findings were discussed with you and those members of your staff identified in the enclosed report.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examination of procedures and representative records, interviews with personnel, and observation of activities in progress. The results of this inspection are documented in the enclosed report.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC's Public Document Room.

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

Sincerely,

Ramon E. Hall  
Director

Enclosure:  
Appendix - NRC Inspection Report  
40-8905/94-01

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Case Closed: X61261

bcc:

Docket File No. 40-8905

LFMB

PDR

Suspense File

URFO r/f

SJCollins, RIV

GSanborn, RIV

RITS Operator

RSTS Operator

NMIS

MIS System

RAScarano, RIV

LJCallan, RIV

RWise, RIV

KHooks, 7J-9

LCarson, WCFO

REvans, RIV

MRodriguez, OC/LFDCB (4503)

DMB (IE-07)

LLUR Branch, LLWM

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PM:URFO <i>PM</i>	PM:URFO <i>PM</i>	DD:URFO <i>PM</i>	D:URFO:RIV <i>PM</i>	
PJGarcia/db	ROGonzales	EFHawkins	REHall	
05/27/94	05/27/94	05/31/94	05/31/94	

Quivira Mining Company

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JUN 02 1994

cc:  
T. Fletcher, Quivira  
B. Garcia, RCPD, NM

\*

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV  
URANIUM RECOVERY FIELD OFFICE

Inspection Report: 40-8905/94-01

License: SUA-1473

Licensee: Quivira Mining Company  
P.O. Box 218  
Grants, New Mexico 87020

Facility Name: Ambrosia Lake Mill

Inspection At: McKinley County, New Mexico

Inspection Conducted: May 9, 1994

Inspectors: Pete J. Garcia, Jr., Senior Project Manager  
Raymond O. Gonzales, Senior Project Manager

Accompanying Personnel: L. Carson, NRC Region IV  
R. Evans, NRC Region IV  
K. Hooks, NRC Headquarters

Approved: \_\_\_\_\_

Edward F. Hawkins, Deputy Director  
Uranium Recovery Field Office

5-31-94  
Date

Inspection Summary

Areas Inspected: Routine announced inspection of uranium milling operations and radiation safety program including: Management Organization and Controls; Operations Review; Operator Training and Retraining; Radiation Protection; Radioactive Waste Management; and Environmental Protection.

Results:

The inspectors determined that site activities were being conducted in accordance with license requirements.

Summary of Inspection Findings:

No violations or deviations were identified during the inspection.

Attachment:

Persons Contacted and Exit Meeting

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## DETAILS

### 1 PLANT STATUS AND TOUR

Conventional ore processing sections of the Ambrosia Lake Mill remain on standby. The licensee has continued to produce yellowcake by extracting uranium from mine water in the mill ion exchange (IX) building. The yellowcake is precipitated and stored onsite. At the time of the inspection, approximately 145,000 pounds of yellowcake slurry were being stored onsite. Also, the licensee was processing about 2000 pounds of yellowcake per month. The licensee has also continued to receive shipments of alternate feed materials from Sequoyah Fuels Corporation's Gore, Oklahoma uranium conversion facility, although no shipments have been received since August, 1993. The alternate feed materials were washed and stored in thickener tanks to await further processing. All exposed tailings onsite have been covered with an interim cover, and the licensee was in the process of placing radon barrier soils on Tailings Pile No. 1 at the time of the inspection.

A thorough tour of the facility was performed by the inspectors on May 9, 1994. A Ludlum Model 19 survey meter was used to measure radiation exposure rates at locations throughout the facility. Background exposure readings were about 20 microRoentgens/hour ( $\mu\text{R/hr}$ ). The tour began at the ore receiving pits, where the ore was dumped into one of 16 ore pockets when the plant was in operation. The next areas toured included the crushing equipment and conveyor belt rooms. Heavy layers of sediment were observed throughout the crusher facility. The primary crusher area was measured at just under 100  $\mu\text{R/hr}$  while soil outside the primary crusher facility measured up to 420  $\mu\text{R/hr}$  in discrete pockets. The exposure rate in the secondary crusher room measured up to 200  $\mu\text{R/hr}$ . Other areas visited in the crusher facility included the sample tower, the fine ore storage bin, and the rod mill room. No abnormal radiation exposure readings were observed in these areas.

From the rod mill room, the ore was previously pumped to the leaching (dissolving) agitators. This area had an exposure rate of up to 500  $\mu\text{R/hr}$ . The next area toured was the slime tails thickeners, where one thickener tank measured 350  $\mu\text{R/hr}$ . The ion exchange building was inspected, and an exposure rate of up to 300  $\mu\text{R/hr}$  was measured. The yellowcake filtration, drying, and packaging area was also visited. The wash filters measured 900  $\mu\text{R/hr}$  on contact at the base, the chute packaging area measured 2500  $\mu\text{R/hr}$  on contact, and filled drums in the packaging area measured 3500  $\mu\text{R/hr}$  on contact. Also visited was the tailings pile. Areas where the radon/erosion cap were installed had exposure rate readings at background levels. None of the areas visited met the criteria for posting as a radiation area. No inappropriate radioactive postings were observed.

### 2 MANAGEMENT ORGANIZATION AND CONTROLS/OPERATIONS REVIEW (88005/88020) —

The licensee described the organization of the radiation safety staff at the site. The General Manager is the highest ranking corporate official onsite. The Supervisor for Radiation Safety and Environmental Affairs, who also serves as facility Radiation Safety Officer (RSO), reports directly to the General Manager. The RSO is assisted by a staff of two technicians. At the time of

the inspection, there were a total of 37 employees at the facility. This total included 4 operations personnel who are involved in uranium recovery activities and 12 equipment operators who are involved in tailings reclamation work.

The inspectors reviewed the records of audits and inspections performed by licensee staff since the previous NRC inspection. The RSO prepared a monthly report for the General Manager which summarized occupational exposure records, environmental data, inspection results, and operational activities. The monthly reports were noted to be thorough. An annual ALARA audit was performed by the licensee and submitted to the NRC as required by the license. Daily walkthrough inspections of the mill were performed by a member of the radiation safety staff. Weekly inspections were performed by the RSO. All inspections were properly documented, although the inspectors did note that some of the daily inspection checklist forms had not been signed.

The inspectors reviewed the Standard Operation Procedures (SOPs) established for routine site activities and the RWPs prepared for non-routine jobs. The SOPs generally contained adequate detail concerning the activity to be performed and had been reviewed by the RSO at least annually. RWPs were found to contain adequate detail regarding the non-routine jobs to be performed and the precautions to be taken to minimize employee exposures. The RWPs were issued by the RSO or a radiation safety technician, although all RWPs were reviewed by the RSO prior to issuance. No deficiencies were identified.

The inspectors toured the mill process facilities, including the yellowcake precipitation area and the mill ion exchange facility. The inspectors noted that housekeeping appeared to be adequate, and that the licensee had installed coverings over the discharge points for water leaving the IX columns to reduce radon daughter concentrations in the mill IX building.

The inspectors also toured the tailings disposal area. The inspectors observed during the tour an employee who was not wearing a reflective, high visibility vest walking among heavy construction equipment. Licensee personnel stated that all employees involved in construction activities had been issued reflective vests, and that the employee had simply forgotten to put the vest on prior to exiting his vehicle. The inspectors recommended that the licensee reinforce to all employees the importance of wearing all protective gear issued when working among construction equipment. The licensee committed to discuss this issue with all construction personnel.

Access to the restricted area was controlled by a barbed-wire fence. Security was provided 24 hours per day by a contract security service. The inspectors noted that the fence was appropriately posted and that notices required by 10 CFR 19.11 were posted on employee bulletin boards.

The inspectors concluded that the licensee's program in this area was functioning adequately.

### 3 OPERATOR TRAINING AND RETRAINING (88010)

The Radiation Safety Training program is administered by the site RSO. New employees are required to complete 24 hours of training, including radiation safety training. All employees are required to attend an annual refresher course, which was most recently conducted for all site employees in April 1994. Employees were given a written test at the conclusion of the training to verify adequate comprehension of the material covered during the course.

The inspectors also noted that the licensee conducts biweekly safety meetings, which cover a variety of topics concerning occupational safety. The RSO received refresher health physics training in March 1994. The inspectors concluded that the training program was conducted in accordance with license requirements.

### 4 RADIATION PROTECTION (83822)

#### 4.1 In-Plant Air Sampling

The inspectors reviewed the in-plant air sampling program implemented by the licensee. Weekly samples for airborne uranium were collected from 12 locations in the yellowcake area using pumps calibrated to draw about 20 cubic feet per minute. Breathing zone samples were collected during RNP jobs using lapel samplers calibrated to draw 1.7 liters of air per minute (lpm). Filters were counted using an alpha scintillation counter.

Radon daughter samples were collected weekly at about 16 locations throughout the mill and the IX building. The samples were collected using pumps calibrated to draw 1.7 lpm and analyzed using an instant working level meter.

The inspectors reviewed the procedure used to calibrate the higher volume pumps. The procedure for calibrating the pumps calls for using a pencil to puncture the sample filter 0-20 times to attempt to create different flow conditions by changing the differential pressure. The flow rates calculated using differential pressure data obtained using a manometer were compared to the flow rates measured using the flow gauge on the pump to calculate correction factors, and the correction factors averaged to obtain an overall correction factor. These calibrations were performed quarterly.

The inspectors reviewed the pump manufacturer's recommendations for calibration. The manufacturer recommends several methods, one of which uses orifice plates with varying numbers of holes to vary flow conditions for calibration. This recommended method is similar, although not identical, to the procedure used by the licensee. The recommended procedure uses the orifice plates to provide varying levels of increased flow resistance, while the licensee's procedure uses the filter holes to provide varying levels of decreased flow resistance. However, both methods use the differential pressure across the filter to calculate actual flow rates for correlation with the flow gauges on the air sampling pumps.

The inspectors did note, however, that the calibrations performed by the licensee often used data from pump gauges whose capacity to measure flow rates had been exceeded. In those cases, the licensee simply used the maximum gauge readings to determine the correction factor. The inspectors noted that the use of the maximum readings resulted in a slight overestimation of the true correction factor for that particular flow condition, and therefore non-conservative estimates of actual flow rates and sampling volumes. The licensee stated that the procedure for calibration would be revised to assure that all numbers used in determining the correction factors represent actual measured values.

The inspector's review of air sampling data showed that all general area concentrations of airborne uranium were less than 5 percent of the Maximum Permissible Concentration (MPC) for 1993 or the Derived Air Concentration (DAC) for 1994. The inspectors did note that breathing zone sampling conducted during RWP was occasionally higher, with values as high as 77 percent of the MPC or DAC. Radon daughter concentrations were also low, with all area averages under 25 percent of the MPC or DAC.

#### 4.2 Exposure Determination

The determination of internal exposures to airborne radioactive materials was conducted by utilizing air sample concentration data, time cards for hours worked in various areas, and respiratory protection factors. Breathing zone sampling was performed to determine exposures during RWP jobs.

The inspectors' review of internal exposure data showed that all exposures were small fractions of the regulatory limit.

#### 4.3 Respiratory Protection and Bioassay

The licensee implemented a respiratory protection program which included the use of negative pressure half-mask, powered air purifying, and supplied air respirators. Credit for the use of the respirators in estimating employee exposures was taken for certain RWP jobs. Respirator issuance records were maintained in a log book, and annual fit testing, training, and medical certifications were performed for all personnel required to wear respirators.

Bioassay samples were collected from all mill employees on a quarterly basis and submitted for analysis by a vendor laboratory. Additional samples were collected following certain RWP jobs. Quality control samples were submitted for analysis along with the specimen samples. The inspector's review of the bioassay data revealed that all results since the previous inspection were less than the initial action level of 15  $\mu\text{g}/\text{l}$  uranium, with the exception of a single value of 29.8  $\mu\text{g}/\text{l}$ . The followup resample showed a result less than the lower limit of detection of 5  $\mu\text{g}/\text{l}$ .

#### 4.4 External Exposure and Contamination Control

Thermoluminescent dosimeters (TLDs) were issued to all mill employees and exchanged quarterly for men and monthly for women. The highest external exposure incurred during calendar year 1993 was 234 mRem. The inspectors did



observe that TLD's were worn by some employees inside the hard hat. The inspectors were concerned that this practice might result in underestimating the shallow dose to which the workers were exposed due to the shielding provided by the hard hat. The licensee stated that a study had been performed which indicated that wearing the TLDs inside the hard hat did not affect the measured doses. The inspectors did not have an opportunity during this inspection to review the report, and indicated that this issue would be reviewed during a subsequent inspection. The inspectors did note, however, that based on the low doses measured during 1993, monitoring of doses from external sources would not be required under 10 CFR 20.1502(a)(1).

The licensee performed weekly surface contamination surveys in 11 locations, including all eating areas and change rooms. Results were all well below the action level specified in the license. The licensee's personnel contamination control program requires that all employees working in the yellowcake area wear smocks, boots, and gloves and shower or monitor with an alpha survey meter prior to leaving the site. All other site employees whose jobs involve a potential for contamination must either shower or monitor with a survey meter before leaving the site. In addition, the radiation safety staff performed weekly random surveys of workers leaving the restricted area.

#### 4.5 Conclusion

The inspectors concluded that the licensee's radiation safety program was being conducted in accordance with license requirements. The only area of concern identified involved the procedure for calibration of high volume air sampling pumps. The licensee committed to modify the procedure to assure that actual measured values are used in performing the calibration.

### 5 RADIOACTIVE WASTE MANAGEMENT (88035)

#### 5.1 Construction Observations

An inspection was made of the reclamation activities currently in progress at the site. Construction activities observed included excavation of the South Diversion Ditch and preparation of the radon attenuation barrier material borrow area. In addition, Pond Nos. 1 and 2 were toured.

The thickness of the approved radon attenuation barrier for Pond No. 1 varies from 4.4 feet in the sand areas to 5.6 feet in the slimes areas. For Pond No. 2, the thickness in the sand areas is also 4.4 feet, and in the slimes areas the thickness varies from 5.6 feet where the slimes are shallowest to 7.2 feet where slimes are the deepest. Since the radon attenuation barrier design was approved, the licensee has submitted a new design to the NRC for review and approval. This design proposes a much thinner radon barrier. Although the NRC has not approved the modified design, the licensee is proceeding with construction of the radon barrier using the modified design.

Placement of the radon cover began last construction season. The entire surface of Pond No. 1 was graded and covered with 1 foot of alluvium. In addition, the north side of the pond received a 1.0-foot layer of Mancos Shale and the south side a 0.5-foot layer. Pond No. 2 was covered with 1 foot of

alluvium, 1 foot of Mancos Shale, and an additional 0.5-foot layer of loose shale for winter protection. The out slopes of both ponds were covered with 1 foot of alluvium, 1 foot of Mancos Shale, and a second 1-foot layer of alluvium. During the past winter, the in-place radon cover has experienced cycles of freezing and thawing. The top surface of the previously placed soils will be reworked and recompact prior to placement of additional material.

An inspection of the interceptor ditch revealed no signs of instability. Water being collected in the ditch from groundwater inflow and surface runoff is currently being pumped into Pond No. 9 at a rate of about 100 gallons per minute.

## 5.2 Quality Control

The construction quality control program was inspected by selective examination of records and procedures. The compaction test results, daily logs, and weekly reports were reviewed for the week of June 28, 1993.

The licensee has organized the construction compaction records by lift (layer). Compaction tests are consecutively numbered. When a test fails to meet the approved specifications, the retests use the same test number followed by R1 for the first retest, R2 for the second retest etc.. During the week of June 28, 1993, radon barrier material was placed on the tailings pond embankment out slopes. Placement consisted of a layer of alluvium followed by a layer of Mancos Shale. Records showed that during this week, 400 cubic yards (cy) of alluvium and 15,520 cy of shale were placed. During the week of June 28, 1993, 18 sand cone tests performed on the shale met both the density requirement of 95 percent of Proctor density and the moisture requirement of  $\pm 3$  percent of optimum moisture. The 18 tests performed on 15,250 cy placed is an average of one test per 861 cy. This exceeds the NRC approved specification of one test per 1000 cy. In addition, three laboratory maximum density (Proctor) tests and three classification tests were performed on the shale for an average of one test per 5173 cy. This exceeds the specification requirement of one test per 10,000 cy. The classification tests showed that the shale met the approved specifications in that the soil was SM or ML material in accordance with the Unified Soil Classification System, had at least 35 percent passing the No. 200 sieve, and was plastic. No tests were performed on the alluvium because of the small amount of material that was placed.

Each test location is plotted on a plan view map of the area. To assure that an adequate number of tests are performed, there is a different map for each layer (lift) of material placed.

Although the testing frequencies and material specifications are being met or exceeded, the licensee is placing a radon cover that is not as thick as the approved design. This is being done in anticipation that the NRC will approve the new design. The licensee was therefore advised that if review of the new design by the NRC concludes that the radon cover is not adequate, it may be necessary to place additional material.

### 5.3 Conclusion

The inspectors concluded that the licensee is performing tailings reclamation in accordance with license requirements. The inspectors did stress, however, that the proposed modification to the radon barrier design has not yet been approved by the NRC. The placement of material to the thicknesses specified in the proposed design is therefore being done at the licensee's risk.

### 6 ENVIRONMENTAL PROTECTION (88045)

The inspectors reviewed environmental monitoring data submitted by the licensee on February 28, 1994. The submittals showed that environmental monitoring was performed in accordance with the requirements of License Condition No. 10 of the facility license, and the submittal of the data was in accordance with License Condition No. 19.

The inspector's review of the data submitted by the licensee indicated that all values were well below regulatory limits, with the exception of several radon values. The mill is located in an area heavily impacted by previous mining activities and includes several mine ventilation shafts near the site. Based on the fact that the licensee has completed covering all exposed tailings, the inspectors concluded that the elevated concentrations were due primarily to contributions from mining areas and not NRC-regulated activities. In addition, no anomalous trends were noted during the inspector's review of the environmental monitoring data.

The inspectors concluded that the licensee's environmental monitoring program was conducted in accordance with license requirements.

### 7 FOLLOWUP (92701)

No items requiring followup were identified during the previous inspection.

## ATTACHMENT

### **I PERSONS CONTACTED**

#### **1.1 Licensee Personnel**

- \*B. Ferdinand, Manager, Radiation Safety, Licensing & Regulatory Affairs
- \*T. Fletcher, General Manager
- \*P. Luthiger, Radiation Safety Officer
- \*G. Ross, Reclamation Engineer

#### **1.2 NRC Personnel**

- \*L. Carson, Radiation Specialist
- \*R. Evans, Radiation Specialist
- \*K. Hooks, Project Manager

\* Denotes personnel that attended the exit meeting.

### **2 EXIT MEETING**

An exit meeting was held on May 9, 1994. During this meeting, the inspectors reviewed the scope and findings of the inspection. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.