

UNITED STATES NUCLEAR REGULATORY COMMISSION

REGION IV 611 RYAN PLAZA DRIVE, SUITE 400 ARLINGTON, TEXAS 76011-4005

July 20, 2005

John H. Ellis, President Sequoyah Fuels Corporation P.O. Box 610 Gore, Oklahoma 74435

SUBJECT: NRC INSPECTION REPORT 040-08027/05-001

Dear Mr. Ellis:

This refers to the inspection conducted on May 31-June 1, 2005, at the Sequoyah Fuels Corporation site in Gore, Oklahoma. This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of a selected examination of procedures and representative records, observations of activities, and interviews with personnel. The preliminary inspection findings were discussed with you and other members of your staff at the conclusion of the onsite inspection. The final inspection findings were discussed with Craig Harlin, Vice President, of your staff during a telephonic conference call conducted on June 23, 2005.

A focus of the inspection was the review of your raffinate sludge dewatering process and the implementation of the radiation protection program controls for this activity. The inspection determined that you are conducting licensed activities at your former uranium conversion facility in a safe and effective manner and in compliance with regulatory and license requirements. No violations were identified; therefore, no response to this letter is required.

Confirmatory surveys were conducted in the former Fertilizer Pond 4 area during the inspection. The surveys included a collection of soil samples. The survey results were compared to the acceptance criteria that was provided in the reclamation plan which is currently under NRC review. Although no specific cleanup criteria has been approved for soil, the survey results were less than the proposed derived concentration guideline levels and cleanup levels provided in the reclamation plan. Details of the confirmatory survey are provided in Section 2 of the enclosed report.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, the letter's enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Mr. Robert Evans, Senior Health Physicist, at (817) 860-8234 or the undersigned at (817) 860-8191.

Sincerely,

/RA/

D. Blair Spitzberg, Ph.D., Chief Fuel Cycle & Decommissioning Branch

Docket No.: 040-08027 License No.: SUB-1010

Enclosure: NRC Inspection Report 040-08027/05-001

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RIV Nuclear Materials File - 5th Floor

SISP Review Completed: RJE

ADAMS: Yes 9 No Initials: RJE

 $\hbox{:}\quad \mathsf{Publicly}\ \mathsf{Available} \quad 9\ \mathsf{Non-Publicly}\ \mathsf{Available} \quad 9\ \mathsf{Sensitive} \quad \hbox{:}\quad \mathsf{Non-Sensitive}$

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION REGION IV

Docket No.: 040-08027

License No.: SUB-1010

Report No.: 040-08027/05-001

Licensee: Sequoyah Fuels Corporation

Location: P.O. Box 610

Gore, Oklahoma

Date: May 31 - June 1, 2005

Inspector: Robert Evans, P.E., C.H.P., Senior Health Physicist

Fuel Cycle & Decommissioning Branch

Accompanied By: Kim Karcagi, General Scientist

Rulemaking and Guidance Branch

Division of Industrial and Medical Nuclear Safety Office of Nuclear Material Safety and Safeguards

Approved by: D. Blair Spitzberg, Ph.D., Chief

Fuel Cycle & Decommissioning Branch

Attachment: Supplemental Inspection Information

EXECUTIVE SUMMARY

Sequoyah Fuels Uranium Conversion Facility NRC Inspection Report 040-08027/05-001

The inspection included a review of facility status, radiation protection, and decommissioning. Overall, the licensee's activities were being conducted in accordance with license and regulatory requirements.

Radiation Protection

- The licensee was conducting sludge dewatering operations in accordance with license requirements. Radiation protection controls were being implemented as described in licensee documents. Routine sample results indicated that occupational exposures to radiation and radioactive contamination were being effectively controlled by the licensee (Section 1).
- The licensee continued to utilize ammonium nitrate solution as a fertilizer on land used to produce hay. The licensee implemented the fertilizer distribution program during 2004 in accordance with license application requirements (Section 1).

<u>Uranium Mill, In-Situ Leach Uranium Recovery, and 11e.(2) Byproduct Material Disposal Site Decommissioning Inspection</u>

- Confirmatory surveys were conducted at former Fertilizer Pond 4. The survey results
 were below the proposed acceptance criteria that was provided in the reclamation plan
 currently under NRC review (Section 2).
- The inspectors reviewed the final status survey results for former Fertilizer Pond 6 and the Loadout Area and noted that all survey results were below the proposed acceptance criteria, indicating that the area would meet the licensee's unrestricted release criteria should the proposed criteria be approved by the NRC (Section 2).

Report Details

Summary of Plant Status

Sequoyah Fuels Corporation operated its uranium conversion facility near Gore, Oklahoma, between 1970 and 1993. The license currently authorizes the licensee to possess up to 20 million metric tons of 11e.(2) byproduct material. According to the draft reclamation plan, the estimated total volume of material to be disposed is about 8.3 million cubic feet. The site also contains residual, low-level radioactive contamination in buildings, plant equipment, and plant debris. The licensee does not have yellowcake or uranium hexafluoride material remaining onsite with the possible exception of residual material that may remain in plant equipment.

Since the last inspection, the licensee conducted limited decommissioning and maintenance work as well as routine sampling and license compliance activities. Non-routine activities completed included the backfilling of former Fertilizer Storage Pond 6 during late-2004. Although this pond was not used for storage of licensed material, the licensee elected to conduct a final status survey to verify the radiological classification of the pond. The licensee also completed the remediation of former Fertilizer Pond 4, a pond previously used to store licensed material. In addition, the licensee excavated a 1600-square foot area on the eastern side of the main processing building. The soil was excavated to remove a non-radiological hazardous waste, polychlorinated biphenyls. The remediation of the hazardous material was completed in January 2005.

During the inspection, dewatering of the raffinate sludge material was in progress. The work was being conducted by a contractor on behalf of the licensee. The sludge dewatering equipment was tested in mid-April 2005, and full scale operations commenced during late-April 2005. The licensee is expected to complete the dewatering project by late-July or early-August 2005.

Site staffing consisted of 6 permanent plant workers and 37 contractors. Most contractors were associated with the sludge dewatering project. The contractors conducting the dewatering project were from two separate companies, in part, to ensure separation of the health physics staff from the operations staff. Other contractors were available for conducting routine maintenance, operations, site security, environmental sampling, and health physics.

1 Radiation Protection (83822)

1.1 Inspection Scope

The purpose of this portion of the inspection was to determine whether the licensee had implemented its radiation protection program in accordance with regulatory requirements and license conditions.

1.2 Observations and Findings

a. Sludge Dewatering Project

By letter dated January 7, 2004, the licensee requested that the NRC amend the license to approve a raffinate sludge dewatering process. The licensee wanted to reduce the volume and weight of the raffinate sludge by reducing the water content from about 15-20 percent solids to 45-50 percent solids. The licensee provided supplemental information by letters dated March 8 and May 19, 2004. Amendment 30 to NRC Materials License SUB-1010 approved the request. Condition 50 was added to the licensee authorizing the licensee to conduct the work.

As stated in its request, the licensee would dewater existing raffinate sludge using high-pressure filter presses, package the dewatered sludge in polypropylene bags, and temporarily store the bags of sludge on site. At some later date, the licensee planned to ship the sludge to an out-of-state facility for reprocessing and/or disposal. During the inspection, the licensee was actively dewatering the raffinate sludge. The inspectors reviewed and compared the dewatering operations to the commitments made in the license amendment request. In summary, the licensee was conducting operations in accordance with license requirements and license application commitments.

The licensee stored about a million cubic feet of raffinate sludge in Clarifier Basins 1A, 2A, and 4A. The dewatering process consisted of dredging the sludge from a pond, storing the sludge in two 15,000-gallon feed tanks, pumping the sludge to one of two trailer-mounted 100-cubic foot capacity pressurized plate filter presses, transferring the filter cake material to a polypropylene bag, and storing the bag on the former Yellowcake Storage Pad. During the inspection, the licensee had filled and stored about 3,400 bags. The licensee estimates that the pond material will fill about 10,500 bags.

The licensee identified a number of bags that were defective. The licensee estimated a bag failure rate of about 1-3 percent mainly because of defective stitching. The licensee segregated these bags with the intention to transfer the contents of the defective bags into new bags. The licensee had established a transfer station to facilitate this activity.

The licensee's health physics program was reviewed to ensure that the work had a minimal impact on worker health and safety. The licensee issued thermoluminescent dosimeters to workers for measurement of external occupational exposures. The dosimeters were to be exchanged on a quarterly basis. At the time of the inspection, no exposure results were available for review; therefore, this program area will be reviewed during a future inspection.

In part to monitor for potential airborne exposures and internal doses, the licensee committed to utilize fixed and lapel air samplers. The licensee installed six fixed air samplers in the work area. Sampling commenced on April 15, 2005, and particulate filters were exchanged every 24 hours during work. To date, all sample results have been below the action level of 0.3 derived air concentrations (DAC). The licensee collected three lapel air samples per shift. No sample result has exceeded the 40-DAC per week investigation level. The licensee conducted the dewatering project using a wet

process, in part, to reduce the potential for airborne exposures. The airborne sample results suggest that the licensee has been successful in this effort.

The licensee measured radon progeny working levels once per shift, twice a day. No sample result exceeded the action level of 0.08 Working Levels. Ambient radon levels were also measured using canisters that were exchanged on a quarterly basis. As of the end of the onsite inspection, the first quarterly radon sample results were unavailable for review.

The licensee conducted weekly exposure rate surveys and recorded the survey results in a field logbook. The inspectors conducted independent survey measurements using a Ludlum Model 19 microRoentgen meter (NRC No. 015544, calibration due date of 11/16/05). The general work area was noted to be under 0.2 millirems per hour during the inspection. The highest exposure rate readings were about 1-2 millirems per hour on contact with loaded bags. These exposure rate readings were comparable to the readings obtained by the licensee during sludge dewatering operations.

Contamination surveys were conducted to control the spread of removable alpha contamination. The licensee conducted daily surveys of the break room, a room located just outside of the controlled access area, as well as the bagging and process areas inside of the controlled access area. The licensee also surveyed bag surfaces as the filled bags were being removed from the controlled access area. Results were being logged in the field logbook. The action level was established at 200 dpm/100 cm². The licensee also conducted fixed contamination surveys in the controlled access area to help control buildup of contamination in the work area.

The licensee committed to take measures to prevent the spread of contamination during dewatering operations and during bag storage. The licensee committed to continuously wash down the work area to control contamination, and a site worker was observed watering down the area with fresh water. Based on discussions with site personnel and review of the logbook, the inspectors concluded that the licensee was proactive in its efforts to control contamination.

The licensee committed to conduct audits and inspections to ensure compliance with regulatory requirements and license conditions. The licensee conducted an independent readiness review during March-April 2005 prior to commencement of full-scale operations. Further, four surveillances of operations and radiation safety requirements were conducted during April-May 2005.

The inspectors compared site procedure instructions to specific requirements listed in Condition 50 of the license. The inspectors confirmed that the licensee had incorporated the specific requirements (2,200 pound bag limit, 6 bag height limit, and inspection of storage cells) of Condition 50 into its site procedures.

b. Ammonium Nitrate Fertilizer Distribution Program

Section 1.8 of the license application allows the licensee to use the ammonium nitrate solution processed from barium-treated neutralized solvent extraction raffinate for use as a fertilizer, subject to a number of conditions. The licensee continued to apply

ammonium nitrate fertilizer solution on Sequoyah Fuels Corporation land near the former processing facility in accordance with Section 1.8 of the license application.

The most recent report available for review was the report for calender year 2004. The license application specifies a limit of 700 pounds of nitrogen per acre. As documented in the report, 7.3 million gallons of ammonium nitrate fertilizer was applied on 60 acres in the Agland XVII tract, 20 acres of Province 5 of Area 160A, and 8 acres of Agland XVII South tract at an average rate of 234-358 pounds of nitrogen per acre. Land application began in August 2004 and ended in November 2004.

The inspectors compared the ammonium fertilizer solution sample results to the fertilizer distribution limits specified in the license. The license application specifies a solution limit of 2 pCi/l for radium-226 and 0.1 milligrams per liter (100 μ g/l) for uranium. The composite sample results for the fertilizer solution indicated that the radium-226 concentration was 0.555 \pm 0.136 pCi/l and the uranium concentration was 3.73 μ g/l. Both radionuclide concentrations were below the respective limits.

The licensee collected vegetation and soil samples as required by Section 1.8 of the license application. Two samples of hay were collected from the fertilizer application areas. Although no licensed limits were exceeded, the hay samples continued to exhibit elevated molybdenum levels. With a caution level of 20 milligrams per kilogram, the molybdenum levels were 35.6 and 14.6 milligrams per kilogram at the Agland I and II areas, respectively. In accordance with standard agricultural practices, the licensee recommended to the harvesters that copper be used as a dietary supplement if the hay was going to be used as livestock feed to help prevent molybdenosis in cattle.

The inspectors also reviewed the soil sample results for the 2004 fertilizer distribution season. The soil was sampled three times (preseason, mid-season, and post-season) and vegetation was sampled twice (two growing cycles). The sample results were compared to the limits specified in Section 1.8 of the license application. No action level was exceeded by any sample. The preseason soil profiles, and the top six inch soil composite, provided the basis for the agronomist's recommendation of application rates for the 2004 fertilizer program.

1.3 Conclusions

The licensee was conducting sludge dewatering operations in accordance with license requirements. Radiation protection controls were being implemented as described in licensee documents. Routine sample results indicated that occupational exposures to radiation and radioactive contamination were being effectively controlled by the licensee. The licensee continued to utilize ammonium nitrate solution as a fertilizer on land used to produce hay. The licensee implemented the fertilizer distribution program during 2004 in accordance with license application requirements.

2 Uranium Mill, In-Situ Leach Uranium Recovery, and 11e.(2) Byproduct Material Disposal Site Decommissioning Inspection (87654)

2.1 Inspection Scope

The objective of this portion of the inspection was to determine if decommissioning activities were being conducted in accordance with applicable regulations and license conditions.

2.2 Observations and Findings

a. Fertilizer Pond 4

A confirmatory survey was conducted at former Fertilizer Pond 4. The confirmatory survey was conducted to verify the results of the licensee's final status survey. Although the licensee had not submitted its final status survey report to the NRC, the confirmatory survey was performed during the inspection, in part, because the licensee wanted to backfill the pond in the near future.

The pond area is roughly 160,000 square feet in size, 25 feet deep, and has 3/1 side slopes. Pond 4 was constructed in 1980 for use as a fertilizer storage pond. The pond was used for temporary storage of raffinate sludge during the late-1980's. During the mid-1990's, the raffinate sludge was moved from Pond 4 to Clarifier Basins 1A, 2A, and 4A.

During early 2005, the licensee completed the remediation of Pond 4. The licensee conducted a final status survey that included ambient gamma radiation measurements. These measurements were qualitative surveys that were used to locate areas of elevated radiation exposure rates. No area was identified with gamma radiation exposure rates greater than twice the background exposure rate with an action level of three times the background exposure rate. Soil sampling was conducted and compared to proposed acceptance criteria provided in the draft reclamation plan. (The reclamation plan was under NRC review during the inspection.) Eventually, the licensee plans to submit the final status survey report to the NRC for review and approval so it can release the pond area from the restricted/protected region of the site.

The NRC confirmatory survey consisted of ambient gamma exposure rate measurements and soil sampling. The inspectors conducted ambient gamma exposure rate measurements to identify any residual radioactive contamination and to identify locations for soil sampling. The ambient exposure rates were measured using a Ludlum Model 19 microRoentgen meter (NRC No. 015544, calibration due date of 11/16/05). The ambient gamma exposure rates were also measured using a Ludlum Model 18 count rate meter (NRC No. 012778, calibration due date of 11/10/05) with a SPA-3 probe.

The inspectors first measured the exposure rates from an unimpacted area to obtain background measurements. The unimpacted area included clay material similar to the material found in the floor of the pond. The background measurements ranged from

10-12 μ R/hr and 2,000-2,100 cpm for the Model 19 and Model 18 survey meters, respectively. Field measurements ranged from 10-19 μ R/hr and 2,000-2,600 cpm. The as-found exposure rates were less than 3 times background, the licensee's qualitative action level for cleanup.

Four samples were collected in roughly each of the four quadrants of the pond. The samples were 5-point composite samples collected in the top 15 cm (6 inches) of soil. The licensee collected split samples for analysis by a third-party laboratory. The NRC's samples were submitted to Oak Ridge Institute for Science and Education (ORISE) for analysis. The ORISE and split sample results were:

TABLE 1: Pond 4 Soil Sample Results (in units of picocuries per gram)

Sample ID/ Location	Radionuclide	NRC's Results	Licensee's Results*	
HA728 - northwest	total/natural uranium	6.7 ± 1.7	3.4	
	thorium-230	18.9 ± 1.6	20.2 ± 1.45	
	radium-226	1.34 ± 0.11	1.47 ± 0.206	
HA729 - southwest	total/natural uranium	9.5 ± 2.2	3.8 / 3.6	
	thorium-230	22.6 ± 1.7	24.8 ± 1.73 / 22.1 ± 1.69	
	radium-226	1.45 ± 0.09	1.65 ± 0.23 / 1.98 ± 0.327	
HA730 - southeast	total/natural uranium	4.4 ± 1.8	2.5	
	thorium-230	6.95 ± 0.57	9.55 ± 1.13	
	radium-226	1.02 ± 0.07	1.6 ± 0.239	
HA731 - northeast	total/natural uranium	8.0 ± 2.2	3.4	
	thorium-230	18.3 ± 0.18	21.1 ± 1.42	
	radium-226	1.21 ± 0.08	1.72 ± 0.23	

^{*}The licensee collected one duplicate sample of HA729 for quality control purposes. Both sample results are reported in Table 1.

The two sets of sample results were considered statistically comparable for both thorium-230 and radium-226; however, the uranium sample results could not be directly compared to each other. The inability to conduct a comparison of the uranium sample results can be explained, in part, by the analytical processes used. The NRC's laboratory (ORISE) used gamma spectroscopy and a calculation to determine total uranium, while the licensee's laboratory (Outreach Laboratory) used the laser fluorimetry method to assay the uranium. The licensee's wet radiochemistry method measured total uranium without regard to isotope and without a statistical uncertainty. Further, all uranium sample results were less than 10-percent of the proposed release criteria indicating that a safety concern did not exist with the sample results.

In the draft reclamation plan, the licensee proposed derived concentration guideline levels and cleanup levels (exclusive of background levels) for site soils:

Table 2: Licensee's Proposed Derived Concentration Guideline and Cleanup Levels

Attribute	Natural Uranium	Thorium-230	Radium-226
Derived Concentration Guideline Level	540 pCi/g	64 pCi/g	5/15* pCi/g
Cleanup Level	100 pCi/g	14/43* pCi/g	5/15* pCi/g

^{*}first 15 cm below surface/15 cm layers greater than 15 cm below the surface

The cleanup levels were selected based on the As Low As Reasonably Achievable (ALARA) principle and regulatory requirements. In the draft reclamation plan, the licensee requested that the cleanup levels be exclusive of background levels. In addition, if more than one radionuclide is present in an area, the sum of ratios concept will be applied. As stated previously, these proposed values have been submitted to the NRC for review and approval through the licensing process. At the time of the inspection, the NRC had not completed its technical review of the reclamation plan.

The inspectors compared the soil sample results to the proposed cleanup levels. Since the pond is expected to be backfilled, the licensee stated during the inspection that the subsurface cleanup levels for thorium-230 and radium-226 were to be compared to the soil sample results. The sample results were below the proposed cleanup levels for all three radionuclides. The licensee is expected to submit a license amendment request to the NRC in the near future requesting release of Pond 4 from the restricted/protected area. Formal NRC review and approval of the request will be conducted following submittal to the NRC.

b. Final Status Survey of Fertilizer Pond 6 and Loadout Area

The inspectors reviewed the licensee's final status survey report for Fertilizer Storage Pond 6 and the Fertilizer Loadout area. These two areas were considered to be unimpacted by previous operations involving radioactive materials, but the licensee elected to conduct a final status survey to demonstrate that the areas were unimpacted.

Pond 6 was constructed in 1985 and was used for storage of fertilizer solution, a byproduct of previous plant operations. The Fertilizer Loadout area was the location where cargo tankers were loaded with solution for transport to other areas for land distribution. The licensee selected a residual radioactivity limit of 35 pCi/g of natural uranium as release criteria for these areas.

The final status survey of Pond 6 consisted of gamma scan surveys and soil sampling. The gamma scans were completed during 1995 for Pond 6 and during 1998 for the Fertilizer Loadout area. The soil samples were collected during the Fall of 2003. The final status survey report was completed during December 2004.

The inspectors reviewed the report. The highest sample result was 2.8 pCi/g of total uranium with a background of 0.7 to 2.6 pCi/g. No gamma scan result exceeded twice

background. Based on these sample results, the licensee concluded that the area could be released for unrestricted use.

2.3 Conclusions

Confirmatory surveys were conducted at former Fertilizer Pond 4. The survey results were below the proposed acceptance criteria that was provided in the reclamation plan currently under NRC review. The inspectors reviewed the final status survey results for former Fertilizer Pond 6 and the Loadout Area and noted that all survey results were below the proposed acceptance criteria, indicating that the area would meet the licensee's unrestricted release criteria should the proposed criteria be approved by the NRC.

3 Exit Meeting Summary

The inspectors presented the inspection results to the licensee at the exit meeting on June 1, 2005. A final exit briefing was conducted with a representative of the licensee on June 23, 2005. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

- J. Ellis, President
- C. Harlin, Vice President and Director of Regulatory Affairs
- C. Mooneyham, Project Supervisor
- S. Munson, Environmental Manager
- K. Simeroth, Health Physics Supervisor

INSPECTION PROCEDURES USED

IP 83822 Radiation Protection
IP 87654 Uranium Mill, In-Situ Leach Uranium Recovery, and 11e.(2) Byproduct Material Disposal Site Decommissioning Inspection

ITEMS OPENED, CLOSED, AND DISCUSSED

Open

None.

Closed

None.

Discussed

None.

LIST OF ACRONYMS USED

ALARA As Low As Reasonably Achievable

cm centimeters

CFR Code of Federal Regulations
DAC derived air concentration
IP Inspection Procedure

µg/I micrograms per liter

mg/I milligrams per liter

ORISE Oak Ridge Institute for Science and Education

pCi/g picocuries per gram pCi/l picocuries per liter