



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION IV
1600 E. LAMAR BLVD.
ARLINGTON, TX 76011-4511

November 14, 2017

John H. Ellis, President
Sequoyah Fuels Corp.
P.O. Box 610
Gore, OK 74435

SUBJECT: SEQUOYAH FUELS CORPORATION - NRC INSPECTION REPORT
040-08027/2017-003

Dear Mr. Ellis:

This letter refers to the U.S. Nuclear Regulatory Commission (NRC) inspection conducted on September 19, 2017, at your Sequoyah Fuels Corporation site near 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 selected representative records, observations of activities, and interviews with personnel.

The inspection included a confirmatory survey of an excavation located east of the Pond 1 Spoils Pile. The confirmatory survey included a walk-over scan survey and collection of soil samples. The preliminary inspection findings were presented to your staff at the conclusion of the onsite inspection. The final inspection results were presented to your staff by telephone on October 25, 2017 after the receipt of your final soil sample results on October 23, 2017. The enclosed report presents the results of the inspection.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management 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 or proprietary information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Eric J. Simpson at 817-200-1553 or the undersigned at 817-200-1191.

Sincerely,

/RA by LEBrookhart Acting for/

Ray L. Kellar, PE, Chief
Fuel Cycle and Decommissioning Branch Division
of Nuclear Materials Safety

Docket: 040-08027
License: SUB-1010

Enclosure:
Inspection Report 040-08027/2017-003
w/Attachment: Supplemental Information

cc w/encl:
John Matthews, Morgan, Lewis, Bockius LLP
Ann-Charlotte Engstrom, General Atomics
Mike Broderick, OK Dept. of Environmental Quality
Rita Ware, U.S. Environmental Protection Agency
William Andrews, U.S. Geological Survey
Sara Hill, Esq., Cherokee Nation

U.S. NUCLEAR REGULATORY COMMISSION
Region IV

Docket: 040-08027
License: SUB-1010
Report: 040-08027/2017-003
Licensee: Sequoyah Fuels Corp.
Facility: Former uranium conversion facility
Location: Gore, Oklahoma
Date: September 19, 2017
Inspector: Eric J. Simpson, CHP, Health Physicist
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety
Approved by: Ray L. Kellar, PE, Chief
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety
Attachment: Supplemental Inspection Information

Enclosure

EXECUTIVE SUMMARY

Sequoyah Fuels Corp.
NRC Inspection Report 040-08027/2017-003

This inspection was a routine, announced U.S. Nuclear Regulatory Commission (NRC) inspection of decommissioning activities being conducted at the Sequoyah Fuels Corporation site near Gore, Oklahoma. In summary, the licensee was conducting decommissioning activities in accordance with regulatory and license requirements.

Closeout Inspection and Survey

- The inspector reviewed the licensee's radiological survey design and sample results for the excavation located east of the Pond 1 Spoils Pile. The licensee's records indicate that it had designed and conducted its survey in accordance with license requirements, and all sample results were less than the limits specified in the NRC-approved reclamation plan. The licensee's records indicated that the area had been effectively remediated prior to performance of the final status survey. (Section 1.2.a)
- The inspector conducted a confirmatory survey of the excavated area. The survey included measurement of ambient gamma radiation levels and the biased collection of soil samples based on inspector judgement. The inspector determined the locations for the soil samples based on local gamma radiation measurements. The inspector did not locate any areas where the measured gamma radiation levels reached or exceed the site-specified action level. The soil radio analytical results were less than the cleanup level specified in the reclamation plan. The inspector's confirmatory survey results and the soil sample results provide sufficient evidence that the licensee had effectively remediated the area in question. (Section 1.2.b)

Report Details

Site Status

License Condition 51 requires the licensee to conduct decommissioning in accordance with the instructions provided in the reclamation plan dated January 2008, as amended. The licensee commenced with site decommissioning in April 2009. To decommission the site, the licensee planned to dismantle and remove systems and equipment, demolish structures, remediate contaminated soil and sediments and to treat wastewater. Most of the waste material is planned to be disposed onsite in a permanent disposal cell.

Since the previous inspection, conducted on June 15, 2017 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML17215B039), the licensee continued to remediate the site and place waste material into the onsite disposal cell.

The licensee still possessed approximately 11,000 tons of bagged raffinate sludge, material that was removed from the clarifier basins. The licensee also possessed approximately 850 bags of sediments removed from the emergency basin, north ditch, and sanitary lagoon. The licensee continued to stage the bagged sludge and sediment material for possible transfer to an out-of-state uranium mill for use as alternate feed material. If the licensee is unable to transfer the material to the mill, the reclamation plan allows the licensee to dispose of this material in the onsite disposal cell. However a court imposed restraining order currently prevents Sequoyah Fuels from placing the raffinate sludge into the onsite disposal cell.

Since the last inspection the licensee had continued to discuss its disposal options with the State of Oklahoma, the Cherokee Nation, and the Sequoyah County District Court. The licensee currently has two options for offsite disposal of the materials: (1) The White Mesa Uranium Mill Site (White Mesa, Utah); or (2) disposal at Energy Solutions (Clive, Utah). The White Mesa Uranium Mill would require a State of Utah Radioactive Materials License amendment to accept the waste for use as alternate feed material. Energy Solutions is a traditional disposal site for radioactive and mixed wastes. The Sequoyah County District Court has allowed until February 1, 2018 for a final decision on disposal, in part to allow enough time for White Mesa to secure a license amendment to accept the waste from Sequoyah Fuels.

1 Closeout Inspection and Survey (83890)

1.1 Inspection Scope

The inspector reviewed documents to determine whether the licensee was conducting decommissioning and associated radiological surveys in accordance with license requirements.

1.2 Observations and Findings

a. Review of Final Status Survey Results

License Condition 51 stipulates that site decommissioning shall be conducted in accordance with the instructions provided in the reclamation plan dated January 2008, as amended. Prior to the onsite inspection, the licensee excavated a 3,200 square foot, roughly rectangular, area that was previously used as a dirt road onsite. The area was adjacent to a previously remediated Multi-Agency Radiation Survey and Site

Investigation Manual (MARSSIM) Class-1 (impacted) area and was classified as a Class-1 area as well. The excavation area had also been associated with the site's Phase-3 leachate collection pipeline area. It should be noted that the area surveyed represented just a small subsection of a much larger Class-1 area.

The licensee had excavated a rectangular area that was roughly 95 feet by 34 feet. Before, during, and after the excavation, several rounds of soil samples were screened using x-ray fluorescence measurements (XRF) to estimate the total residual uranium content in the remaining surface soils. The inspector reviewed 51 remedial action support sample results screened by XRF. During remediation the XRF screened results ranged from less than 7 micrograms uranium per gram soil ($\mu\text{g/g}$) to 245 $\mu\text{g/g}$ total uranium in soil. In units of radioactivity, these values range from approximately 5 picocuries per gram in the soil (pCi/g) to roughly 160 pCi/g .

Section 3.2.2 of the reclamation plan provides the cleanup criteria for radionuclides in the soil. The soil cleanup level for natural uranium is 100 pCi/g , total uranium – including all isotopes, regardless of depth of the contamination. Per the reclamation plan, the cleanup level is applied without subtracting background values. If the soil sample results are less than the cleanup level, then the licensee has effectively remediated the area.

Section 3.2.3 of the reclamation plan specifies that the licensee will conduct final status surveys based on the radionuclides of concern for that area. In accordance with the reclamation plan, the radionuclide of concern in this area was natural uranium. Thus, the licensee was required to survey the area using the guidance provided in NUREG-1575, Revision 1, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Detailed guidance for conducting final status surveys was provided in Attachment B, "Final Status Survey," of the reclamation plan. The final status survey consisted of measurement of ambient gamma radiation levels and collection of soil samples.

As stated earlier, the location of the excavation was located in a MARSSIM Class-1 area. According to MARSSIM, Class-1 areas are areas that have had known contamination and have the highest potential for residual contamination. For this reason, MARSSIM recommends a 100 percent coverage scanning survey be performed over the entire impacted area. This is intended to reduce the likelihood that any residual contamination will be missed.

The licensee's staff used sampling points from a statistically determined set of grid locations that were calculated using MARSSIM methodologies for the entire 2,000 square meter Class-1 area. The three locations were nodes of the grid that overlaid the current area of investigation. Three final status survey sampling points were identified and sampled in the excavation area and surveyed by the licensee on September 13, 2017. The licensee screened the samples using the XRF meter. The XRF results (which were translated from $\mu\text{g/g}$ to pCi/g) were from < 5 to approximately 17 pCi/g , total uranium. The three samples were subsequently submitted to an offsite laboratory for radiochemical analyses. The three samples resulted in two non-detects, indicating levels less than method detection limits, to about 15 pCi/g . The inspector noted that the highest laboratory sample result was the same sample that resulted in the highest XRF meter sample result (17 pCi/g).

The licensee conducted a walk-over scanning survey to support final status of the area on September 18, 2017. Prior to conducting the walk-over scan survey, the licensee established a radiological background count rate in an unimpacted background area. Any area that exhibited residual contamination in levels greater than three times background was required to be flagged for further investigation or remediation.

The inspector reviewed the licensee’s walkover survey results. With an established background of approximately 9,300 counts per minute (cpm), the survey results ranged from an established baseline of 13,000 cpm to about 23,000 cpm. None of the walk-over survey results exceeded the action level of three times background (28,000 cpm). The soil sample results are discussed below.

Table 1: Licensee Final Status Survey Results (see Figure 1, below)

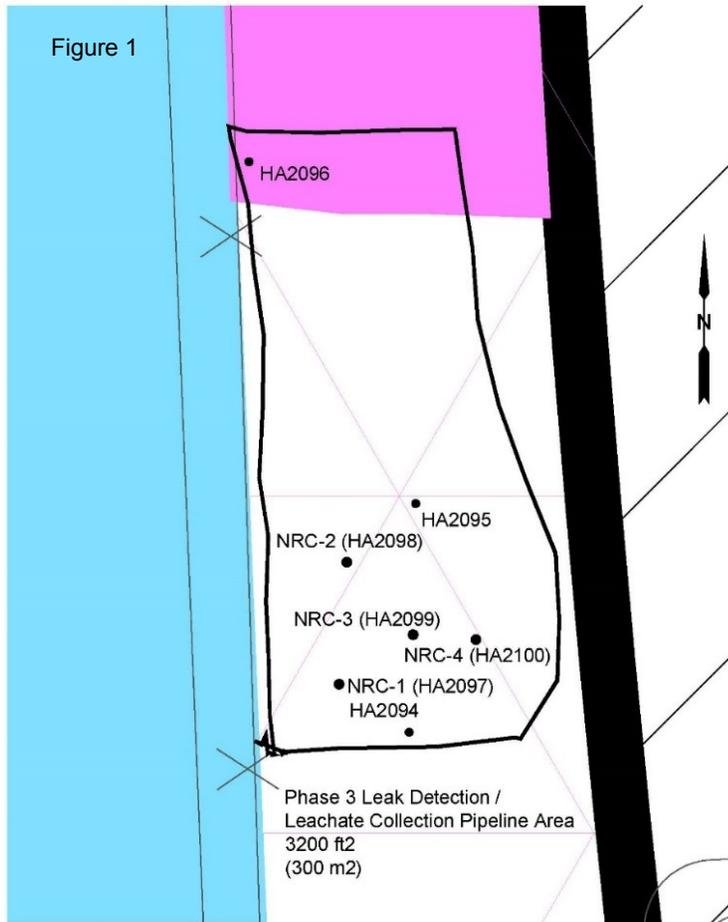
| Licensee Sample ID | Location | Value (pCi/g) |
|---------------------------|----------------------|--------------------------|
| HA2094 | Lower Excavation | 14.7 |
| HA2095 | Middle Excavation | Non-Detect (ND) (< 3.33) |
| HA2096 | Northwest Excavation | ND (<3.33) |

In summary, the licensee’s records indicate that the excavated area had been effectively remediated. The scan survey results were less than the action level. In addition, the licensee collected a sufficient number of soil samples. All soil sample results were less than the cleanup level specified in the reclamation plan. Final residual contamination levels met all of the applicable clean-up levels with walkover survey results less than the action level of three times background and total uranium in soil results of 100 pCi/g or less.

b. Confirmatory Survey

A confirmation walk-over survey and samples were taken by an NRC Region IV inspector on September 19, 2017. The purpose of the confirmatory survey was to confirm the effectiveness and accuracy of the licensee’s final status survey relative to whether the area met the acceptance criteria established in the reclamation plan. The inspector’s confirmatory survey included measurement of ambient gamma exposure rates and collection of soil samples.

The inspector conducted the gamma scan using a Ludlum Model 18 survey meter with an Eberline SPA-3 Probe (NRC No. 012778, calibration due date of August 15, 2018). Prior to conducting the gamma scan, the inspector measured the ambient background level to establish an action level for the survey meter.



Phase 3 Leachate Collection Area, 300m²

The background measurement was recorded outside of the restricted area in the yard adjacent to the administrative building, a background count rate of 12,000 counts per minute (cpm). Because the licensee's action level was three times the background level, for consistency, the inspector's action level for sample collection was also set at three times the measured background level, 36,000 cpm. The inspector conducted a walk-over scan survey of the excavated area. The count rates in the area ranged from 26,000 cpm to 32,000 cpm. In summary, the scan survey results remained below the action level (36,000 cpm), however the gamma exposure rates were slightly elevated in the survey area due to shine from nearby unremediated impacted areas.

The inspector collected four soil samples for comparison to the cleanup level specified in the reclamation plan (100 pCi/g). The locations for the samples taken were based on areas of elevated readings found by the inspector during the survey. All four

samples were taken in the southern end of the excavation. Each of the locations came from areas that exhibited counts of around 32,000 cpm.

Immediately after the soil samples were collected, the licensee conducted a screening measurement of the four samples using their XRF meter. The licensee's screen (again, translated from $\mu\text{g/g}$ to pCi/g) indicated that all four samples contained less than 6 pCi/g of uranium, results well below the cleanup level (100 pCi/g). Based on all available information, the licensee's staff indicated that they may elect to backfill the excavated pit at risk soon after the onsite inspection.

The inspector submitted the four soil samples to the NRC's contract laboratory, Oak Ridge Associated Universities in Oak Ridge, Tennessee, for analysis. The samples were analyzed by gamma spectroscopy for determination of total uranium concentrations. The licensee collected split samples and submitted the samples to its offsite, contract laboratory for radiochemical analysis. The NRC's sample results and the licensee's split sample results are presented in the following table:

Table 2: Split Sample Results (see Figure 1, above)

| NRC Sample ID | Licensee Sample ID | All Samples Taken from Southern Half of Excavation | NRC (pCi/g) | Licensee (pCi/g) |
|----------------------|---------------------------|---|--------------------|-------------------------|
| NRC-1 | HA-2097 | Southwestern Sample | 5.8 | ND (< 3.33) |
| NRC-2 | HA-2098 | Northwestern Sample | 4.3 | ND (<3.33) |
| NRC-3 | HA-2099 | Middle Section | 9.2 | 6.7 |
| NRC-4 | HA-2100 | Eastern Sample | 5.0 | ND (<3.33) |

The inspector compared the sample results to the NRC-approved cleanup level of 100 pCi/g for total uranium. Both sets of sample results were less than the cleanup level. Further, the inspector noted that the NRC's sample results were similar to the licensee's sample results, suggesting reasonable correlation between the two laboratories. Some variations in sample results can be explained by different laboratory sample protocols and possible inadequate mixing of split samples in the field. Both laboratories identified the most elevated sample as being the same.

1.3 Conclusions

The inspector reviewed the licensee's radiological survey design and sample results for the excavation located east of the Pond 1 Spoils Pile. The licensee's records indicate that it had designed and conducted its survey in accordance with license requirements, and all sample results were less than the limits specified in the NRC-approved reclamation plan. The licensee's records indicated that the area had been effectively remediated prior to performance of the final status survey.

The inspector conducted a confirmatory survey of the excavated area. The survey included measurement of ambient gamma radiation levels and the biased collection of soil samples based on inspector judgement. The inspector determined the locations for the soil samples based on local gamma radiation measurements. The inspector did not locate any areas where the measured gamma radiation levels reached or exceed the site-specified action level. The soil radio analytical results were less than the cleanup level specified in the reclamation plan. The inspector's confirmatory survey results and the soil sample results provide sufficient evidence that the licensee had effectively remediated the area in question.

2 **Exit Meeting Summary**

The inspector presented the preliminary inspection results to the licensee's representatives at the conclusion of the onsite inspection on September 19, 2017. The final inspection results were presented to the licensee's representative by telephone on October 25, 2017, after receipt of the licensee's radiochemical soil sample results. During the inspection, the licensee did not identify any information reviewed by the inspector as proprietary that was included in the report.

SUPPLEMENTAL INSPECTION INFORMATION
PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Munson, Manager, Health, Safety and Environment

INSPECTION PROCEDURES USED

IP 83890 Closeout Inspection and Survey

ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS USED

| | |
|---------|--|
| ADAMS | Agencywide Documents Access and Management System |
| CFR | <i>Code of Federal Regulations</i> |
| cpm | counts per minute |
| IP | Inspection Procedure |
| MARSSIM | Multi-Agency Radiation Survey and Site Investigation Manual (NUREG-1575) |
| ND | non-detect |
| NRC | U.S. Nuclear Regulatory Commission |
| pCi/g | picocuries per gram |
| XRF | x-ray fluorescence |

SEQUOYAH FUELS CORPORATION - NRC INSPECTION REPORT 040-08027/2017-003 -
 DATED NOVEMBER 14, 2017.

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