



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BLVD
ARLINGTON, TEXAS 76011-4511

March 14, 2013

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

SUBJECT: NRC INSPECTION REPORT 040-08027/13-001

Dear Mr. Ellis:

This refers to the inspection conducted on February 5-7, 2013, 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 examination of procedures and representative records, observations of activities, and interviews with personnel.

The preliminary inspection findings were presented to your staff at the conclusion of the onsite inspection, and a final exit briefing was held with your staff by telephone on March 1, 2013, following receipt of the results for confirmatory soil samples collected during the inspection. The enclosed report presents the results of this inspection. No violations were identified, and no response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," 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, proprietary, or safeguards information so that it can be made available to the Public without redaction.

J. Ellis

-2-

Should you have any questions concerning this inspection, please contact Mr. Robert Evans, Senior Health Physicist, at 817-200-1234 or the undersigned at 817-200-1191.

Sincerely,

/RA/

D. Blair Spitzberg, Ph.D., Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Docket: 040-08027

License: SUB-1010

Enclosure:

NRC Inspection Report 040-08027/13-001

cc w/encl: Alvin H. Gutterman, Morgan, Lewis, Bockius LLP
Rita Ware, U.S. EPA, Region VI
Ann-Charlotte Engstrom, General Atomics
William Andrews, U.S. Geological Survey
Clayton Eubanks, Office of Attorney General
David Cates, Oklahoma Department of
Environmental Quality
Sara Hill, Cherokee Nation, Office of
Attorney General
Jim Harris, U.S. Army Corps of Engineers
Mike Broderick, Oklahoma Department of
Environmental Quality

J. Ellis

-2-

Should you have any questions concerning this inspection, please contact Mr. Robert Evans, Senior Health Physicist, at 817-200-1234 or the undersigned at 817-200-1191.

Sincerely,

/RA/

D. Blair Spitzberg, Ph.D., Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Docket: 040-08027
License: SUB-1010

Enclosure:
NRC Inspection Report 040-08027/13-001

cc w/encl: Alvin H. Gutterman, Morgan, Lewis, Bockius LLP
Rita Ware, U.S. EPA, Region VI
Ann-Charlotte Engstrom, General Atomics
William Andrews, U.S. Geological Survey
Clayton Eubanks, Office of Attorney General
David Cates, Oklahoma Department of
Environmental Quality
Sara Hill, Cherokee Nation, Office of
Attorney General
Jim Harris, U.S. Army Corps of Engineers
Mike Broderick, Oklahoma Department of
Environmental Quality

DISTRIBUTION w/encl:

A. Vogel, D:DNMS
V. Campbell, DD:DNMS
B. Spitzberg,
C:DNMS/RSFS

K. Kalman,
FSME/DWMEP/DURLD
Z. Cruz,
FSME/DWMEP/DURLD
G. Schlapper, RSFS

L. Gersey, RSFS
R. Evans, RSFS
M. Herrera, Fee
Coordinator, DRMA

S:\DNMS\!RSFS\RJE\SFC IR 2013-001.docx

ADAMS: <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes		<input type="checkbox"/> SUNSI Review Complete	Reviewer Initials: RJE
		<input checked="" type="checkbox"/> Publicly Available	<input checked="" type="checkbox"/> Non-Sensitive
		<input type="checkbox"/> Non-publicly Available	<input type="checkbox"/> Sensitive
RIV:DNMS/RSFS	FSME:DWMEP/DURLD	C:RSFS	
RJEvans	ZLCruz	DBSpitzberg	
/RA/	via email	/RA/	
03/1/13	03/1/13	03/14/13	

OFFICIAL RECORD COPY

T=Telephone

E=E-mail

F=Fax

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket: 040-08027

License: SUB-1010

Report: 040-08027/13-001

Licensee: Sequoyah Fuels Corporation

Location: P.O. Box 610
Gore, Oklahoma

Dates: February 5-7, 2013

Inspectors: Robert Evans, PE, CHP, Senior Health Physicist
Repository and Spent Fuel Safety Branch

Zahira L. Cruz, Geotechnical Engineer
Special Projects Branch
Division of Waste Management and Environmental Protection
Decommissioning and Uranium Recovery Licensing Directorate
Office of Federal and State Materials and Environmental
Management Programs

Approved by: D. Blair Spitzberg, Ph.D. Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Attachment: Supplemental Inspection Information

Enclosure

EXECUTIVE SUMMARY

Sequoyah Fuels Corporation NRC Inspection Report 040-08027/13-001

This inspection was a routine, announced inspection of decommissioning activities being conducted at the Sequoyah Fuels Corporation site near Gore, Oklahoma. The inspection included a review of construction activities and a confirmatory survey of the western portion of the Phase III disposal cell footprint. The inspectors concluded that the licensee was conducting decommissioning activities in accordance with the U.S. Nuclear Regulatory Commission (NRC)-approved Reclamation Plan.

Management Organization and Controls

- The licensee was conducting its technical reviews and Reclamation Plan changes in accordance with performance-based license requirements. (Section 1.2)

Radiation Protection

- The licensee conducted its radiation protection program in accordance with the requirements of 10 CFR Part 20 and the license. (Section 2.2)

Onsite Construction

- The inspectors reviewed the onsite construction activities and found that these activities were being conducted in accordance with license requirements. (Section 3.2)

Closeout Inspection and Survey

- The licensee excavated the Phase III footprint in accordance with the NRC-approved Reclamation Plan. (Section 4.2.a)
- The licensee conducted a demonstration survey to confirm that the remediated portions of the Phase III disposal cell footprint met the criteria established in the Reclamation Plan. (Section 4.2.b)
- The inspectors conducted a confirmatory survey of the western portion of the Phase III footprint. The survey included collection of soil samples for comparison to the cleanup criteria. One sample screened high prior to sending to the NRC's contracted laboratory, and the licensee requested the return of the sample. The licensee conducted additional remediation in this area after which the NRC obtained a second sample. The inspectors sent eight soil samples to the NRC's contractor laboratory for analysis. The results of the eight samples met the soil derived concentration guideline level established in the Reclamation Plan for uranium. The inspectors noted that the NRC's sample results were similar to the licensee's sample results. (Section 4.2.c)

Report Details

Summary of Plant Status

License Condition 51 allows the licensee to conduct decommissioning in accordance with the Reclamation Plan dated July 2008, as amended. The licensee commenced with site decommissioning during April 2009. To decommission the site, the licensee plans to dismantle and remove systems and equipment, demolish structures, treat site sludges and sediments, remediate contaminated soils, and treat wastewater. Most of the residual waste material will be placed in an onsite disposal cell for permanent disposal.

The licensee is constructing the onsite disposal cell in three phases. At the time of this inspection, the licensee had constructed and filled the Phase I and Phase II areas with decommissioning and reclamation waste material. Because the licensee needed additional space to temporarily stage contaminated material destined for disposal in the Phase III area, the licensee placed additional contaminated wastes on top of the material currently situated in the Phase I and II areas. A contractor conducted an analysis and determined that the licensee could temporarily stage a certain amount of excess waste on top of the Phase I and II areas without impacting the integrity of the disposal cell. A temporary cover was installed over portions of the Phase I and II areas for erosion control. The licensee will eventually remove this temporary cover and place the excess waste material into Phase III for permanent disposal.

During the inspection, the licensee had finished excavating the footprint of the Phase III disposal cell in preparation for construction of the base of the cell. The licensee performed demonstration surveys to confirm that the Phase III footprint area met the radiological criteria established in the license. The NRC inspectors performed a confirmatory survey of the eastern portion of the Phase III footprint during November 2012. The inspectors performed a confirmatory survey of the western portion during this inspection. In the near future, the licensee plans to re-grade and backfill the excavated area with subgrade fill material as necessary. After re-grading and backfilling, the licensee plans to construct the base of the cell in the Phase III area on top of the compacted subgrade fill material.

Since the last inspection, the licensee completed the reclamation of the former sanitary lagoon, solvent extraction building subsurface area, and cooling tower basin. Further, the licensee drained Clarifier 3A and removed the sediment from this pond. Clarifier 3A previously contained nitrate-impacted water. The licensee plans to use this pond for future storage of non-impacted storm water.

At the time of the inspection, the remaining site structures within the radiologically restricted area included the eastern end of the main process building, water treatment facility, oil storage building, and laundry building. The licensee continued to store equipment previously salvaged from the former DUF₄ (depleted uranium tetrafluoride) building in the main process building. The licensee plans to transfer this salvaged material to a different NRC licensee in the near future.

The licensee still possesses approximately 11,000 super-sacks of raffinate sludge. Most of the raffinate sludge originated from the four clarifier basins. In recent months, the licensee bagged additional sediments from the emergency basin, north ditch areas, and sanitary lagoon. The licensee continues to stage the bagged sludge and sediment material for possible transfer to an out-of-state uranium mill for processing as alternate feed material.

1 Management Organization and Controls (88005)

1.1 Inspection Scope

The inspectors reviewed management organization and controls to ensure that the licensee had established the necessary controls to ensure that the disposal cell will be constructed in compliance with Reclamation Plan requirements.

1.2 Observations and Findings

In accordance with License Condition 54, the licensee is authorized to make changes to the license application, including the Reclamation Plan, under certain instances. The inspectors reviewed the licensee's implementation of its performance-based license. During 2012, the licensee completed various technical reviews, including Reclamation Plan clarifications and changes. These changes and reviews included analysis of the impacts of overfilling the Phase I and II areas with waste material and establishing a formal definition for the disposal cell footprint. The inspectors also reviewed the licensee's responses to previous NRC concerns documented in NRC Inspection Report 040-08027/12-002 (ML12240A375) regarding the licensee's approval process for field changes, method for conducting field density testing, material placement sequence, and use of clean soil in the construction of the disposal cell. The inspectors considered these technical reviews to be acceptable, and the reviews were made in accordance with the requirements of the performance-based license.

The licensee is considering several design changes to the disposal cell. For example, the licensee was considering options for modifying the physical dimensions of the Phase III disposal cell footprint, increasing the overall height of the disposal cell, and changing the type of rock that will be used for erosion protection. The inspectors discussed these proposed changes with the licensee. At the time of this inspection, the licensee had not formally reviewed these proposed changes, and the licensee had not made a final decision about these proposed changes. If the licensee chooses to pursue these changes through its performance-based license process, the NRC staff will review these proposed changes in detail during a future inspection.

1.3 Conclusions

The licensee was conducting its technical reviews and Reclamation Plan changes in accordance with performance-based license requirements.

2 Radiation Protection (83822)

2.1 Inspection Scope

The inspectors examined the licensee's radiation protection program for compliance with license and 10 CFR Part 20 requirements.

2.2 Observations and Findings

The inspectors reviewed the licensee's occupational exposure records for 2012. Exposure monitoring consisted of a combination of external monitoring, internal monitoring, and bioassays. The licensee monitored 49 individuals during 2012, and the

highest dose was 0.156 rem (0.00156 sievert) with a regulatory limit of 5 rem (0.05 sievert).

To monitor for external exposures, thermo luminescent dosimeters were assigned to certain individuals based on work activities. During 2012, the licensee assigned dosimeters to contract workers who conducted building demolition work and those who used the x-ray fluorescence (XRF) meter. The licensee exchanged the dosimeters quarterly. The highest external exposure for 2012 was 0.021 rem (0.00021 sievert).

In accordance with License Condition 51, the licensee monitored internal exposures using breathing zone/lapel air samplers. Based on these air sample results, the licensee calculated the derived air concentration-hours to which individuals were exposed. The highest internal doses were associated with Pond 2 reclamation work.

The licensee trended internal exposures over time. The licensee's analysis indicated that the site-wide total derived air concentration-hours were elevated during the first few months of 2012 due to ongoing building demolition and Pond 2 reclamation work. The site-wide total derived air concentration-hours dropped significantly in mid-2012 after these reclamation activities were discontinued.

The bioassay requirements are specified in License Conditions 9.4, 42, and 43. The licensee collected routine bioassay samples from workers for analysis of uranium concentrations. During 2012, the licensee collected a total of 2318 samples from the workers. The highest sample result was 12.1 micrograms per liter. No individual sample result exceeded the lowest action level of 15 micrograms of uranium per liter of urine. In summary, the sample results for 2012 indicate that no individual experienced an intake greater than the 10 milligrams of uranium per week limit specified in 10 CFR 20.1201(e).

The licensee recycles certain salvaged metal components. These items are decontaminated, radiologically surveyed, and free-released by the licensee. During the inspection, the inspectors conducted a random survey of metal components that had been free-released by the licensee. The inspectors used an Eberline E-600 survey meter (NRC No. 063473, calibration due date of October 22, 2013) to survey the surfaces of randomly selected metal components.

Prior to conducting the survey, the inspectors obtained background measurements of alpha-particulate radioactivity on non-impacted metal surfaces located outside of the restricted area. These outdoor background measurements averaged 29 disintegrations per minute per 100-square centimeters (dpm/100 cm²). The inspectors then measured the alpha contamination levels on recently released metal components being stored in an outdoor dumpster. The alpha contamination ranged from background levels to 188 dpm/100 cm².

License Condition 9.4 specifies that the surface contamination levels on equipment to be released shall not exceed an average of 5,000 dpm/100 cm² (alpha). Since the highest measured alpha contamination level was below the release limit, the inspectors concluded that the licensee's staff properly decontaminated, surveyed, and released the metal components in accordance with License Condition 9.4.

2.3 Conclusions

The licensee conducted its radiation protection program in accordance with the requirements of 10 CFR Part 20 and the license.

3 **Onsite Construction (88001)**

3.1 Inspection Scope

The inspectors reviewed the licensee's decommissioning activities to determine if these activities were being conducted in accordance with the NRC-approved reclamation plan, license conditions, and construction specifications.

3.2 Observations and Findings

License Condition 51 allows the licensee to conduct site decommissioning in accordance with the NRC-approved Reclamation Plan. The technical specifications, an attachment to the Reclamation Plan, provide the detailed requirements for construction of the disposal cell. During the inspection, the inspectors conducted tours of the construction areas to observe work in progress. The inspectors compared the work in progress to the technical specification requirements provided in the Reclamation Plan.

At the time of the inspection, the Phase I and Phase II areas had been filled with radioactive waste material. A temporary cover was installed on top of the Phase I and II material. The licensee had completed the excavation of the Phase III area and was backfilling the eastern portion of the excavated area with subgrade fill material.

The licensee's representatives stated that it would re-grade the Phase III excavated area, estimated to be 22,500 square meters (m²), using a cut-and-fill approach. In other words, the licensee will grade the high points to fill the low points, resulting in a balanced distribution of the subgrade soil in the area. After re-grading, the licensee will import additional subgrade fill material as necessary to meet the elevation requirements. When the licensee has completed this activity, it plans to begin construction of the disposal cell base on top of the compacted subgrade fill material.

During the inspection, the licensee described its plans to modify the footprint of the Phase III portion of the disposal cell. The licensee plans to modify the cell to avoid interferences in the southeastern and southwestern corners of the footprint. The bagged raffinate sludge material is located in the southwestern corner, and the licensee wants to avoid moving several thousand bags of material. The licensee is concerned that bags may have deteriorated to the point that they may fail during movement. Further, the licensee wants to modify the southeastern corner of the footprint to avoid demolition of the machine shop and to keep the access road around the cell intact. The NRC staff questioned whether the modified footprint will be sufficient for placement of the remaining material into the disposal cell and whether there will be any changes to the drainage systems (drainage channels, slopes, etc.).

At the time of the inspection, the licensee's contractors were conducting a calculation of the remaining volume of wastes that will have to be placed into the cell. Once the licensee obtains the calculated volume of the remaining wastes, it will decide whether to implement these two modifications to the footprint of the disposal cell. The licensee

plans to review and approve this change as allowed using its performance-based license. The licensee's Plant Review Committee will be responsible for reviewing and approving this change. The NRC inspectors will review the licensee's decision at a later date.

The inspectors also discussed with the licensee how they plan to protect the Phase III footprint from impacted surface waters originating from the southwestern area of the site, because the southwestern area is physically higher than the Phase III excavated areas. During construction of the base, the footprint area will be considered a "clean" area, and the licensee will have to consider how it plans to keep potentially contaminated surface and rain water from migrating into the clean area. Some of the ideas discussed included the use of berms and/or liners to physically isolate the clean area from the potentially contaminated areas.

During a previous inspection, the inspectors noted that the licensee had installed temporary erosion protection cover on top of the Phase I and II areas that included a geomembrane felt cover and vegetation. The inspectors noted that the licensee's Plant Review Committee had not approved the installation of the temporary cover, although the upper elevation of the cover was well below the analyzed height limit. The inspectors discussed with the licensee its plans for the temporary erosion barrier. The licensee reiterated that it plans to remove the geomembrane felt liner and vegetation prior to installation of the cell cover. The licensee stated that it planned to revise the Disposal Cell Construction Plan, Attachment E to the Reclamation Plan, to indicate that the liner and vegetative covers will remain in place until the surface is raised or modified by additional disposal cell construction. The temporary covers will be removed at that time. The licensee's Plant Review Committee plans to approve these revisions to the Disposal Cell Construction Plan in accordance with the performance-based license.

The inspectors reviewed the licensee's technical analysis to temporarily overfill the Phase I and Phase II areas with contaminated wastes. The licensee's analysis was based on slope stability and buried pipe loading. The licensee concluded that the cell height could be raised an additional ten feet, to elevation 600 feet, without adversely affecting the leachate collection system and without creating slope stability concerns along the outside slopes of the cell. The inspectors noted that the licensee had installed elevation markers on the Phase I and II areas, and the staged material did not exceed the elevation markers.

The final as-built cell height will be dependent on the volume of the material being disposal and the area of the final cell footprint. The inspectors discussed with the licensee whether it planned to increase cell height, from elevation 590 to 600-feet, to accommodate any additional volume of material that will need to be disposed. The licensee stated that it would notify the NRC staff if a final decision is made to raise the top of the cell from 590 feet to 600 feet.

Finally, the inspectors discussed with the licensee the option of using a different source of rock for erosion protection. At the time of the inspection, the owners of the original quarry were about to perform additional studies of the thicknesses of the rock layers to determine if it was sufficient to produce the rock size needed. If the quarry cannot produce the size or quantity of rock needed, the licensee may have to pursue other sources of rock. The licensee had not made a final decision about which source of rock

will be used, and any changes in the rock source will first be reviewed by the licensee's Plant Review Committee.

3.3 Conclusions

The inspectors reviewed the onsite construction activities and found that these activities were being conducted in accordance with license requirements.

4 **Closeout Inspection and Survey (83890)**

4.1 Inspection Scope

The purpose of this portion of the inspection was to ensure that the licensee was conducting decommissioning in accordance with license and Reclamation Plan requirements.

4.2 Observations and Findings

a. Excavation and Backfill of Phase III footprint

The inspectors discussed the excavation of the Phase III footprint with licensee representatives, and the inspectors observed some backfill work in progress. In general, the licensee elected to excavate the Phase III portion of the disposal cell from east to west. The Phase III area, as currently designed, is approximately 22,500 m² in size.

During the November 2012 inspection, the contractor had finished excavating the eastern portion of the Phase III footprint and was actively excavating the western portion. The NRC staff conducted a confirmatory survey of the eastern area during November 2012. Since that time, the licensee completed the excavation of the western portion of the property.

During the excavation work, the licensee's staff screened the excavated material for sorting into three groups - highly impacted, moderately impacted, and low impacted. The licensee conducted the screening using an x-ray fluorescence (XRF) meter and a radioactivity survey meter coupled to a sodium iodide detector. The XRF meter measured the uranium concentrations in the soil, while the survey meter measured the radioactivity levels of the soil.

The licensee developed action levels for each group. The highly impacted material was the most radioactive. This material was transferred to the Phase I and II disposal areas as overfill. Eventually, this overfill material will be transferred to the Phase III portion of the cell. The highly impacted material included material excavated from the solvent extraction yard.

The licensee was storing the contaminated soils and debris classified as moderately impacted in the calcium fluoride settling ponds and the clarifier area. This material will also be disposed in the Phase III portion of the cell.

Low impacted material was being stored in two locations, in the eastern portion of the Phase footprint and near the former DUF₄ Building. This material was staged for use as subgrade fill in the Phase III footprint area. To be used as subgrade fill, the low impact

material cannot contain radioactive material in excess of the limit specified in the Reclamation Plan.

During the inspection, the licensee began filling the eastern edge of the Phase III footprint with subgrade fill material. As discussed below, the NRC inspectors collected a sample of this material to ensure that it met the radiological criteria for use as subgrade fill. As the material was being placed into 8-inch lifts, the licensee's contractor staff was radiologically surveying the subgrade fill material to ensure that it met the criteria specified in the Reclamation Plan. The inspectors confirmed that the licensee's methods for screening and sampling the soil were effective for ensuring compliance with the licensed limit for subgrade fill material.

b. Review of Demonstration Survey Results

License Condition 51 stipulates that the site will be decommissioned in accordance with the guidance provided in the Reclamation Plan dated January 4, 2008, as amended. At the time of the inspection, the licensee had completed the excavation of the western portion of the Phase III footprint. Before the licensee can begin backfilling the area, the licensee has to demonstrate that the ground surface meets certain radiological characteristics.

The Reclamation Plan provides the NRC-approved derived concentration guideline level (DCGL) for the ground surface and the backfill material. In accordance with the Reclamation Plan, the natural uranium concentrations on the surface and in the backfill material must be less than or equal to 570 picocuries per gram (pCi/g). If the soil exceeds this DCGL, then it must be placed into the disposal cell.

The Reclamation Plan stipulates that the licensee must conduct a demonstration survey to confirm that the DCGL has been satisfied in the excavated area. The licensee conducts this demonstration survey using the general guidance provided in the Reclamation Plan for final status surveys.

The licensee conducted the demonstration survey for the eastern portion of the Phase III footprint during October-November 2012. The eastern area was about 6,400 m². The licensee's demonstration survey included measurement of ambient gamma radiation levels and analysis of soil samples for total uranium concentrations. The inspectors reviewed the preliminary results of this demonstration survey during the November 2012 inspection. In summary, the licensee's walk-over survey results were below the action level, and the licensee's soil sample results were less than the DCGL.

During this inspection, the inspectors reviewed the results of the licensee's demonstration survey of the western portion of the Phase III footprint area. The licensee elected to waive the walk-over survey because of the radiation "shine" from the bagged raffinate sludge that was located adjacent to the excavated area. The radiation emanating from the raffinate sludge impacted the gamma exposure rate measurements in the western half of the Phase III area. The licensee decided that the results of the gamma radiation survey would not provide realistic and useful information. Instead, the licensee elected to concentrate its efforts on the collection and analysis of soil samples from the western portion of the Phase III footprint for comparison to the DCGL.

The licensee collected 72 systematic soil samples from the approximately 16,000 m² area. The licensee analyzed the samples onsite using the XRF meter. The licensee also sent the samples to an offsite laboratory for analysis. The inspectors reviewed the preliminary sample results during this inspection. The preliminary results indicate that the total uranium concentration in all samples was less than the DCGL of 570 pCi/g. The highest sample result was 481 pCi/g. In summary, the licensee's sample results indicate that the area has been properly excavated. The inspectors will review the licensee's final survey results during a future inspection.

c. Confirmatory Survey

The inspectors conducted a confirmatory survey of the western portion of the Phase III footprint area. The purpose of the survey was to confirm the effectiveness and accuracy of the licensee's surveys and decisions relative to whether the area met the acceptance criteria established in the Reclamation Plan. The survey included measurement of ambient gamma exposure rates and collection of soil samples. The inspectors conducted the gamma scan using a Ludlum Model 19 microRoentgen survey meter (NRC 033906, calibration due date of 01/10/13) and a Ludlum Model 12 count rate meter with 2-inch by 2-inch sodium iodide probe (NRC 20888G, calibration due date of 10/18/13). The ambient gamma exposure rates were measured, in part, to identify any area that exhibited radiation levels above background for soil sampling.

Prior to conducting the gamma scan, the inspectors measured ambient background levels to establish action levels for these survey meters. The background measurements were collected outside of the restricted area in the yard adjacent to the administrative building. The licensee's action level for gamma radiation exposure rates was three times the background level. The NRC inspectors' action levels were also set at three times the measured background levels for consistency.

The inspectors conducted surface scans of the western portion of the Phase III footprint. As expected, the survey results were impacted by the radiation emanating from the bagged raffinate sludge material. The inspectors measured the ambient gamma exposure rates using the Model 19 survey meter. With a background of about 10-12 microRoentgens per hour, the exposure rates ranged from 20 to 190 microRoentgens per hour. The inspectors also surveyed the area with the Model 12 count rate meter. With a background of about 8,000 counts per minute, the count rates ranged from 15,000 to 100,000 counts per minute. A significant percentage of the property exceeded the action level of three times background. The highest exposure and count rates were measured near the raffinate sludge.

The inspectors collected eight soil samples for comparison to the total uranium DCGL. The licensee split the samples with the inspectors. Seven samples were collected from within the western footprint area, and the eighth sample was collected from soils staged in the eastern area. The licensee planned to use these soils as backfill material in the Phase III footprint, and the inspectors wanted to ensure that these soils met the radiological criteria for use as backfill material.

After the soil samples were collected, the licensee screened the samples with the XRF meter. One sample (NRC-E) was identified as elevated, suggesting that the total uranium concentration in the sample might exceed the action level, but not the DCGL. The licensee decided against performing a radiological measurement of this sample to determine whether

it was above the action level and instead performed additional remediation of the former cooling tower basin, the area where the sample had been collected. This area may have become contaminated during plant operations due to a leaking pipe. During the inspection, the licensee completed the additional remediation of the ground surface in this area to bedrock, and the inspectors collected another sample from the area.

The NRC's eight soil samples were submitted to Oak Ridge Associated Universities (ORAU) for analysis. The NRC's samples were analyzed by gamma spectroscopy for determination of total uranium concentrations. The NRC's sample results and the licensee's split sample results are presented below:

Split Soil Sample Results for Total Uranium

NRC Sample	SFC Sample	Sample Location	NRC pCi/g	SFC* pCi/g
NRC-A	HA-1383	East end subgrade fill	14.5 ± 1.3	11.6
NRC-B	HA-1384	Near marker 1379	41.6 ± 3.0	38.3
NRC-C	HA-1385	Near marker 1375	160.1 ± 10.2	169.3
NRC-D	HA-1386	Near marker 1347	2.45 ± 0.86	2.9
NRC-E	HA-1391	Near marker 1330	26.7 ± 2.0	27.6
NRC-F	HA-1388	Near marker 1382	2.94 ± 0.84	3.0
NRC-G	HA-1389	Near marker 1356	3.26 ± 0.75	2.9
NRC-H	HA-1390	Near marker 1354	3.24 ± 0.86	2.1

*The licensee's sample results were converted from units of micrograms per gram

The inspectors compared the total uranium concentrations in the samples to the NRC-approved DCGL of 570 pCi/g. All sample results were less than the NRC-approved DCGL. As noted earlier, Sample NRC-E originally screened high prior to sending the sample to the NRC's contracted laboratory, and the licensee requested the return of this sample. The licensee conducted additional remediation of the area where the sample was collected. After the licensee had completed this additional remediation, the inspectors obtained a second sample which met the DCGL. The inspectors noted that the NRC's sample results were similar to the licensee's sample results.

4.3 Conclusions

The licensee excavated the Phase III footprint in accordance with the NRC-approved Reclamation Plan. The licensee conducted a demonstration survey to confirm that the remediated portions of the Phase III disposal cell footprint met the criteria established in the Reclamation Plan. The inspectors conducted a confirmatory survey of the western portion of the Phase III footprint. The survey included collection of soil samples for comparison to the cleanup criteria.

The inspectors conducted a confirmatory survey of the western portion of the Phase III footprint. The survey included collection of soil samples for comparison to the cleanup criteria. One sample screened high prior to sending to the NRC's contracted laboratory,

and the licensee requested the return of the sample. The licensee conducted additional remediation in this area after which the NRC obtained a second sample. The inspectors sent eight soil samples to the NRC's contractor laboratory for analysis. The results of the eight samples met the soil DCGL established in the Reclamation Plan for uranium. The inspectors noted that the NRC's sample results were similar to the licensee's sample results.

5 Exit Meeting

The inspectors reviewed the preliminary scope and findings of the inspection during an exit meeting conducted at the conclusion of the onsite inspection on February 7, 2013. A final exit briefing was conducted by telephone on March 1, 2013. During the inspection, the licensee did not identify any information reviewed by the inspectors as proprietary.

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

J. Cumbers, Design Engineer, MWH
J. Ellis, President
R. Miller, Contractor, RMA
S. Munson, Manager, Health, Safety and Environment
B. Reid, Director, Decommissioning, RMA
K. Schlag, Manager, Quality Assurance, RMA
C. Strachan, Design Engineer, MWH

INSPECTION PROCEDURES USED

IP 83822	Radiation Protection
IP 83890	Closeout Inspection and Survey
IP 88001	Onsite Construction
IP 88005	Management Organization and Controls

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS

CFR	Code of Federal Regulations
DCGL	derived concentration guideline level
DUF ₄	depleted uranium tetrafluoride
dpm/100 cm ²	disintegrations per minute per 100 square centimeters
IP	Inspection Procedure
m ²	square meters
NRC	U.S. Nuclear Regulatory Commission
µg/g	micrograms per gram
ORAU	Oak Ridge Associated Universities
pCi/g	picocuries per gram
XRF	x-ray fluorescence