



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 14, 2018

MEMORANDUM TO: Bill Von Till, Chief  
Uranium Recovery Licensing Branch  
Division of Decommissioning, Uranium Recovery  
and Waste Programs  
Office of Nuclear Materials Safety and Safeguards

FROM: Ron Linton, Project Manager */RA/*  
Uranium Recovery Licensing Branch  
Division of Decommissioning, Uranium Recovery  
and Waste Programs  
Office of Nuclear Materials Safety and Safeguards

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW,  
URANIUM ONE USA, INC., WILLOW CREEK PROJECT, SEMI-  
ANNUAL EFFLUENT AND ENVIRONMENTAL MONITORING  
REPORTS FOR THE REPORTING PERIODS: JULY 1, 2016  
THROUGH DECEMBER 31, 2016; JANUARY 1, 2017 THROUGH  
JUNE 30, 2017; AND JULY 1, 2017 THROUGH DECEMBER 31,  
2017; MATERIALS LICENSE SUA-1341, DOCKET NO. 04008502

Uranium One USA, Inc., submitted to the U.S. Nuclear Regulatory Commission (NRC), the above listed reports. The reports are available in the Agencywide Documents Access and Management System at package Accession No. ML17090A252, Accession No. ML17272A146, and package Accession No. ML18072A095, respectively.

The NRC staff review of these reports are contained in the enclosed NRC Staff Review Report. The NRC Staff Review Report has been reviewed by the Willow Creek Project NRC Project Manager and Hydrogeologist and NRC Health Physicist. The NRC staff observations are provided below. The NRC staff may follow up on items in this NRC Staff Review Report during future inspections.

Enclosure: NRC Staff Review Report

cc: Luke McMahan, PG. (WDEQ)  
Ryan Schierman (WDEQ)  
Scott Schierman (Uranium One)

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW, URANIUM ONE USA, INC., WILLOW CREEK PROJECT, SEMI-ANNUAL EFFLUENT AND ENVIRONMENTAL MONITORING REPORTS FOR THE REPORTING PERIODS: JULY 1, 2016 THROUGH DECEMBER 31, 2016; JANUARY 1, 2017 THROUGH JUNE 30, 2017; AND JULY 1, 2017 THROUGH DECEMBER 31, 2017; MATERIALS LICENSE SUA-1341, DOCKET NO. 04008502, DATED JUNE 14, 2018

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**NRC STAFF REVIEW REPORT  
REVIEW OF SEMI-ANNUAL EFFLUENT AND ENVIRONMENTAL  
MONITORING REPORTS AND ALARA AUDITS  
JULY 1, 2016 THROUGH DECEMBER 31, 2016  
JANUARY 1, 2017 THROUGH JUNE 30, 2017  
JULY 1, 2017 THROUGH DECEMBER 31, 2017  
URANIUM ONE USA, INC., WILLOW CREEK PROJECT**

DATE: June 14, 2018

DOCKET NO.: 04008502

LICENSEE: Uranium One USA, Inc.

SITE: Willow Creek Project, Wyoming

PROJECT MANAGER: Ron Linton

TECHNICAL REVIEWERS: David Brown, Ron Linton

### **Introduction**

Uranium One USA, Inc., (Uranium One or the licensee), submitted to the U.S. Nuclear Regulatory Commission (NRC), the following reports:

- Willow Creek ISR Project, Semi-Annual Report, July 1, 2016 through December 31, 2016, Agencywide Documents Access and Management System (ADAMS), package Accession No. ML17090A252.
- Willow Creek ISR Project, Semi-Annual Report, January 1, 2017 through June 30, 2017, and 2014 Annual ALARA Audit Report, ADAMS Accession No. ML17272A146.
- Willow Creek ISR Project, Semi-Annual Report, July 1, 2017 through December 31, 2017, ADAMS package Accession No. ML18072A095.

The above listed reports are reviewed collectively in this NRC staff review report.

### **Applicable Requirements**

The Semi-Annual Report is required by License SUA-1341, License Condition (LC) 12.1, and Title 10 of the *Code of Federal Regulations* (10 CFR) Part 40.65. LC 12.1 states:

*Effluent and environmental monitoring program results provided in the semi-annual report and in accordance with 10 CFR 40.65, "Effluent monitoring reporting requirements," shall be reported in the format shown in Table 3 of Regulatory Guide 4.14, (Rev. 1) entitled, "Sample Format for Reporting Monitoring Data." The report shall also include injection rates, recovery rates and*

Enclosure

*injection manifold pressure, status of well fields in operation (including last date of lixiviant injection), status of well fields in restoration and restoration progress, status of any long term excursions, and a summary of mechanical integrity tests during the reporting period.*

## **Review of Willow Creek ISR Project, Semi-Annual Reports**

### **Section 2.0 - Operational Monitoring**

The licensee reported bleed rates of 5.2%, 2.97%, and 4.5% respectively for the three reports reviewed. The licensee is required by LC 10.1 to maintain an inward hydraulic gradient by maintaining a bleed in each individual wellfield starting when lixiviant is first injected into the production zone and continuing until the ground water restoration stability monitoring has begun. The NRC staff reviewed Appendix A, Table 1 of the data presented by the licensee and the values appear accurate. The licensee reported performing 1156 mechanical integrity tests on wells with a total of 41 failures. Two wells were repaired and the other wells were grouted and abandoned, or have been scheduled for abandonment. The licensee reports that the operational plan for 2018 involves the cessation of injection in the operating wellfields with limited production and sustaining a recovery bleed sufficient to maintain a cone of depression towards the wellfields.

### **Section 3.0 - Restoration**

The licensee stated that groundwater restoration activities, including stabilization monitoring, ended at Christensen Ranch Mine Units 2 through 6 on May 30, 2005. The NRC has reviewed the results in a wellfield restoration report and the licensees' response to NRC review of the report. Groundwater restoration has not been approved by the NRC at this time for Christensen Ranch Mine Units 2 through 6. Groundwater restoration activities were approved by the NRC for Irigaray Mine Units 1-9 on November 1, 2005. Surface restoration and decommissioning activities are actively ongoing at the Irigaray Mine Units 1-9. The staff notes that the NRC Region IV staff have been recently onsite observing licensee soil sampling and collecting confirmatory soil samples for independent analysis from Irigaray Mine Units 1-9.

### **Section 4.0 - Environmental Monitoring**

In sub-section 4.1, "Regional Ranch Wells", of the semi-annual reports reviewed, the licensee reported that all parameters are in line with historical data. The NRC staff reviewed the regional well data from the Willow Creek ISR Project, Semi-Annual Report, July 1 through December 31, 2013 (Accession No. ML14069A008), Semi-Annual Report Jan 1, 2016 through June 30, 2016 (Accession No. ML16246A013), and the three reports listed above and did not observe any trends in the data.

In sub-section 4.2, "Surface Water Monitoring", of the semi-annual reports reviewed, the licensee reported that all parameters are in line with historical data. The NRC staff reviewed the surface water data from the Willow Creek ISR Project, Semi-Annual Report Jan 1, 2016 through June 30, 2016 (Accession No. ML16246A013), and the three reports listed above and did not observe any trends in the data.

In sub-section 4.4, "Soil Sampling," of the semi-annual reports reviewed, the licensee described the results of annual soil sampling at the Willow Creek air sampling stations, including five sites at the Irigaray Ranch site, and four sites around the Christensen Ranch Project. The NRC staff did not observe trends in the data. The NRC staff observed that uranium concentrations at the two Irigaray air sample stations (i.e., IR-1 and IR-3) located downwind and upwind of the restricted area boundary, respectively, continue to have elevated values, consistent with past measurements (e.g., see Table 5.15, "Irigaray Annual Soil Sampling Summary," of 2008 renewal application (Accession No. ML081890414)). The NRC staff notes that location IR-3 appears to be located in a wellfield (e.g., see Figure 5.5, "Irigaray and Christensen Ranch Environmental Monitoring Station Locations," (Accession No. ML081850709).

In sub-section 4.5, "Vegetation Sampling," of the semi-annual reports reviewed, the licensee described the results of annual vegetation sampling at the Willow Creek air sampling stations, including five sites at the Irigaray Ranch site, and four sites around the Christensen Ranch Project. The licensee observed an elevated result for uranium in vegetation at the IR-3 location ( $6E-03 \mu\text{Ci}/\text{kg}$ , or  $6 \text{ pCi}/\text{g}$ ), which is located upwind of the restricted area in a wellfield, as stated above. The licensee committed to reevaluate and potentially resample this location. The NRC staff evaluated this result and determined that occasional elevated vegetation concentrations may be expected because this wellfield location has elevated average historical soil concentrations (i.e.,  $419 \text{ pCi}/\text{g}$  maximum (1995) value, and  $89 \text{ pCi}/\text{g}$  six-year average, as reported in Table 5.15, "Irigaray Annual Soil Sampling Summary," of 2008 License Renewal Application (Accession No. ML081890414)). For example, using a uranium root uptake plant-food/soil concentration ratio published in the RESRAD Version 6 User's Manual of  $0.0025 \text{ pCi}/\text{g-wet}$  (plant) to  $\text{pCi}/\text{g-dry}$  (soil), and dry-to-wet conversion of 0.2, the uranium in vegetation could be an average of  $89 \times 0.0025 \times (1/0.2) = 1 \text{ pCi}/\text{g-dry}$  to a maximum of  $5 \text{ pCi}/\text{g-dry}$ .

### Section 5.0, Air Monitoring

In Section 5.0, "Air Monitoring," of the semi-annual reports reviewed, the licensee described the results of dryer stack emissions testing, environmental air sampling, gamma radiation monitoring, and effluent monitoring. The NRC staff did not observe trends in dryer stack emissions or environmental air sampling. However, the NRC staff observed an anomalous result in the March 9, 2018, report for July 1 to Dec. 31, 2017, Table 6, "Environmental Radon Monitoring," Irigaray Project, 4th quarter 2017. In Table 6, the result for location IR-1 (Downwind of Restricted Area), the licensee reported a value of  $6.5E-08 \mu\text{Ci}/\text{mL}$ . The uncertainty on this value is expressed incorrectly as "e-10". This high value is just over 100 times the average of all other samples that quarter. Also, the NRC staff observed that the location average for IR-14 is incorrectly stated as  $8.5E-01 \mu\text{Ci}/\text{mL}$ , and the uncertainty at AS-13 (Substation) in 3rd Quarter is incorrectly stated as  $1.8E+00 \mu\text{Ci}/\text{mL}$ .

With regard to measurements of other sources of air effluents, the licensee stated in Section 5.5, "Effluent Released from Willow Creek Activities," of its September 27, 2017, report that its program was verified in June 2017 and that it would begin reporting in the second half of 2017. The NRC staff verified the licensee's effluent monitoring program on June 13, 2017 (Accession No. ML17144A198), however, in the July 1, 2017 through December 31, 2017, Semi-Annual Report, the licensee did not begin reporting its results for additional effluent monitoring, and did

not provide an explanation of when it would start measuring and reporting these values. In Table 9, "Environmental Gamma Radiation Monitoring," the NRC staff could not determine how the licensee calculated net radiation exposures. An example of an acceptable method of calculation was provided by NRC staff during a September 14, 2017 workshop on health physics topics (see pkg. ML17262A496, Slide 50).

#### Section 6.0, Public Dose

In Section 6.0, "Public Dose," of the Semi-Annual Report, July 1, 2016 through December 31, 2016, and Semi-Annual Report, July 1, 2017 through December 31, 2017, reports reviewed, the licensee provided the results of its calculation of public dose for calendar years 2016 and 2017, respectively. The NRC staff checked each step of the calculation and found no errors, aside from treatment of the Environmental Gamma Radiation Monitoring data described above.

#### Section 7.0 - Safety and Environmental Review Summary

The licensee completed two safety and environmental evaluation panels (SERPs). SERPs are reviewed during inspections and will not be reviewed in this staff review of the semi-annual reports.