



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION IV  
1600 EAST LAMAR BOULEVARD  
ARLINGTON, TEXAS 76011-4511

August 27, 2019

Mr. Walt Nelson, Coordinator  
Safety, Health, Environment and Quality  
Crow Butte Resources, Inc.  
86 Crow Butte Road  
Post Office Box 169  
Crawford, NE 69339-0169

SUBJECT: CROW BUTTE RESOURCES, INC. - NRC INSPECTION REPORT 040-08943/2019-001

Dear Mr. Nelson:

This letter refers to the announced routine inspection U.S. Nuclear Regulatory Commission (NRC) inspection conducted July 28 through August 1, 2019, at your Crow Butte Project facility in Dawes County, Nebraska. This inspection examined activities conducted under your license as they relate to public health and safety, the common defense and security, and to confirm compliance with the Commission's rules and regulations and the conditions of your license.

Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, tours of the uranium recovery facilities and environmental monitoring locations, conduct of independent radiation measurements and interviews with personnel. The inspection findings were discussed with you at the conclusion of the onsite inspection on August 1, 2019. No violations were identified.

In accordance with Title 10 *Code of Federal Regulations* Part 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 Management System (ADAMS), accessible from the NRC Web site at <https://www.nrc.gov/reading-rm/adams.html>.

To the extent possible, your response, if you choose to provide one, should not include any personal privacy or proprietary information so that it can be made available to the Public without redaction.

W. Nelson

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Should you have any questions concerning this matter, please contact Ms. Marti Poston, Health Physicist at (817) 200-1181 or the undersigned at (817) 200-1156.

Sincerely,

*/RA/*

Heather J. Gepford, PhD, CHP, Chief  
Materials Licensing and Decommissioning  
Branch  
Division of Nuclear Materials Safety

Docket: 040-08943

License: SUA-1534

cc w/enclosure:

Julia Schmidt, Manager

Nebraska Department of Health and Human Services

David Miensbach, P.E., Groundwater Supervisor

Nebraska Department of Environmental Quality

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 040-08943

License No.: SUA-1534

Report No.: 040-08943/2019-001

Licensee: Crow Butte Resources, Inc.

Location Inspected: Crow Butte Project  
Dawes County, Nebraska

Inspection Dates: July 28 through August 1, 2019

Inspectors: Martha R. Poston, Health Physicist  
Materials Licensing and Decommissioning Branch  
Division of Nuclear Materials Safety

Accompanied By: Thomas Lancaster, Hydrogeologist  
Uranium Recovery Licensing Branch  
Decommissioning, Uranium Recovery and Waste Program  
Nuclear Materials Safety and Safeguards

Heather J. Gepford, PhD, CHP, Chief  
Materials Licensing and Decommissioning Branch  
Division of Nuclear Materials Safety

Approved By: Heather J. Gepford, PhD, CHP, Chief  
Materials Licensing and Decommissioning Branch  
Division of Nuclear Materials Safety

Attachment: Supplemental Information

Enclosure

## EXECUTIVE SUMMARY

### **Crow Butte Resources, Inc., In-Situ Recovery Facility NRC Inspection Report 040-08943/2019-001**

The U. S. Nuclear Regulatory Commission (NRC) performed a routine, announced health and safety inspection from July 28 through August 1, 2019, at the Crow Butte Project which included observations of site activities, independent radiation measurements, review of records and interviews with personnel. In summary, the licensee was conducting operations in accordance with regulatory and license requirements described below.

#### Management and Organization

The organizational structure and staffing levels maintained by the licensee met the requirements specified in the license and were adequate for the work in progress. The licensee had a written safety policy and standard operating procedures. The licensee conducted audits and inspections and completed the necessary submissions in accordance with the regulatory and license requirements. (Section 1.2)

#### In-Situ Leach Facilities

The licensee conducted in-situ leach recovery operations and restoration activities in accordance with the license and regulatory requirements. Radiological controls including signs and postings were implemented in accordance with license and regulatory requirements. (Section 2.2)

#### Radiation Protection

The licensee implemented a radiation protection program meeting the requirements of Title 10 of the *Code of Federal Regulations* (CFR) Part 20 and the license. Occupational doses were less than established regulatory limits. (Section 3.2)

#### Effluent Control and Environmental Protection and Maintaining Effluents from Materials Facilities As Low As Reasonably Achievable (ALARA)

The licensee conducted environmental monitoring in accordance with license requirements. The licensee reported the results in semiannual reports to the NRC. The licensee was documenting spills and conducting excursion spill sampling as specified in the license. (Section 4.2)

#### Inspection of Transportation Activities and Radioactive Waste Processing, Handling, Storage and Transportation

The licensee maintained a waste disposal agreement as required by the license. The management, storage, transportation and disposal of 11.e(2) wastes were conducted in accordance with the license and regulatory requirements. The deep disposal well injection of wastewater did not exceed the permitted limits for natural uranium or radium-226. Pond inspections were conducted as required by license condition. (Section 5.2)

### Emergency Preparedness and Fire Protection

The licensee maintained and implemented standard operating procedures associated with emergency preparedness and fire protection to meet the requirements of the license. Employees and visitors were provided emergency preparedness and fire protection training as applicable. The licensee coordinated with local law enforcement and emergency response organizations for emergency response purposes. (Section 6.2)

## Report Details

### Site Status

At the time of the inspection, the licensee had ceased the in-situ recovery of uranium. The use of injection fluids was discontinued on April 25, 2018. The site had transitioned from recirculation mode into a care and maintenance mode. Of the 11 mine units (MU) constructed at the site, one MU (MU-1) has completed groundwater restoration and its related wells and header houses have been decommissioned; another MU (MU-2) is in stabilization mode, three MUs (MU-3, MU-4, and MU-5) are in stabilization monitoring mode, and two MUs (MU-6 and MU-7) are in restoration mode. The remaining four MUs (MU-8 through MU-11) are in “bleed only” recirculation mode to maintain an inward hydraulic gradient in the mine units.

The licensee was not processing uranium or conducting yellowcake drying operations at the Crow Butte Project. The ion exchange columns had been filled with salt and water to protect the resins during care and maintenance mode.

### 1 **Management Organization and Controls (Inspection Procedure (IP) 88005)**

#### 1.1 Inspection Scope

Ensure the licensee has established an organization to administer the technical and safety policies, program and procedures necessary to satisfy the license and regulatory requirements and perform internal reviews, self-assessments and audits. Specifically, the inspectors should determine whether the licensee:

- Implemented an organization in accordance with the license with defined qualifications, responsibilities and functions to administer the safety program
- Implemented a policy for facility safety and ensure that management and staff understand their roles under these policies
- Implemented procedures that ensure the use of current procedures and that procedures exist for all facility functions affecting safety
- Implemented a series of internal reviews, self-assessments and audits to identify and correct deficiencies

#### 1.2 Observations and Findings

##### a. Organizational Structure

The inspectors reviewed the licensee’s organizational structure for the Crow Butte Project. At the time of the inspection, the Crow Butte Project had 19 full time employees, the same level since the previous NRC inspection conducted November 5-8, 2018. Since the previous inspection, the organizational structure had changed to reflect the reassignment of personnel to address attrition. The senior safety technician position was eliminated; that individual now serves as plant foreman, replacing the plant superintendent. The former plant superintendent moved to the restoration manager

position. Duties and responsibilities were redistributed to address this staff reorganization.

The inspectors determined that the movement of duties and responsibilities associated with attrition and reorganization did not have a negative impact of essential functions such as operations and radiation protection. The radiation safety officer (RSO) was supported by one full-time health physics technician (HPT). The RSO and HPT met the qualification requirements in Section 2.4 of Regulatory Guide 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities will be As Low As Reasonably Achievable," in accordance with License Condition (LC) 9.6.

The radiation safety duties are shared between the HPT and the RSO, with assistance provided as necessary by RSO designees. The RSO designees' training and qualifications were reviewed and complied with the commitments made in the licensee's submittals dated March 4, 2014 (ADAMS Accession No. ML14064A143), and May 15, 2014 (ADAMS Accession No. ML14135A414) as required by LC 9.7.

Groundwater monitoring and environmental surveillance activities were performed by wellfield technicians and supported by designated operations staff. The inspectors determined that the licensee had adequate staff to implement the radiation safety program, groundwater monitoring program and environmental program at current staffing levels.

The licensee had a written safety policy, CAM-SHEQ-CG, "Safety, Health, Environment and Quality Policy", Revision 5, issued July 24, 2018. Interviews with managers and staff at the Crow Butte Project indicated a strong commitment to safety existed at all levels of the organization.

The licensee had standard operating procedures that addressed operational activities involving radioactive and non-radioactive materials associated with licensed activities, radiation protection, environmental surveillance, and emergency response in accordance with the requirements of LC 10.1.2.

b. Safety and Environmental Review Panel

License Condition 9.4 of the Crow Butte performance-based license requires that the licensee establish a Safety and Environmental Review Panel (SERP) process to evaluate whether program changes, tests or experiments require an NRC license amendment prior to implementation. The inspectors reviewed SERP evaluation, SERP-18-01, "Technical Qualifications for RSO – Casey Yoda", the only SERP completed since the November 2018 inspection.

License Condition 9.4 requires, in part, that the licensee submit a description of each change, test or experiment approved by the SERP to the NRC in the annual report. This SERP was included in the annual report. The inspectors reviewed the SERP and its supporting documentation and concluded the evaluation did not require prior NRC approval.

c. Audits and Inspections

The inspectors reviewed the routine site inspections performed by the licensee since the previous inspection. As required by LCs 9.2, 9.7 and 11.1.9, the licensee was conducting and documenting a daily walk-through of all work and storage areas of the facility to ensure that good radiation practices was being followed.

In accordance with LC 9.7, site procedures allowed trained and qualified operators to perform daily walkthroughs on days when the radiation safety staff was not available, such as weekends and holidays. The RSO or HPT would then review the walk-through documentation upon return to the facility. A spot check of the daily walk-throughs conducted since the previous inspection revealed no example of the RSO or HPT failing to perform the required review. When delays in performing the review occurred, the reason for the delay was documented on the form (illness, document misplaced, etc.). The weekly and monthly reviews by the RSO/HPT were conducted at the required frequencies. The inspectors observed that the majority of the daily, weekly and monthly walk-throughs were performed by operations and radiation safety staff working together.

Title 10 of the *Code of Federal Regulations* (CFR) 20.1101(c) requires that the licensee periodically (at least annually) review the radiation protection program content and implementation. The inspectors reviewed the licensee's annual audit for calendar year 2018 (CY2018). The audit, performed by members of the health physics organization from the licensee's corporate headquarters on May 13-17, 2019, included an evaluation of occupational exposures, radiation survey results, public dose, training and compliance with license and regulatory requirements.

License Condition 11.1.2 requires the licensee to submit a copy of the annual audit to the NRC. At the time of the inspection, the licensee had not submitted the audit to the NRC since the cover letter incorrectly identified the audit date as May 13-17, 2018. The licensee requested a corrected copy from the corporate auditors. Once the corporate staff provides a corrected cover letter, the RSO plans to submit the audit to the NRC. The licensee has until the end of CY2019 to submit the audit results. The inspectors determined that the audit met the requirements of 10 CFR 20.1101(c) and LC 11.1.2.

The highest public dose reported by the licensee for CY2018 was 15.8 millirem (mrem) for individuals at the nearest occupied residence. The dose was consistent with the dose of 15.9 mrem reported for CY2017 and represented a decrease from the dose of 32.4 mrem reported for CY2016.

d. Additional Protocols

The inspectors verified the licensee had provided the NRC with appropriate CY2018 documentation to comply with the requirements of 10 CFR 75.11, related to the agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States. The licensee provided the necessary forms which included contact information, the capacity of production, the actual annual production and the quantity of material on hand. The inspectors concluded that the reports were complete, accurate and consistent for CY2018.

e. Financial Assurance

In accordance with LC 9.5, the licensee submitted its annual financial assurance updates for CY2019 for Crow Butte Operations on September 26, 2018 (ADAMS Accession No. ML18276A085). The NRC completed its review and determined the financial assurance was acceptable on March 21, 2019 (ADAMS Accession No. ML19036A957).

1.3 Conclusions

The organizational structure and staffing levels maintained by the licensee met the requirements specified in the license and were adequate for the work in progress. The licensee had a written safety policy and a clear management commitment to safety. The licensee conducted audits and inspections and completed the necessary submissions in accordance with the regulatory requirements and the license.

**2 In-Situ Leach Facilities (IP 89001)**

2.1 Inspection Scope

Determine if in-situ leach activities were conducted in accordance with regulatory requirements, the license, and in a manner that would protect the environment and the safety and health of workers and the public.

2.2 Observations and Findings

a. Uranium Recovery

The licensee stopped injecting lixiviant on April 25, 2018; MU-8 through MU-11 were operating in “bleed-only” mode to ensure an inward hydraulic gradient was maintained. All other mine units were either in stability sampling, restoration or had completed the decommissioning process. MU-1 had completed decommissioning, MU-2 had completed stability monitoring, and MU-3 through MU-5 were in the stability sampling phase that demonstrates stability of restored groundwater quality. Mine units MU-6 and MU-7 were in restoration phase, where groundwater quality is being actively restored through groundwater extraction, treatment and injection.

Consistent with LC 10.2.3, the inspectors observed that the highest recorded flow rate over the last year was below the maximum allowed plant throughput of 9,000 gallons per minute (gpm). Facility records for MU-8 through MU-11, which were not in restoration mode, indicate that the average and maximum operating flow observed for last year were 96 gpm and 185 gpm, respectively.

The inspectors spot-checked facility records to verify that the bleed at MU-10 was sufficiently maintaining an inward hydraulic gradient. The inspectors observed average monthly bleed data for MU-10 for the period from November 2018 to July 2019. The inspectors also reviewed the hydrographs (i.e., time series graphs of monthly groundwater level measurements) for perimeter monitoring wells CM10-15, CM10-11, CM10-15, CM10-21 and CM10-26 from November 2018 to May 2019. These records indicated that an inward hydraulic gradient had been maintained at MU-10 in accordance with LC 10.1.6.

b. Site Tours

The inspectors conducted a site tour to observe in-situ uranium recovery operations and restoration process testing at the Crow Butte Operations Central Processing Plant (CPP) and Restoration Building. The inspectors observed multiple mine units and header houses, the two deep disposal wells (DDW), an effluent monitoring station, selected environmental monitoring locations and the disposal ponds.

The inspectors observed all entrances to the facility and wellfields were posted with the words, "Any Area Within This Facility May Contain Radioactive Materials", as required by LC 9.11. Additionally, the temporary storage of byproduct waste materials was located in a fenced and locked restricted area which was appropriately posted.

The inspectors conducted independent radiological surveys of gamma exposure rates present in the CPP, header houses and wellfields. The surveys were conducted using a Ludlum Model 19 microroentgen rate meter (NRC #015518, serial #33035, calibration due date of November 9, 2019, calibrated to radium-226). The inspectors noted that the gamma exposure rates were consistent with the licensee's measurements. The licensee had several areas which were conservatively posted as radiation areas. The inspectors did not identify any areas which were not already posted as radiation areas by the licensee.

c. Evaporation Ponds

The inspectors observed three commercial evaporation ponds (ponds 1, 3 and 4) and the two research and development (R&D) ponds (east and west ponds) to assess the condition of the pond liners, condition of the side slopes, and the way the ponds were being operated. The licensee was authorized to construct a total of five ponds; however, commercial evaporation ponds 2 and 5 were never constructed. The R&D ponds and commercial evaporation ponds received well reverse osmosis building sump wastewater and CPP process waste effluent, respectively. The inspectors observed that the licensee was maintaining the appropriate amount of freeboard on the respective ponds in accordance with LC 10.2.5

License Condition 11.2.1 requires the licensee to perform and document inspections of its onsite evaporation ponds. The inspectors reviewed recent pond inspection documentation to determine whether inspection results were being appropriately reported and confirm that inspections were being performed properly. The inspectors observed a weekly pond inspection and verified that the inspection was performed in accordance with the inspection procedures outlined in Crow Butte Project Environmental Manual Volume IV, Chapter 8.

The NRC inspectors reviewed records of commercial pond 1's standpipes monitoring after the May 29, 2019, liner leak verification. The inspectors observed that water quality in the affected standpipes was monitored since the time of the last inspection. In accordance with LC 11.2.1, the monitoring was observed to include the analysis of five parameters (i.e., specific conductivity, chloride, alkalinity, sodium and sulfate) once every seven days during the liner leak period and two weeks after repair. Inspection of the facility records indicated that a corrective action plan was submitted to the NRC on June 27, 2019 (ADAMS Accession No.: ML19184A077). The inspectors found that the

licensee's corrective action plan documented steps to adequately address the liner leak. The leak was repaired in accordance with the corrective action plan on June 28, 2019. The licensee notified the NRC of completion of the repairs on July 16, 2018 (ADAMS Accession No.: ML19206A069).

### 2.3 Conclusion

The licensee conducted in-situ leach recovery operations and restoration activities in accordance with the license and regulatory requirements. Radiological controls including signs and postings were implemented in accordance with license and regulatory requirements.

## **3 Radiation Protection (IP 83822)**

### 3.1 Inspection Scope

Determine whether the licensee's radiation protection program was conducted in compliance with the license and 10 CFR 20 requirements. Specifically, verify the performance of the radiation protection program commensurate with the risk involved with licensee activities and the following program elements: (1) occupational exposure, (2) radiation work permits and respiratory protection, (3) radiological surveys, (4) instrumentation, and (5) training.

### 3.2 Observations and Findings

#### a. Occupational Exposures

The inspectors reviewed the licensee's occupational exposure records for fourth quarter CY2018 and the first two quarters of CY2019. Occupationally monitored employees included plant and wellfield operators, safety and environmental staff including health physics, laboratory and maintenance employees. Employees were monitored for external exposure using optically stimulated luminescence dosimeters which were exchanged on a quarterly basis. These results were reported as deep dose equivalent (DDE). The highest DDE assigned for CY2018 was 159 mrem. The highest DDE reported for the first half of CY2019 was 24 mrem.

The licensee conducted air sampling, in part, for assessment of internal exposures. The inspectors reviewed the licensee's radon-222 air sampling records and the uranium particulate and worker breathing zone results for CY2018 and the first two quarters of CY2019. The inspectors confirmed the licensee had conducted air sampling at the required intervals. The appropriate exposures were calculated and recorded for each employee.

Bioassay results since the previous inspection were reviewed by the inspectors. Bioassay samples were collected quarterly. The change from monthly bioassay collection to quarterly was implemented the fourth quarter of CY2018. Except for the planned spiked samples required by the radiation protection plan, no bioassay results were above the lower limit of detection for uranium or the 15 micrograms per liter action level for investigation.

Internal dose or committed effective dose equivalent (CEDE) was assigned based on radon monitoring, uranium particulate monitoring and bioassay results. The average CEDE assigned to employees for CY2018 was 36 mrem. The maximum CEDE assigned to an employee for CY2018 was 67 mrem.

b. Radiation Work Permits and Respiratory Protection

Since the previous inspection, no radiation work permits were issued. The licensee maintained respiratory protection in case of need. All twelve individuals identified as personnel who might need to wear respiratory protection were currently medical qualified for respirators and had current respiratory fit test records. Respiratory protection refresher training was conducted on December 13, 14, and 18, 2018. Respirator inspections and surveys were conducted monthly in accordance with the radiation protection program procedures.

c. Radiation Protection Surveys

The inspectors reviewed the licensee's routine contamination and gamma radiation surveys conducted since the previous inspection. The licensee conducted weekly removeable contamination surveys in designated clean areas of the facility, such as lunchrooms and office areas. Monthly gamma radiation surveys were conducted in the CPP, wellfield and DDWs. Monthly contamination spot checks were conducted on trash containers and respirators.

Quarterly spot checks for contamination were conducted on employees, vehicles and equipment in the wellfield. Free release surveys at the Crow Butte Project since the previous NRC inspection were reviewed and determined to be performed in accordance with LC 9.6, LC 9.8, Regulatory Guide (RG) 8.30, "Health Physics Surveys in Uranium Recovery Facilities," Revision 1, and RG 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities will be As Low As Reasonably Achievable," Revision 1. The inspectors verified that surveys were being conducted and documented as required. No contamination issues were identified during this survey review.

d. Radiation Safety Instrumentation

The inspectors reviewed the licensee's operability, calibration and maintenance records for survey instruments. Instruments reviewed were determined to be in calibration. The licensee used an offsite vendor to perform annual calibrations of radiation safety instrumentation. The inspectors observed survey meters in use by licensee personnel when exiting restricted areas. The survey meters examined by the inspectors were in calibration and were used appropriately by the licensee's employees.

e. Training

The inspectors reviewed the licensee's training program. Employees were provided with initial hazard communications and radiation protection training at hire and an annual refresher. Employees preparing shipping paperwork had current U.S. Department of Transportation (DOT) training. Other employees were provided DOT training commensurate with their job responsibilities. Annual refresher training also included job hazard analysis, confined space entry, fire protection and emergency response. All

licensee staff completed annual refresher training on April 18, 2019, or May 3, 2019. The inspectors determined that the licensee's training program met license and regulatory requirements.

### 3.3 Conclusions

The licensee implemented a radiation protection program meeting the requirements of 10 CFR 20 and the license. The licensee's radiation protection program was commensurate with the risk involved based on licensee activities and addressed the required program elements.

## 4 **Effluent Control and Environmental Protection (IP 88045) and Maintaining Effluents from Material Facilities As Low As Is Reasonably Achievable (ALARA) (IP 87102)**

### 4.1 Inspection Scope

Determine if environmental and effluent monitoring programs are adequate to monitor the impacts of site activities on the local environment. Specifically, determine if the effluent control and environmental monitoring program is conducted in accordance with the license and procedural requirements in a manner that supports the principles of ALARA.

### 4.2 Observations and Findings

#### a. Environmental and Effluent Monitoring

Since the previous NRC inspection, the licensee had submitted the February 29, 2019, Semiannual Radiological Effluent and Environmental Monitoring Report. This report was for the third and fourth quarters of CY 2018 (ADAMS Accession No. ML19060A064). This report was submitted in a timely manner in accordance with the requirements of 10 CFR 40.65. The environmental monitoring program consisted of air particulate, radon, surface water, private well water, sediment and ambient gamma exposure rate as required by LC 11.2.3. The inspectors reviewed the semiannual report and compared the reported data to the licensee's records, procedures and records of daily operations. The licensee's reported data was found to be consistent with the inspectors' review of the licensee's records.

Surface water samples were collected quarterly from streams and water impoundments at the facility. The licensee collected water samples from five locations (unless they were dry) and three impoundments. The inspectors reviewed the analysis and sample frequency of recorded data and found the samples were analyzed quarterly for uranium and radium in accordance with LC 11.2.3. The inspectors also found that the results were presented in the semiannual report consistent with previously collected data.

Stream sediment samples were collected annually from three locations in Squaw Creek, two locations on English Creek and three impoundments on English Creek, consistent with the water sampling locations. The samples were analyzed for natural uranium, radium-226 and lead-210 concentrations. No specific limit had been established for sediment samples; data was used by the licensee for trending purposes.

The semiannual report also contained water supply well data. Water supply wells located within 1 kilometer of the wellfield were sampled quarterly. A total of 21 wells were sampled. The inspectors found the results presented in the semiannual report consistent with previously collected data.

The licensee monitored plant emissions for radon, radon progeny and uranium particulate at seven locations in the CPP and at eighteen locations outside the CPP. Air filters were collected and counted routinely. The environmental stations outside the CPP were also monitored for radon using a track etch and gamma using optically stimulated luminescence dosimeters. The inspectors reviewed the monitoring/counting results from the air filters since the previous NRC inspection and determined that all results were below the effluent limits of 10 CFR Part 20. Radon and direct gamma levels were within the appropriate limits established in the environmental monitoring program in LC 11.2.3.

b. Wellfield and Excursion Monitoring

Within the wellfields, the inspectors viewed the interior of header houses 30 and 64. Locks were secured, and spill containment was present. In accordance with LC 10.1.12, the inspectors found that the licensee monitored and maintained daily records of flow rates on each injection and recovery well, and manifold pressures on the entire system. The inspectors reviewed the facility records for the past year and determined that the injection pressures did not exceed 100 pounds per square inch (psi) at the injection well heads as specified by LC 10.1.12.

The inspectors reviewed the spill records since the previous NRC inspection. According to the licensee's records, there were three spills resulting in a total of 58,259 gallons of unrecovered fluid. Of the total unrecovered fluid, 15,459 gallons of production fluid was estimated to have been released. The inspectors determined that the licensee took appropriate corrective actions and made the appropriate notifications associated with the spills.

License Condition 11.1.5 specifies excursion monitoring well sampling requirements and the criteria for placing a groundwater monitoring well on excursion status. The licensee's excursion sampling program requirements included biweekly monitoring of wells in active mine units, weekly sampling of wells in excursion status and well sampling in mine units under restoration. The inspectors reviewed groundwater sampling records since the previous NRC inspection to determine whether the licensee collected samples at the required frequency and whether excursions were properly identified. The inspectors randomly selected monitoring data and examined the reports to confirm the licensee's automated excursion reporting system was functioning properly. Data from the eight known excursions was reviewed to ensure that the monitoring frequency had been increased according to the license requirements. The inspectors concluded that the licensee was implementing the excursion monitoring program in accordance with LC 11.1.5 requirements.

The licensee stopped injection of lixiviant into MU-8 and MU-11 in April of 2018. To assess whether the conditions in these MUs allowed for the detection of excursions as specified in LC 11.1.5, the inspectors observed recent conductivity results for groundwater samples from MU-8 through M-11 production wells and from several perimeter monitoring wells around these MUs. These results generally indicated that the conductivity of groundwater in the production zone was roughly 100% to 170% higher

than that measured in the perimeter monitoring wells. The inspectors observed that conductivity levels in these production zones had not significantly decreased since lixiviant injection was terminated. Based on these observations, the inspectors found that the conditions in MU-8 and MU-11 allowed for the detection of excursions.

Inspectors observed five of the eight known excursions occurred in the overlying aquifer monitoring wells in MU-6 or MU-8. License Condition 11.2.2 requires overlying aquifer monitoring wells in MU-6 or MU-8 that are placed on excursion status be tested weekly for natural uranium in addition to the required excursion indicators of alkalinity, conductivity and chloride. Inspection of facility records indicated that weekly tests of samples from these five wells indicated that the sample testing included natural uranium. The inspectors concluded that the licensee was implementing the additional testing of overlying aquifer monitoring wells in MU-6 or MU-8 in accordance with the license.

The inspectors observed recent monitoring well sampling to determine whether excursion monitoring sampling was being performed in accordance with the license commitments. The inspectors observed sampling of well CM7-13 and verified that sampling was performed in accordance with the monitoring well sampling procedure in the facility operating manual. Through observation and discussion with licensee staff, the inspectors determined the individual conducting the sampling had appropriate knowledge and understanding of the procedure and implemented the necessary safety measures to protect the environment.

The inspectors observed on-site laboratory analysis of excursion monitoring well samples to determine whether the analyses were being performed in accordance with licensee procedures. The inspectors observed the in-house analytical analysis of conductivity, chloride and alkalinity and verified the analyses were performed in accordance with test procedures outlined in the standard operating procedures of the facility laboratory manual.

c. Mechanical Integrity Testing

The inspectors reviewed recent Mechanical Integrity Testing (MIT) documentation to determine whether the tests were being performed in accordance with license commitments and that the test results were being appropriately reported. During the review period, 511 well MITs were completed. Of the 511 wells tested, there were two of failures. Production well P5020-16 was repaired and production well P402-13 was scheduled to be plugged and abandoned the week of August 12-16, 2019.

4.3 Conclusion

The licensee conducted environmental monitoring in accordance with license and procedural requirements. The licensee reported the results in semiannual reports to the NRC. The licensee was documenting spills and conducting excursion sampling as specified in the license.

## **5.0 Inspection of Transportation Activities (IP 86740) and Radioactive Waste Processing, Handling, Storage and Transportation (IP 88035)**

### 5.1 Inspection Scope

Determine if storage and disposal activities were conducted in accordance with regulatory and license requirements.

### 5.2 Observations and Findings

#### a. Inspection of Transportation Activities

The inspectors reviewed transportation activities conducted since the last NRC inspection. The licensee had made no yellowcake shipments and one 11.e(2) byproduct material shipment. The single waste shipment was sent to the Energy Fuel's White Mesa Facility (White Mesa) in Blanding, Utah. The licensee had a current waste disposal contract for 11.e(2) byproduct waste in place with the White Mesa facility. The inspectors reviewed the shipment paperwork and associated shipping procedures. No issues or items of concern were identified.

#### b. Inspection of Byproduct Waste Storage

The inspectors observed that all 11.e(2) waste storage bins were staged within the restricted area with surrounding fences and locked entries. The inspectors performed an ambient gamma survey of the containers and confirmed that the areas were appropriately posted and controlled in accordance with the regulatory and license requirements.

#### c. Wastewater Treatment and Disposal Activities

The licensee processed liquid effluent either through reverse osmosis units, stored in storage tanks, or disposed of to a DDW or to the evaporation ponds. Consistent with LC 10.2.6, the licensee disposed of plant and wellfield operations wastewater to DDW injection and evaporation ponds.

The licensee had two DDWs. The inspectors reviewed the Class I injection well reports for each of the DDWs since the previous NRC inspection. The capacities reported by the licensee for DDW#1 and DDW#2 were 364 gpm under an injection pressure of 2 psi and 132 gpm under an injection pressure of 314 psi, respectively. The combined capacity of the two DDWs was approximately 496 gpm. The average injection rate for DDW#1 and DDW#2 since the last inspection were 186 gpm and 19 gpm, respectively. The licensee did not exceed the permitted limits for natural uranium and radium-226 concentrations in waste water.

The inspectors observed the DDW#1 wellhead to assess the operation and general condition. The DDW injection pressures were satisfactorily monitored, controlled and recorded. The DDW housing was observed to be framed with heavy iron beams that were bolted to the housing concrete foundation. Locks were found secured and spill containment was present.

d. Pond Inspections

The licensee conducted daily and weekly inspections of the ponds and documented these inspections as required by LC 11.2.1. As required by LC 10.25, the research and development ponds had at least 3 feet of freeboard and the commercial solar evaporation ponds had at least 5 feet of freeboard. The inspectors reviewed the pond inspection records and determined that pond inspections were performed as required by the license conditions.

5.3 Conclusion

The licensee maintained a waste disposal agreement as required by the license. The management, storage, transportation and disposal of 11.e(2) wastes were conducted in accordance with the license and regulatory requirements. The DDW injection of wastewater did not exceed the permitted limits for natural uranium or radium-226. Pond inspections were conducted as required by license condition.

**6 Emergency Preparedness (IP 88050) and Fire Protection (IP 88055)**

6.1 Inspection Scope

Determine whether the licensee's emergency preparedness and fire protection programs are adequate to protect the safety and health of employees, members of the public and the environment.

6.2 Observations and Findings

a. Emergency Preparedness

The inspectors reviewed procedures in the Emergency Response Plan for Crow Butte addressing medical emergencies, fire and explosions, electrical and gas emergencies, chemical emergencies, natural disasters, radiological emergencies, security plan and security threats, transportation emergencies, evacuation procedures, and emergency reporting.

The inspectors also reviewed the standard operating procedures related to emergency response telephone numbers, emergency medical services for ambulance and life flight, transportation accidents involving radioactive materials, spills and personnel decontamination. The inspectors verified new employee and refresher training for personnel included emergency response. Visitors to the site were provided site orientation training, which included evacuation gathering points. The licensee also provided annual training regarding hazards onsite to the local law enforcement and volunteer firefighting organizations who would respond to an emergency at the facility.

b. Fire Protection

The inspectors reviewed the fire protection program developed by the licensee. Employees were trained on fire prevention and fire extinguisher use as part of new employee orientation and annual refresher training.

The inspectors reviewed the standard operating procedures and the fire protection plan related to flammable and combustible material control, spill control, and firefighting. An overview of the fire protection plans and procedures were part of new employee orientation training and annual refresher training.

### 6.3 Conclusion

The licensee maintained and implemented standard operating procedures associated with emergency preparedness and fire protection to meet the requirements of the license. Employees and visitors were provided emergency preparedness and fire protection training as applicable. The licensee coordinated with local law enforcement and emergency response organizations for emergency response purposes.

## **7 Exit Meeting Summary**

The NRC inspectors presented the inspection findings to the licensee's representatives at the end of the onsite inspection on August 1, 2019. During the inspection, the licensee did not identify any information reviewed by the NRC and included in this report as proprietary.

**SUPPLEMENTAL INSPECTION INFORMATION**

**Partial List of Persons Contacted**

Licensee

Walt Nelson, Safety, Health, Environment, and Quality Coordinator  
Tami Dyer, Radiation Safety Officer  
Casey Yada, Health Physics Technician  
Tate Hageman, Restoration Manager  
Brian Taylor, Plant Supervisor  
Michelle O'Donnell, Laboratory Foreman  
Linda Turnbull, Chemical Technician

**Inspection Procedures (IP) Used**

IP 83822	Radiation Protection
IP 86740	Inspection of Transportation Activities
IP 87102	Maintaining Effluents from Materials Facilities ALARA
IP 88005	Management Organization and Controls
IP 88045	Effluent Control and Environmental Protection
IP 88035	Radioactive Waste Processing, Handling, Storage and Transportation
IP 88050	Emergency Preparedness
IP 88055	Fire Protection
IP 89001	In-Situ Leach Facilities

**Items Opened, Closed and Discussed**

Opened

None

Closed

None

Discussed

None

## List of Acronyms

ADAMS	Agencywide Documents Access and Management System
ALARA	As Low As Is Reasonably Achievable
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CPP	Central Processing Plant
CY	Calendar Year
DDE	Deep Dose Equivalent
DDW	Deep Disposal Well
DOT	Department of Transportation
gpm	gallons per minute
HPT	Health Physics Technician
IP	NRC Inspection Procedure
LC	License Condition
MIT	Mechanical Integrity Testing
mrem	millirem
NRC	U.S. Nuclear Regulatory Commission
psi	pounds per square inch
RG	Regulatory Guide
RSO	Radiation Safety Officer
SERP	Safety and Environmental Review Panel
SHEQ	Safety, Health, Environment and Quality

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 DATED AUGUST 27, 2019

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