



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
612 EAST LAMAR BLVD, SUITE 400  
ARLINGTON, TEXAS 76011-4125

August 28, 2008

Larry L. Teahon  
Manager, Safety, Health and  
Environmental Affairs  
Crow Butte Resources, Inc.  
86 Crow Butte Road  
Post Office Box 169  
Crawford, NE 69339-0169

SUBJECT: NRC INSPECTION REPORT 040-08943/08-001

Dear Mr. Teahon:

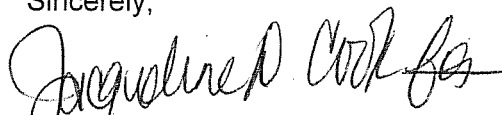
This refers to the inspection conducted on July 15-17, 2007, at the Crow Butte Resources facility in Crawford, Nebraska. The inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and conditions of your license. Within these areas, the inspection consisted of selected examinations of procedures and representative records, observations of activities, and interviews with personnel. The preliminary inspection findings were discussed with you at the exit briefing conducted at the conclusion of the onsite inspection, and the final inspection findings were presented to you by telephone on August 5, 2008.

Based on the results of this inspection, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. This violation involves your failure to perform mechanical integrity tests on all wells as stipulated by the license. This non-repetitive, licensee-identified and corrected violation is being treated as Non-Cited Violations (NCVs), consistent with Section VI.A.8 of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region IV, and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

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 document system (ADAMS), accessible from the NRC website at <http://www.nrc.gov/reading-rm/adams.htm>!. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Linda Gersey, Health Physicist, at (817) 860-8299, or the undersigned at (817) 860-8197.

Sincerely,



Jack E. Whitten, Chief  
Nuclear Materials Safety Branch B

Docket No.: 040-08943  
License No.: SUA-1534

Enclosure:  
NRC Inspection Report  
040-08943/08-001

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U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 040-08943

License No.: SUA-1534

Report No.: 040-08943/08-001

Licensee: Crow Butte Resources, Inc.

Facility: Crow Butte Facility

Location: Dawes County, Nebraska

Dates: July 15-17, 2007

Inspectors: Robert J. Evans, PE, CHP, Senior Health Physicist  
Nuclear Materials Safety Branch B

Linda M. Gersey, Health Physicist  
Nuclear Materials Safety Branch B

Accompanied by: Stephen J. Cohen, PG, Project Manager  
James Webb, Health Physicist  
Ronald A. Burrows, Senior Health Physicist  
Decommissioning and Uranium Recovery Licensing Directorate  
Division of Waste Management and Environmental Protection  
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Ernesto Quinones, Project Manager  
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Office of Federal and State Materials and Environmental  
Management Programs

Approved by: Jack E. Whitten, Chief  
Nuclear Materials Safety Branch B

Attachment: Supplemental Inspection Information

ENCLOSURE

## Executive Summary

Crow Butte Resources, Inc.  
NRC Inspection Report 040-08943/08-001

This inspection included a review of site status, management organization and controls, site tours, radiation protection, environmental protection, transportation, and radwaste activities. In summary, the licensee was conducting operations in accordance with regulatory and license requirements, with one exception described below.

### Management Organization and Controls

- The organizational structure and staffing levels were sufficient for the work in progress at the facility. The licensee's Safety and Environmental Review Panel evaluations were conducted in accordance with requirements of the performance-based license. The licensee conducted the As Low As Reasonably Achievable program review as required by the license (Section 1).

### In-Situ Leach Facilities

- Site operations were being conducted in accordance with applicable performance-based license conditions and regulatory requirements (Section 2).
- Inline filters recently installed in several wellhouses appear to be negatively impacting the radiation safety program. The inspectors will review the licensee's follow-up to this potential problem during the next inspection (Section 2).

### Radiation Protection

- The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. Occupational exposures were below the annual regulatory limit. The licensee free-released the restoration room and the inspectors confirmed that the final status survey results were within procedural action levels (Section 3).

### Environmental Protection and Maintaining Effluents from Materials Facilities As Low As Reasonably Achievable

- The licensee conducted environmental monitoring in accordance with license requirements. The licensee did not release licensed material into the environment in quantities exceeding regulatory limits (Sections 4a and 4b).
- Wells were being sampled in accordance with site procedures. One Non-Cited Violation was identified involving the licensee's failure to conduct mechanical integrity tests (Section 4c).

### Transportation of Radioactive Material and Radioactive Waste Management

- The licensee was conducting transportation and waste disposal operations in accordance with license and regulatory requirements (Section 5).

## Report Details

### **Site Status**

The Crow Butte Resources, Inc. facility started commercial operations in April 1991. At the time of the inspection, the licensee continued to recover uranium through *in situ* recovery operations. Uranium processing and drying operations were in progress at the Central Processing Plant (CPP). The current operational status of the facility is as follows:

- Groundwater in Mine Unit 1 has been restored and wells and wellhouses were decommissioned
- Mine Units 2, 3, 4, and 5 were undergoing groundwater restoration
- Mine Units 6, 7, 8, 9, and 10 were in production
- Mine Unit 11 was under development

Because of Nebraska Department of Environmental Quality regulations, the licensee can only produce five mine units and restore five mine units at any one time. Therefore, production in Mine Unit 11 cannot start until Mine Unit 6 is placed into restoration.

Since the previous inspection, conducted in September 2007, NRC staff has been reviewing the licensee's North Trend expansion amendment, and a hearing has been granted for this particular licensing action. The licensee also submitted a license renewal application, which is currently under NRC review. Hearing requests were submitted for the license renewal and a determination on these petitions is pending

NRC staff approved an amendment allowing the licensee to add a low-grade recovery circuit to the CPP. The approved license amendment for plant expansion permitted the licensee to increase its flow throughput from 5,000 to 9,000 gallons per minute. At the time of the inspection, the licensee had installed 6 downflow ion exchange columns, resin shaker, and transfer tank. The restoration ion exchange columns formerly located in the CPP were relocated to the research and development building, where two new reverse osmosis units were also installed.

The licensee intends to submit an application for a satellite operation at the Three Crow site located south of Crawford, NE, in 2009. The licensee has performed the pumping test at Three Crow, is conducting baseline sampling, and is delineating the ore body. The licensee is also performing exploration drilling at another potential satellite site called Marsland, which is approximately 30 miles southeast of the current facility.

### **1 Management Organization and Controls (88005)**

#### **1.1 Inspection Scope**

Determine if the licensee had established an organization to administer the technical programs and a program to perform internal reviews, self-assessments, and audits.

#### **1.2 Observations and Findings**

The licensee's corporate organizational structure is illustrated in Figure 5.1-1 of the license application. During the inspection, the inspectors were provided with the most

recent site organizational chart. Currently the licensee had 66 full time employees including six temporary employees. The licensee also employed three students, two college interns, and 20 full-time contractors. Four new employees were scheduled to begin work during the week of July 21, 2008, and the licensee was actively recruiting for 4 additional people including a wellfield manager. A new restoration superintendent had been hired since the previous inspection. Also, the licensee added the offsite positions of vice president of operations and director of compliance and licensing. The inspectors concluded that the licensee had sufficient staff to implement the conditions of the license.

License Condition 9.4 of the performance-based license requires the licensee to establish a Safety and Environmental Review Panel (SERP). The inspectors reviewed the licensee's SERP evaluations that were performed during 2008. Six reviews were conducted during 2008, including three reviews involving approval of new wellfields. The inspectors concluded that the evaluations were technically adequate and provided sufficient detail to support the proposed changes. Also, the changes that resulted from the SERP recommendations did not negatively impact the licensing basis of the site.

Annual As Low As Reasonably Achievable (ALARA) program reviews are required by License Condition 9.12 and License Application Section 5.4.4. The annual ALARA audit for 2007 was conducted during June 2008 by a third-party contractor. No significant problems were identified by the auditor. The ALARA auditor provided a number of suggestions to the licensee to possibly reduce occupational doses. The inspectors determined that the licensee's ALARA audit was a thorough review of licensed activities.

### 1.3 Conclusions

The organizational structure and staffing levels were sufficient for the work in progress at the facility. The licensee's SERP evaluations were conducted in accordance with requirements of the performance-based license. The licensee conducted the ALARA program review as required by the license.

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

### 2.1 Inspection Scope

Determine if operations were being conducted in accordance with regulatory and license requirements.

### 2.2 Observations and Findings

Site tours were conducted to observe in-situ recovery operations in progress. Areas toured included the CPP, research and development building, selected wellfields, selected header houses, and the evaporation ponds. The inspectors observed the condition of plant equipment, fences, postings, and gates. Plant operating parameters (flow, pressure) were compared to licensed limits. In summary, operations were being conducted in accordance with license requirements and established procedures. Since the dryer was not in operation, the inspectors did not compare dryer operations to the safety requirements listed in License Condition 10.8.

The inspectors observed the areas of the plant that had been reconstructed since the last inspection. Additional reverse osmosis equipment was relocated to the research and development building, while six new pressurized downflow columns were added to the CPP. The equipment appeared to be functioning as designed during the site tours.

In late June 2008, the licensee began adding inline filters in the wellfield houses. The filters were being installed to protect downstream components from buildup of calcium carbonate scale. The calcium carbonate scale was negatively impacting functionality of the downstream piping, pressure reducing valves, flow meters, and wells. However, the installation of the filters was causing unanticipated problems for the licensee including the creation of new radiation areas, contamination control during filter changes, access control restrictions to these new radiation areas, and transportation of filter sludge across the site. The inspectors discussed these problems with the licensee. The inspectors will review the licensee's actions taken to address the impacts of these plant modifications on the radiation protection program during the next inspection.

License Condition 11.4 and License Application Section 5.8.8.3 specify that the licensee must perform and document inspections of its onsite evaporation ponds. The most recent annual pond inspection report was submitted to the NRC by letter dated November 2, 2007. The inspection was conducted by a third party engineer who stamped and signed the report. According to the engineer's report, data from the monitoring wells indicates that no leaks to the groundwater system have occurred.

NRC staff inspected the three commercial ponds (Ponds 1, 3, and 4) to assess the condition of the pond liners, condition of the side slopes, and the manner in which the ponds were being operated. Although the licensee is authorized to construct a total of five ponds, Ponds 2 and 5 were never constructed. The staff observed that the licensee was maintaining the proper amount of freeboard. The aforementioned engineer's report also indicated that the proper amount of freeboard has been maintained (5 feet). At the time of the inspection, the spray evaporation system was not operating due to unfavorable wind conditions.

The liners on all three ponds were in good condition. Expansion ripples were observed in the liner material, and salt from the spray evaporation operations was observed accumulating on the liner in Pond 3. In a few spots along the north side of Pond 3, soil appeared to be settling at the toe trench. Otherwise, the commercial ponds were in satisfactory condition and were being operated properly.

### 2.3 Conclusions

Site operations were being conducted in accordance with applicable performance-based license conditions and regulatory requirements. Inline filters recently installed in several wellhouses appear to be negatively impacting the radiation safety program. The inspectors will review the licensee's follow up to this potential problem during the next inspection.

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

#### **3.1 Inspection Scope**

Determine if the licensee's radiation protection program was in compliance with license and 10 CFR Part 20 requirements.

#### **3.2 Observations and Findings**

The licensee's occupational dose monitoring program was reviewed to ensure that no worker had exceeded the occupational dose limits specified in 10 CFR 20.1201. The licensee's exposure records for 2007 through the first quarter 2008 were reviewed. Occupational doses are a summation of airborne uranium and radon daughters, if applicable, and optical stimulated luminescence dosimetry. The records indicated that the highest total effective dose equivalent exposure for calendar year 2007 was 576 millirems. The highest total effective dose equivalent for the first quarter of 2008 was 236 millirems. The weekly uranium intake was also being monitored to satisfy 10 CFR 20.1201(e) requirements. All exposures remained below the annual limit of 5,000 millirems as specified in 10 CFR 20.1201(a).

In addition to occupational exposure records, the inspectors reviewed the 2007-2008 records for in-plant radiological surveys, solid waste surveys, radiation work permits, employee training, and instrument calibrations. Based on these records, all program areas met regulatory and license requirements.

During site tours, the inspectors performed independent radiological surveys using two NRC-issued survey meters, a Ludlum Model 2401-P survey meter (calibration due date 11/30/2008) and a Ludlum Model 19 microRoentgen meter (calibration due date 2/14/2009). The inspectors did not measure any areas greater than 5 millirems per hour, which the licensee had not previously identified and posted as radiation areas. The inspectors determined that the licensee was identifying and posting radiation areas as required in 10 CFR 20.1902.

Since the previous inspection, the licensee conducted a final status survey in the restoration room located in the eastern end of the research and development building. The area was approximately 3540 square feet (329 square meters) in size. Soil samples were collected twice from the area during 2007. The uranium concentrations were less than 1.5 picocuries per gram of soil with a procedural limit of 230 picocuries per gram. The radium-226 concentrations were less than 4 picocuries per gram with a procedural limit of 5 picocuries per gram. In addition, the area was surveyed for ambient gamma exposure rates during March 2008. No area exceeded the licensee's action level. The SERP approved the release of the area on June 26, 2008, and the approval was documented in SERP 2008-05. The inspectors reviewed the licensee's final status survey sample results and agreed that the results were less than the licensee's action levels. Although the area was free released by the licensee, the area remains within the owner controlled area.

#### **3.3 Conclusions**

The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. Occupational exposures were below the annual



regulatory limit. The licensee free-released the restoration room, and the inspectors confirmed that the final status survey results were within procedural action levels.

#### **4 Environmental Protection and Maintaining Effluents from Materials Facilities ALARA (88045, 87102)**

##### **4.1 Inspection Scope**

Determine if the environmental and effluent monitoring programs were effective to monitor the impacts of site activities on the local environment.

##### **4.2 Observations and Findings**

###### **a. Environmental Monitoring**

The effluent and environmental monitoring program requirements are specified in License Condition 11.3, and the reporting requirements are specified in License Condition 12.1. The two semi-annual environmental monitoring reports for 2007 were reviewed during the inspection. The semi-annual reports were submitted to the NRC in a timely manner and provided relevant data for the facility.

The environmental monitoring program consisted of air particulate, radon, groundwater, surface water, sediment and ambient gamma exposure rate sampling. The licensee has seven monitoring stations at various locations around the licensed property including one background station.

The seven stations were used to measure natural uranium, radium-226, and lead-210 concentrations in air. Radon-222 was also measured using track-etch detectors. The sample results were less than 7 percent of the respective effluent concentration limits specified in 10 CFR Part 20, Appendix B, Table 2, for air releases. The perimeter stations sample results were similar to the background station sample results.

The licensee measured ambient gamma radiation levels at the seven sample stations using dosimeters that were exchanged quarterly. The annual ambient gamma radiation levels ranged from 29-40 millirems and were comparable to background levels.

Water supply wells within 1-kilometer of the wellfields were sampled quarterly. A total of 19 wells were sampled in 2007. Surface water was collected quarterly from streams and water impoundments in the wellfield areas. The licensee collected water samples from five streams and three impoundments during 2007. The samples were analyzed for natural uranium and radium-226 concentrations. The sample results were less than 11 percent of the effluent concentration limits for water.

Sediment samples were collected annually at locations where water sampling was conducted. The samples were analyzed for natural uranium, radium-226, and lead-210 concentrations. No specific limit has been established for sediment samples, but the data is used for trending purposes.

Based on the environmental and effluent monitoring sample results, the inspectors concluded that the potential radiation dose to any member of the public from licensed material during 2007 was below the 100 millirems per year annual dose limit specified in 10 CFR 20.1301(a).

b. Groundwater Sampling

The NRC staff reviewed well monitoring records to determine if the licensee was collecting samples at the required frequency and if excursions were properly identified. The NRC staff reviewed well sampling records and the semi-annual reports and determined that the sampling program is in compliance with license conditions. Results presented in the semi-annual reports are consistent with previously collected data.

The inspectors reviewed private well and surface water sampling reports, semi-annual groundwater reports, well sampling records, and groundwater analytical data. The licensee had effectively implemented the groundwater sampling programs including biweekly monitoring well sampling in active mine units, weekly sampling of wells in excursion status, and lower-frequency well sampling in mine units under restoration. No unusual conditions were identified during this review

c. Wellfield and Excursion Monitoring

License Condition 11.2 specifies the monitoring well sampling requirements and the criteria for placing a well on excursion status. NRC staff reviewed groundwater sampling records from September 2007, through July 2008. NRC staff reviewed groundwater monitoring data to determine if the licensee was correctly identifying and reporting excursions. The inspectors selected monitoring data at random and examined the reports to confirm the licensee's automated excursion reporting system was functioning properly and to identify any excursions that were not reported. Data from known excursions was also reviewed to ensure that the monitoring frequency had been increased according to License Condition 11.2 requirements. The inspectors concluded that the licensee was correctly identifying and reporting excursions. For example, the system correctly identified the excursions at CM9-3 and -5.

The NRC staff reviewed the spill records for the past 12 months. According to the licensee's records, 21 spills occurred resulting in a total of 10,574 gallons of unrecovered fluids. Of the total unrecovered volume, 1,463 gallons was production fluid. During the inspection, NRC staff noted fluid leaking from a production well union in Wellhouse 47. This potential problem was pointed out to the licensee for correction.

The NRC staff reviewed recent mechanical integrity test (MIT) documentation to determine if test results were being appropriately reported and the tests were being properly performed. Staff observed that the test results for a few wells indicated that the wells were close to failing the test. For example, the final pressure in wells 1754, 1784, and 1798 was 113 pounds per square inch (psi) with passing being 112.5 psi. NRC staff asked the licensee if any problems occurred when a well passed at a pressure of 113 psi. They stated that no subsequent failures have occurred when a well passed at 113 psi. Staff determined that the licensee was properly performing and documenting the MIT tests.

License Condition 10.2 requires that every injection and production well be retested every 5 years. The licensee notified NRC staff, by email dated May 1, 2008, that it had missed several 5-year MIT retests due to the corruption of its MIT database. The failure to retest all wells within 5 years was identified as a violation of License Condition 10.2 (NCV 04008943/0801-01). However, this non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VI.A.8 of the NRC Enforcement Policy. The licensee's corrective measures included rectifying the computer error and mobilizing its available MIT units to test the missed wells. No MIT failures occurred as a result of this self-identified violation, and the staff determined that the corrective measures were satisfactory.

#### 4.3 Conclusions

The licensee conducted environmental monitoring in accordance with license requirements. The licensee did not release licensed material into the environment in quantities exceeding regulatory limits. Wells were being sampled in accordance with site procedures. One Non-Cited Violation was identified involving the licensee's failure to conduct MITs.

### **5 Transportation of Radioactive Materials and Radioactive Waste Management (86740, 88035)**

#### 5.1 Inspection Scope

Determine if transportation and waste disposal activities were being conducted in compliance with license requirements.

#### 5.2 Observations and Findings

License Condition 9.7 specifies, in part, that the licensee dispose of 11e. (2) byproduct material at a site licensed to receive such material. The inspectors confirmed that the licensee had a current disposal agreement with Pathfinder Mines Corporation, which expires July 31, 2009. The licensee made seven shipments to Pathfinder during August 2007, and the licensee maintained records of these waste disposal shipments. The shipments were consistent with the terms of the agreement.

The licensee maintained records of yellowcake shipments. The shipping papers were compared to the requirements of 49 CFR 172.202 and 172.203. The inspectors randomly reviewed yellowcake shipment records from September 2007, to June 2008. All required information was presented on the shipping papers.

#### 5.3 Conclusions

The licensee was conducting transportation and waste disposal operations in accordance with license and regulatory requirements.

### **6 Exit Meeting Summary**

The inspectors presented the preliminary inspection results to the licensee's representatives at the conclusion of the onsite inspection on July 17, 2008. A final exit briefing was conducted by telephone with the licensee on August 5, 2008.

Representatives of the licensee acknowledged the findings as presented. During the inspection, the licensee did not identify any information reviewed by the inspectors as proprietary.

## SUPPLEMENTAL INSPECTION INFORMATION

### Partial List of Persons Contacted

#### Licensee

D. Crawford, Manager, Project Development  
R. Grantham, Radiation Safety Officer  
J. Stokey, Mine Manager  
L. Teahon, Manager, Health Safety and Environmental

### Items Opened, Closed, and Discussed

#### Open

04008943/0801-01 NCV Failure to perform 5 year mechanical integrity tests

#### Closed

04008943/0801-01 NCV Failure to perform 5 year mechanical integrity tests

#### Discussed

None

### Inspection Procedures Used

IP 83822	Radiation Protection
IP 86740	Transportation of Radioactive Material
IP 87102	Maintaining Effluents from Materials Facilities ALARA
IP 88005	Management Organization and Controls
IP 88035	Radioactive Waste Management
IP 88045	Effluent Control and Environmental Protection
IP 89001	In-Situ Leach Facilities

### List of Acronyms Used

ALARA	As Low As Reasonably Achievable
CPP	Central Processing Plant
IP	Inspection Procedure
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
psi	pounds per square inch
SERP	Safety and Environmental Review Panel

ATTACHMENT