

**CAMECO RESOURCES
CROW BUTTE OPERATION**



**86 Crow Butte Road
P.O. Box 169
Crawford, Nebraska 69339-0169**

**(308) 665-2215
(308) 665-2341 - FAX**

April 3, 2018

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

40-8943

Attn: Document Control Desk, Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Request for Alternate Decommissioning (Groundwater Restoration) Schedule
License SUA-1534 (November 2014)

Dear Director:

In accordance with 10 CFR 40.42 and 10 CFR 40.44, Cameco Resources, Crow Butte Operation is submitting a license amendment request on NRC Form 313 for an alternate decommissioning (groundwater restoration) schedule for MUs 2-6. The schedule changes reflect current projections for completion of restoration activities in these mine units.

Enclosed is a license amendment request on NRC Form 313 for an alternate decommissioning schedule for MUs 2-6.

If there are any further questions or concerns feel free to contact me at (308) 665-2215 ext. 122.

Sincerely,

Bob Tiensvold
Restoration Manager

Enclosure

NM5501

**CAMECO RESOURCES
CROW BUTTE OPERATION**



Document Control Desk, Director
April 3, 2018
Page 2

cc: Deputy Director
Division of Decommissioning
Uranium Recovery and Waste Programs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Mail Stop T-8F5
11545 Rockville Pike
Two White Flint North, Rockville, MD 20852-2738

CBO- File

ec: CR-Electronic File

NRC FORM 313 U.S. NUCLEAR REGULATORY COMMISSION
 (M-YYYY)
 10 CFR 30, 32, 33,
 34, 35, 36, 39, and 40

APPLICATION FOR MATERIALS LICENSE

APPROVED BY OMB: NO. 3150-0120 **EXPIRES: (MM/DD/YYYY)**

Estimated burden per response to comply with this mandatory collection request: 4.3 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Information Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

OFFICE OF FEDERAL & STATE MATERIALS AND ENVIRONMENTAL MANAGEMENT PROGRAMS
 DIVISION OF MATERIALS SAFETY AND STATE AGREEMENTS
 U.S. NUCLEAR REGULATORY COMMISSION
 WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA,

SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
 DIVISION OF NUCLEAR MATERIALS SAFETY
 U.S. NUCLEAR REGULATORY COMMISSION, REGION I
 475 ALLENDALE ROAD
 KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN,
SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
 U.S. NUCLEAR REGULATORY COMMISSION, REGION III
 2443 WARRENVILLE ROAD, SUITE 210
 LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING,

SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
 U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
 1600 E. LAMAR BOULEVARD
 ARLINGTON, TX 76011-4511

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR (Check appropriate item)

A. NEW LICENSE

B. AMENDMENT TO LICENSE NUMBER SUA-1534

C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT (Include ZIP code)

Doug Pavlick, General Manager of U. S. Operations
 Cameco Resources
 P.O. Box 1210
 Glenrock, WY 82637

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Crow Butte Resources, Inc.
 86 Crow Butte Road
 P.O. Box 169
 Crawford, NE 69339

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Doug Pavlick

BUSINESS TELEPHONE NUMBER (307) 358-6541	BUSINESS CELLULAR TELEPHONE NUMBER (308) 430-1908
BUSINESS EMAIL ADDRESS doug_pavlick@cameco.com	

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
 a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY	AMOUNT ENCLOSED \$
--------------	--------------------

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE

Doug Pavlick General Manager of U.S. Operations

SIGNATURE



DATE

4-3-18

FOR NRC USE ONLY					
TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			\$		
APPROVED BY				DATE	

**CAMECO RESOURCES
CROW BUTTE OPERATION**



**86 Crow Butte Road
P.O. Box 169
Crawford, Nebraska 69339-0169**

**(308) 665-2215
(308) 665-2341 - FAX**

**Attachment to NRC Form 313
Request for License Amendment**

Request to Amend License Condition 10.6
Alternate Decommissioning (Groundwater Restoration) Schedule
License SUA-1534 (November 2014)

Based on the conditions that are included in the following summary of the restoration activities, CBO is requesting a revision to the approved restoration dates and an amendment to License Condition 10.6.

Mine Unit #2

History

The restoration plan for this mine unit was submitted to NDEQ on December 5, 1995 and was approved by NDEQ in a letter dated December 15, 1995. Injection of lixiviant into this mine unit ceased on January 2, 1996. Since that time period, the mine unit has been in IX and RO treatment and stability monitoring with the following exception.

On August 9, 2007 the entire restoration circuit was shut down so that changes could be made to increase the flow through IX and RO treatment. During this time period the mine unit was in recirculation to maintain a hydrologic bleed until April 1, 2009, when IX treatment resumed in this mine unit. On May 26, 2009, the RO circuit was restarted and this mine unit was placed back into RO treatment.

In February 2009, Crow Butte contracted with a third party hydrogeologist to develop a restoration flow model for Mine Units 2 through 5. The groundwater flow at the facility was simulated using MODFLOW2000, a three-dimensional groundwater flow model developed by the United States Geological Survey. The groundwater flow model was calibrated to pre-mining conditions using water level data collected prior to the mining activities in January 1983. Initial estimates of aquifer properties and boundary water levels were adjusted slightly as part of the model calibration process in order to achieve the best possible match between observed and simulated water levels. The calibrated groundwater flow model is currently being used to optimize restoration in Mine Units 2 through 5 given certain practical limitations on treatment rates, disposal capacity, and existing well injection and extraction rates. The model is calibrated periodically to reflect current mine conditions. Based on this model, eight additional restoration wells were installed to remediate the excursion of lixiviant along the perimeter monitor wells PR-8,



Document Control Desk, Director
April 3, 2018
Page 2

PR-15, and IJ13-P. On February 1, 2010 the Safety Environmental Review Panel approved the startup of these additional wells. Based on these conditions, it was estimated that Mine Unit 2 would be placed into stability monitoring by July 1, 2012. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 2 by July 1, 2012.

Current Status

On May 23, 2013, CBO submitted to the Nebraska Department of Environmental Quality (NDEQ) data supporting the successful restoration of the groundwater in Mine Unit #2. By letter June 10, 2013, the NDEQ indicated that the data had been reviewed and determined that stabilization could begin. Stability monitoring and sampling was initiated in June 2013 and continued through September 2014. The data indicates that all the monitored constituents have stabilized and have been returned to the approved NDEQ restoration standards. However, a few of the monitored constituents do not meet the concentration limits under 10 CFR 40, Appendix A, Criterion 5B(5). As a result of this, CBO has collected coring data from this mine unit and anticipates submitting an application requesting an alternate concentration limit (ACL) for these constituents. Because of the small size, geographic proximity, and similar water quality between Mine Unit #2 and Mine Unit #3, CBO plans to prepare and submit the ACL application for these mine units together, which will defray significant cost in preparation of the submittal. CBO projects that this application will be submitted during the fourth quarter of 2020 and that regulatory review will be completed by the fourth quarter of 2022.

Mine Unit #3

History

The restoration plan for this mine unit was submitted to NDEQ on March 24, 1999 and was amended and approved by NDEQ in a letter dated February 13, 2008. Injection of lixiviant into this mine unit ceased on July 22, 1999. Since that time period, the mine unit has been in IX and RO treatment and stability monitoring with the following exception.

On August 9, 2007 the entire restoration circuit was shut down so that changes could be made to increase the flow through IX and RO treatment. During this time period the mine unit was in recirculation to maintain a hydrologic bleed until April 1, 2009, when IX treatment resumed in this mine unit. On May 26, 2009, the RO circuit was restarted and this mine unit was placed back into RO treatment.

CAMECO RESOURCES CROW BUTTE OPERATION



Document Control Desk, Director
April 3, 2018
Page 3

In February 2009, Crow Butte contracted with a third party hydrogeologist to develop a restoration flow model for Mine Units 2 through 5. The groundwater flow at the facility was simulated using MODFLOW2000, a three-dimensional groundwater flow model developed by the United States Geological Survey. The groundwater flow model was calibrated to pre-mining conditions using water level data collected prior to the mining activities in January 1983. Initial estimates of aquifer properties and boundary water levels were adjusted slightly as part of the model calibration process in order to achieve the best possible match between observed and simulated water levels. The calibrated groundwater flow model is currently being used to optimize restoration in Mine Units 2 through 5 given certain practical limitations on treatment rates, disposal capacity, and existing well injection and extraction rates. The model is calibrated periodically to reflect current mine conditions. Based on this model, eight additional restoration wells were installed to remediate the excursion of lixiviant along the perimeter monitor wells PR-8, PR-15, and IJ13-P. On February 1, 2010 the Safety Environmental Review Panel approved the startup of these additional wells.

Based on these conditions, it was estimated that Mine Unit 3 would be placed into stability monitoring by July 1, 2013. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 3 by July 1, 2013.

On May 23, 2013, CBO submitted to the Nebraska Department of Environmental Quality (NDEQ) data supporting the successful restoration of the groundwater in Mine Unit #3. By letter June 10, 2013, the NDEQ indicated that the data had been reviewed and determined that stabilization could begin. Stability monitoring and sampling was initiated in June 2013 and continued through September 2014. The data indicates that all the monitored constituents have stabilized and have been returned to the approved NDEQ restoration standards. However, a few of the monitored constituents do not meet the concentration limits under 10 CFR 40, Appendix A, Criterion 5B(5). As a result of this, CBO has collected coring data from this mine unit and anticipates submitting an application requesting an ACL for these constituents.

Current Status

On September 15, 2017, spot treatment of P246 in Mine Unit 3 was reinitiated after in-house samples indicated that the uranium levels in the well had increased significantly. Additional sampling indicated that the likely source of the elevated uranium levels in the well was an incursion of solutions from neighboring Mine Unit 7. In addition to spot treating the well, CBO initiated a conductivity monitoring program utilizing downhole trolls around the Mine Unit 2 and 3 perimeters that interface with active Mine Units 4, 5, and 7. CBO anticipates that spot treatment of P246 will be completed by the end of the



Document Control Desk, Director
April 3, 2018
Page 4

third quarter of 2020, and an ACL application will be submitted during the fourth quarter of 2020 with regulatory review finished during the fourth quarter of 2022.

Mine Unit #4

History

The restoration plan for this mine unit was submitted to NDEQ on March 4, 2003 and was approved by NDEQ in a letter dated August 26, 2003. Injection of lixiviant into this mine unit ceased on October 31, 2003. Since that time period the mine unit has been in IX and RO treatment with the same exceptions as Mine Unit 2. On April 1, 2009, IX and RO treatment was resumed in this mine unit. Based on these conditions, it was estimated that Mine Unit 4 would be placed into stability monitoring by January 1, 2015. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 4 by January 1, 2015.

Current Status

The mine unit is currently in IX and RO treatment. Based on the MODFLOW2000 model, stability monitoring of the mine unit should begin in the first quarter of 2019. If an ACL is required, CBO anticipates this submitting the application during the first quarter of 2021. It is estimated that the regulatory review will be completed during the first quarter of 2023.

Mine Unit #5

History

The restoration plan for this mine unit was submitted to NDEQ on July 9, 2007 and was approved by NDEQ in a letter dated August 6, 2007. Injection of lixiviant into this mine unit ceased on August 14, 2007. Since that time period the mine unit has been in IX and RO treatment with the same exceptions as Mine Unit 2. On April 1, 2009, IX and RO treatment was resumed in this mine unit. Based on these conditions, it was estimated that Mine Unit 5 would be placed into stability monitoring by July 1, 2016. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 5 by July 1, 2016.

Current Status

The mine unit is currently in IX and RO treatment. Based on the MODFLOW2000 model, stability monitoring of the mine unit should begin in the first quarter of 2019. If an ACL is required, CBO anticipates this submitting the application during the first

**CAMECO RESOURCES
CROW BUTTE OPERATION**



Document Control Desk, Director
April 3, 2018
Page 5

quarter of 2021. It is estimated that the regulatory review will be completed during the first quarter of 2023.

Mine Unit #6

History

On October 28, 2010, CBO permanently ceased injection of lixiviant into the mine unit. By letter dated December 21, 2010, CBO provided notice of cessation of mining in Mine Unit #6. As specified in 10 CFR Part 40.42(h)(1), CBO must also complete mine unit restoration within 24 months after restoration is initiated. If the mine unit requires more than 24 months to complete, CBO must notify the NRC and request an alternate schedule for completion of decommissioning, along with adequate justification for the request. The following table was submitted displaying the schedule and timeline for the various phases of restoration for the mine unit.

<u>IX Treatment</u> November 1, 2010 through June 30, 2014 (3 pore volumes)	<u>Flow</u> 100 GPM
<u>RO Treatment</u> July 1, 2014 through June 30, 2016 (6 pore volumes)	400 GPM
<u>Recirculation</u> July 1, 2016 through December 31, 2014 (2 pore volumes)	200 GPM
<u>Stability and Regulatory Approval</u> January 1, 2018 through December 31, 2019	N/A

Current Status

In reviewing the currently approved alternate decommissioning schedule, it appears that the timelines CBO proposed for Mine Unit 5 and 6 may have been switched. Mine Unit 6 is currently in IX and RO treatment. Based on the MODFLOW2000 model, stability of the mine unit should begin during the first quarter of 2021. If an ACL is required, CBO anticipates submitting the application during the first quarter of 2023. It is estimated that the regulatory review will be completed during the fourth quarter of 2024.

Conclusion

Attached is a schedule that displays the timeline for the various phases of restoration for each mine unit. This schedule is based on the flow capacity through the IX and RO circuits, the volume of waste water generated in these circuits, the pore volume of each mine unit and regulatory review. The size of the mine units, flow and piping capacity of

**CAMECO RESOURCES
CROW BUTTE OPERATION**



Document Control Desk, Director
April 3, 2018
Page 6

the restoration circuit, deepwell disposal capacity, and the need to maintain a hydrologic balance between the mining and restoration units creates a technical barrier for restoring each mine unit in a two year period. CBO believes that the alternate schedule is technically feasible and will not be detrimental to the public health and safety and is otherwise in the public interest.

