

## **APPENDIX A**

### **Responses to NRC Requests for Additional Information (RAI) Cumulative Impacts**

## TABLE OF CONTENTS

RAI CI-1.....	1
RAI CI-1 Response.....	2

### List of Tables

Table 1: Powder River Basin EIS's .....	3
Table 2: Past, Existing, and Potential Uranium Recovery Sites Within 50-miles of the Proposed Ludeman Project .....	5
Table 3: Wyoming Coal Mines Near the Proposed Ludeman Project.....	7

**RAI CI-1**

***Please provide additional information on the cumulative-impact analysis contained in Section 4.14 of the ER.***

- A. Please state explicitly the geographic and temporal parameters used to develop the scope of the cumulative-impact assessment.*
- B. Please define the geographic boundaries of the areas that were used in ER Section 4.14 for each resource area to assess the respective cumulative impacts, and please explain why these areas were selected. Explain how these choices compare with the criteria from Section 5 and Appendix F of the Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (GEIS) (NUREG-1910 Volume 2, ADAMS Accession No. ML091480188).*
- C. Please identify and describe reasonably foreseeable future actions (RFFA) that could potentially contribute to the impacts of the proposed Ludeman Project in addition to available information regarding the schedule for development of identified actions.*
- D. Please provide quantitative information about each past, present, and reasonably foreseeable action that was used by Uranium One to assess cumulative impacts for each resource area. For example, the volume of waste disposed of by deep-well injection at other ISR facilities located within a defined geographic area must be clarified so that a comparison of the volume projected to be disposed of at the Ludeman Project can be made. For transportation, the traffic to and from other present projects and RFFA within the transportation cumulative-impact geographic area must be quantified. This will allow comparison of the Project's baseline conditions with any traffic increases as a result of the Ludeman Project.*

*In order for the NRC to assess the cumulative impacts of past, present, and RFFA under Section 5 of the GEIS, the geographic boundaries (i.e., scope) of each area must be explicitly established for every resource area as noted in Step 2 of the 11-step process established by the Council on Environmental Quality and included as Appendix F to the GEIS. A discussion of RFFA must be included in all cumulative-impact analyses. Analyses of cumulative impacts must be based upon, to the extent possible, quantitative comparisons between the projected impacts from the Ludeman Project and the cumulative impacts of other actions in the defined geographic and temporal scope for each resource area. Additional detail on the impacts of these actions will assist in the NRC's environmental impact analysis.*

**RAI CI-1 (A) (B) (C) (D) Response**

The following Cumulative Impact discussion will be inserted into ER Sec. 4:

The Powder River Basin within the Wyoming East Uranium Milling Region is the primary focus of this cumulative impacts review. The Powder River Basin is chosen as it most closely correlates to EIS's within the region and allows for the inclusion of the impacts available through these EIS's. The temporal extent of the cumulative impact assessment ranges from approximately 25 years ago through the reasonably foreseeable future. Uranium One has provided the following discussion within the ER impacts section and this response to impart additional detail for the NRC's assessment of potential cumulative impacts:

**Other Past, Present, and Reasonably Foreseeable Future Actions**

The Proposed Project area is located at the southern end of the PRB, which covers an approximately 10,000-mi<sup>2</sup> area and spans large portions of northeastern Wyoming and southeast Montana. In comparison, the proposed activities at the Proposed Project will potentially affect less than 0.001 percent of the area within the PRB. This area holds the largest deposits of coal in the United States, as well as significant reserves of uranium and other natural resources such as oil and gas. As such, there has been, and continues to be, substantial extraction activities throughout the PRB. CBM extraction continues to be the most prolific mining activity in the region and is a form of natural gas extraction from coal beds.

Another indicator of present and reasonably foreseeable future actions is the number of draft and final EISs Federal agencies have prepared within the past five years. Using information in NUREG-1910 (GEIS, Section 5.2.2) and the EPA EIS database (EPA, 2012), several EISs were identified for the PRB (see Table 1). These projects potentially could contribute to both local and regional cumulative impacts on several resources.

The various past, present, and reasonably foreseeable future actions in the vicinity of the Proposed Project are discussed separately, as follows.

**Table 1: Powder River Basin EIS's**

Date	Agency	Report	Title
4/13/2007	BLM	Final EIS	Maysdorf Coal Lease by Application (LBA) Tract, (Federal Coal Application WYW154432), Implementation, Campbell Counties, WY
8/17/2007	USFS	Final EIS	Thunder Basin Analysis Area Vegetation Management, To Implement Best Management Grazing Practices and Activities, Douglas Ranger District, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Campbell, Converse and Weston Counties, WY
8/31/2007	BLM	Final EIS	Eagle Butte West Coal Lease Application, Issuance of Lease for a Tract of Federal Coal, Wyoming Powder River Basin, Campbell County, WY
12/19/2008	BLM	Final EIS	West Antelope Coal Lease Application (Federal Coal Lease Application WYW163340), Implementation, Converse and Campbell Counties, WY
8/17/2009	BLM	Final EIS	South Gillette Area Coal Lease Applications, WYW172585, WYW173360, WYW172657, WYW161248, Proposal to Lease Four Tracts of Federal Coal Reserves, Belle Ayr, Coal Creek, Caballo, and Cordero Rojo Mines, Wyoming Powder River Basin, Campbell County, WY
10/16/2009	UDFS	Final EIS	Thunder Basin National Grassland Prairie Dog Management Strategy, Land and Resource Management Plan Amendment #3, Proposes to Implement a Site-Specific Strategy to Manage Black Trailed Prairie Dog, Douglas Ranger District, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Campbell, Converse, Niobrara and Weston Counties, WY
7/30/2010	BLM	Final EIS	Wright Area Coal Lease Project, Applications for Leasing Six Tracts of Federal Coal Reserves Adjacent to the Black Thunder, Jacob Ranch, and North Antelope Rochelle Mines, Wyoming Powder River Basin, Campbell County, WY
8/27/2010	NRC	Final SEIS	Moore Ranch In-Situ Uranium Recovery (ISR) Project, Proposal to Construct, Operate, Conduct Aquifer Restoration, and Decommission an In-Situ Recovery (ISR) Facility, NUREG-1910, Campbell County, WY
1/28/2011	NRC	Final SEIS	Nichols Ranch In-Situ Uranium Recovery (ISR) Project, Proposal to Construct, Operate, Conduct Aquifer Restoration, and Decommission and In-Situ Recovery Uranium Milling Facility, Campbell and Johnson Counties, WY
9/16/2011	USFS	Final EIS	Livestock Grazing and Vegetation Management on Five Project Area, Proposes to Continue to Authorize Livestock Grazing, Tongue, Medicine Wheel/Paintrock, and Power River Districts of the Bighorn National Forest, Johnson, Sheridan, Big Horn and Washakie Counties, WY

Source: U.S. Environmental Protection Agency, 2011

### Uranium Recovery Sites

Wyoming has been the nation's leading producer of uranium since 1995, and also hosts the nation's largest uranium reserves (WSGS 2010). The ISR GEIS identifies four uranium milling regions: the Wyoming West Region, Wyoming East Region, Nebraska-South Dakota-Wyoming Region, and Northwestern New Mexico. Numerous uranium recovery sites, both potential and existing, are present in these regions. These projects are in various stages of development, and are discussed within the context of cumulative impacts based on available information.

Currently, there are other NRC licensed ISR facilities located within 50 miles of the Proposed Project. Wyoming currently has two producing uranium ISR operations, the Smith Ranch-Highland Project and the Willow Creek Project operated by Cameco Resources Inc. and Uranium One, respectively. In addition, several other ISR operations are in various stages of licensing and construction and are anticipated to go into operation within the next ten years, as shown in Table 2. This table lists known past, existing, and potential uranium recovery sites within 50 miles of the Proposed Project including their current status and distance from the Proposed Project area.

As indicated in Table 2, there are two conventional uranium milling sites that are in the decommissioning process, Bear Creek and Highlands, and a Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I (reclamation work at inactive tailings site) site, the Spook site. The Bear Creek Uranium Recovery Project (Bear Creek) is owned by Bear Creek Uranium Company and is located approximately 15 miles north of the proposed facility. Highlands (Highlands) Uranium Recovery Facility is owned by Exxon Mobil Corporation and is located in Converse County, Wyoming, approximately 10 miles north of the Proposed Project site. Both the Bear Creek and Highlands site decommissioning activities have been performed under NRC license.

**Table 2: Past, Existing, and Potential Uranium Recovery Sites Within 50-miles of the Proposed Ludeman Project**

Site Name	Company/Owner	Type	County, State	Status Code†	Approximate Distance in mi (km)	Direction
Allemand-Ross	Uranium One	ISR-Expansion	Johnson, WY	1	30.1 (48.4)	NNW
Bear Creek	Bear Creek Uranium Co.	Conventional	Converse, WY	Decommissioning	25.1 (40.3)	N
Collins Draw	Uranerz Energy Corp.	ISR	Campbell, WY	1	50.4 (81.1)	NW
Highland Ranch	Exxon-Minerals	Conventional	Converse, WY	Decommissioning	10.7 (17.1)	NNE
Moore Ranch	Uranium One	ISR-Expansion	Campbell, WY	4	41.2 (66.3)	NNW
Reynolds Ranch	Cameco Resources, Inc.	ISR-Expansion	Converse, WY	4	14.8 (23.8)	N
Reno Creek	AUC, Inc.	ISR	Campbell, WY	2	49.5 (79.6)	N
Smith Ranch-Highland Ranch	Cameco Resources, Inc.	ISR-Expansion	Converse, WY	4	10.7 (17.1)	NNW
Spook	DOE	Conventional	Converse, WY	UMTRCA Title I disposal site	22.5 (36.2)	N
Ruth	Cameco Resources, Inc.	ISR	Johnson, WY	Not operating	50.6 (81.4)	NW

†= Code indicating the status of the application where: (1)=Not Received, (2)=Acceptance Review Ongoing, (3)=Technical Review Ongoing, and (4)=Licensing Action Completed. Source: NRC 2013

The UMTRCA Title I program established a joint Federal/State-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Under Title I, the U.S. Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet the EPA standards. In 1993, DOE became a licensee of NRC under the general license provisions of 10 CFR 40.28. This occurred after NRC concurred in the completion of construction and surface cleanup at the Spook, Wyoming inactive tailings site and accepted DOE's plan for long-term surveillance and maintenance at the Spook site. The Spook facility is located in Converse County, Wyoming, and is approximately 22 miles north of the Proposed Project.

### Coal Mining

The Powder River Regional Coal Team (PRRCT) decertified the Powder River Federal Coal Region as a Federal coal production region in 1990, which allowed leasing to occur in the region on an application basis. Because of decertification, U.S. coal production increased 11 percent, from 1.14 billion tons in 1990 to 1.27 billion tons in 2007 (BLM, 2009e). Between 1990 and 2008, the BLM Wyoming State Office held 25 competitive lease sales and issued 19 new Federal coal leases containing more than 5.7 billion tons of coal using the “lease by application” process (BLM, 2005a,b,c). In 2003, PRB coal mines produced 363 million tons of coal. These mines make up more than 96 percent of the coal produced in Wyoming each year (BLM, 2005a,b,c). In 2003, the cumulative disturbed land area of the PRB attributable to coal mines totaled nearly 70,000 acres. Reasonably foreseeable future development projects for cumulative disturbed land area range from 47,400 to 117,000 to 125,000 acres in the year 2015, under estimated low and high production scenarios, respectively. Other development related to coal includes railroads, coal-fired power plants, major (230 kV) transmission lines, and coal technology projects. The total land area of other coal-related disturbance in the PRB in 2003 was nearly 5,000 acres.

Table 3 lists coal mines near the Proposed Project in Wyoming. The Wyoming East Uranium Milling Region has 14 surface mines. Surface mining of coal can potentially cause adverse impacts to land use, geology and soils, water resources, ecology, air quality, noise, historic and cultural resources, visual and scenic resources, socioeconomics, and byproduct material management.



**Table 3: Wyoming Coal Mines Near the Proposed Ludeman Project**

Site Name	Company/Owner	Type	County, State	Production in millions of tons	Approximate Distance in mi (km)	Direction
Antelope	Cloud Peak Energy, LLC	Surface	Converse, WY	34.3 (2012)	25 (40)	NE
Buckskin	Buckskin Mining Co.	Surface	Campbell, WY	25.5 (2011)	68 (109)	NNE
Belle Ayr	Alpha Coal West Inc.	Surface	Campbell, WY	25.8 (2010)	80 (129)	NNE
Black Thunder	Thunder Basin Coal Co. LLC	Surface	Campbell, WY	104.9 (2011)	67 (108)	NE
Caballo	Peabody Powder River Operations, LLC	Surface	Campbell, WY	16.8 (2012)	75 (121)	NNE
Coal Creek	Thunder Basin Coal Co. LLC	Surface	Campbell, WY	10 (2011)	75 (121)	NE
Cordero Rojo Complex	Cloud Peak Energy, LLC	Surface	Campbell, WY	39.2 (2012)	78 (126)	NNE
Dave Johnston	Glenrock Coal Co.	Surface	Converse, WY	Reclaimed-no production since 2000	29 (47)	NW
Dry Fork	Western Fuels of Wyoming, Inc.	Surface	Campbell, WY	6.8 (2011)	99 (159)	NNE
Eagle Butte	Alpha Coal West Inc.	Surface	Campbell, WY	23.2 (2010)	99 (159)	NNE
KFX plant/Fort Union	Evergreen Energy	Surface	Campbell, WY	0 (2010)	97 (156)	NNE
North Antelope Rochelle	Peabody Powder River Operations, LLC	Surface	Campbell, WY	98.1 (2011)	69 (111)	NE
Rawhide	Peabody Powder River Operations, LLC	Surface	Campbell, WY	14.7 (2012)	100 (161)	NNE
Wyodak	Wyodak Resources Develop. Corp.	Surface	Campbell, WY	5.7 (2011)	96 (155)	NNE

Source: WMA and individual mine company web sites

### Conventional Oil and Gas Production

By the end of 2007, there were approximately 3,857 producing conventional oil and gas wells in the Wyoming PRB study area plus an estimated 1,500 seasonally active wells (IHS 2008). These are evenly dispersed throughout the entire PRB. WOGCC reported that these wells produced approximately 11.4 million barrels of oil and 22 billion ft<sup>3</sup> of conventional gas in 2007 (WOGCC 2008).

Most of Wyoming's current oil production is from old oil fields with declining production. The level of exploration drilling to discover new fields has been low (BLM, 2008a). From 1992 to 2002, oil production from conventional oil and gas wells in Campbell and Converse Counties within the PRB decreased approximately 60.4 percent. Oil- and gas-related development includes major transportation pipelines and refineries. In 2003, the cumulative disturbed land area in the PRB from oil and gas, CBM, and related development was nearly 188,000 acres. Increasing development associated with extraction of these energy resources will result in a total of 305,000 acres under development by 2015 (BLM, 2005a, b, c). The depth to producing gas and oil-bearing horizons generally ranges from 4,000 to 13,500 feet, but some wells are as shallow as 250 feet (BLM, 2005a, b, c).

### Coal Bed Methane Development

Natural gas production has been increasing in Wyoming. In the PRB, this is from the development of shallow CBM resources. Annual CBM production in the PRB increased rapidly between 1999 and 2003, with nearly 15,000 producing CBM wells in the PRB in 2003 and a total production volume of 364 billion ft<sup>3</sup> (BLM, 2005 a, b, c). In 2007, CBM production within Campbell County was 167,000 million ft<sup>3</sup> (BLM, 2009h). The BLM Buffalo Field Office, which administers the area where the Proposed Project is located, has processed approximately 3,000 applications for permits to drill since 2003; more than 98 percent of these applications are for CBM recovery (BLM, 2009i).

The recovery of CBM involves the installation of facilities that include access roads; pipelines for gathering gas and produced water; electrical utilities; facilities for measuring and compressing recovered gas; facilities for treating, discharging, disposing of, containing, or injecting produced water; and pipelines to transport gas high-pressure transmission pipelines. The wells are located on a well pad installed in an 80 acres spacing pattern (eight pads per square mile). The overall life of each well is

approximately seven to 10 years after which pipes are abandoned in place and well sites are reclaimed (NRC, 2010).

### Wind Power

There is strong interest from consumers, investor-owned utilities, and environmental and economic sustainability interests in wind energy generating projects and other forms of renewable energy projects. The current development interest in wind energy generation is driven in part by mandates for many utilities to increase the use of renewables in their overall energy portfolio, decisions by environmentally conscious firms to use renewable energy sources, and also due to the development of wind energy manufacturing infrastructure in the region.

Wind power facilities have been proposed, are being constructed, and are providing energy at various sites in Wyoming, including the PRB region. There is good potential for wind power, and these facilities can contribute to meeting forecasted electric power demands; however, they are dependent on available transmission capacity to send power to users. Although many Wyoming locations having the highest potential are in the southern portion of the state, areas in both Campbell and Converse counties offer sufficient potential to support commercial-scale wind generation projects including:

- Glenrock Wind Farm, is currently providing power in the Wyoming PRB. PacifiCorp completed construction of the three phase project in 2009. The wind farm is located approximately 8 miles west on and near the reclaimed Dave Johnston Coal Mine and consists of 92- 15 MW wind turbines (Pacific Corp 2011);
- Duke Energy (dba Three Buttes Windpower, LLC) completed the Campbell Hill Windpower Project and began commercial operations in December 2009. The Campbell Hill Windpower Project is located approximately 15 miles northeast of Casper in Converse County and consists of 66 wind turbines generating 99 MW; and
- Duke Energy built the Top of the World Wind Energy Project, a 200-MW wind farm consisting of 110 turbines located approximately 12 miles northwest of the Proposed Project area (Duke Energy 2011).

Land use disturbance for wind energy projects is associated with development of access roads, a turbine assembly pad, and foundation pad for each wind turbine tower.

Additional land disturbance results from installation of transformers and substations, underground electric and fiber optic communications cables, one or more operations and maintenance facilities, meteorological towers, and a transmission line connecting the project to the regional grid. Much of the disturbance area is reclaimed immediately following construction, with long-term disturbance associated with permanent facilities (i.e., access roads, support facilities, and tower foundations).

### Other Mining

Sand, gravel, bentonite, and clinker (or scoria) have been and are being mined in the PRB. There is also potential for rare earth elements near Sundance, Wyoming.

Bentonite is weathered volcanic ash that is used in a variety of products, including drilling mud and cat litter, because of its absorbent properties. There are three major bentonite-producing districts in and around the PRB: the Colony District in the Northern Black Hills, the Clay Spur District in the Southern Black Hills, and the Kaycee District west of Kaycee, Wyoming.

Aggregate, which consists of sand, gravel, and stone, is used in the construction purposes. In the PRB, the largest identified aggregate operation is located in northern Converse County. It has an associated total disturbance area of approximately 67 acres, of which four acres have been reclaimed.

Scoria, or clinker, is used as aggregate where alluvial terrace gravel or in-place granite/igneous rock is not available. Scoria generally is mined in Converse and Campbell Counties in the PRB (BLM, 2005a, b, c).

Rare Earth Elements, Ltd has delineated rare earth elements-thorium deposits in the southern Bear Lodge Mountains about five-miles northwest of Sundance in Crook County. There are no recognized cumulative impacts associated with a potential rare earth elements mine due to the distance from the Proposed Project area.

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