

**USNRC APPLICATION**  
**SUA-1341 License Amendment**  
**Ludeman Project**  
**Converse County, WY**



**June 2015**



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Appendix A: Cumulative Impacts

## **RAI Response Explanation**

Uranium One is pleased to provide this Environmental Report response package to the NRC staff's Request for Additional Information (RAI) in a letter dated December 18, 2014. Included in this package is each RAI followed by Uranium One's response. Any response which quotes specific existing application language will highlight that language in quotations. Specific text revisions or new additional language within the application will be highlighted in the color red. All responses which detail revisions or additional language to the application will clearly list the appropriate application location where those changes will be made.



## **General Follow-Up RAIs**

### ***Round 2 GEN-1***

*Please provide specific data/information to conduct site-specific air quality impact assessment.*

### **Round 2 GEN-2 Response**

Uranium One has revised TR Section 7 and ER Section 4 to reflect potential site-specific air quality impacts as shown below. When combined with the response detailed in AQ-2 of this ER Response Package, Uranium One believes its initial assessment of SMALL air quality impacts remains accurate.

### **Technical Report**

#### **“7.1.1 Potential Air Quality Effects of Construction**

Construction activities at satellite facilities such as the proposed Ludeman Project site will potentially cause minimal short-term effects on local air quality. Increased suspended particulates from vehicular traffic on unpaved roads, fugitive dust caused by wind erosion of areas cleared of vegetation, and diesel emissions from construction equipment will be the primary potential air quality impacts. The application of water to unpaved roads will reduce the amount of fugitive dust to levels equal to or less than the existing condition. Diesel emissions from construction equipment are expected to be short term only, essentially ceasing once the operational phase begins. Additional details on potential air quality impacts can be found in Section 4.6 of the ER.

#### **7.2.1 Potential Air Quality Impacts of Operations**

Satellite ISR facilities such as the Ludeman Project are not major point source emitters and are not expected to be classified as major sources under the operation (Title V) permitting program. Other potential emissions during operations include fugitive road dust and diesel combustion engine emissions from equipment, transport trucks, and other vehicles. For National Ambient Air Quality Standards (NAAQS) attainment areas, it is expected that air quality impacts would be small.

During operations of the proposed project, impacts to air quality will be less than impacts from construction because the use of diesel-powered construction equipment would be reduced and therefore pollutant levels will remain low. It is anticipated that the site-specific

conditions at the Proposed Project are comparable to those described in the GEIS (NUREG-1910) for air quality and incorporates by reference the GEIS conclusions that the impacts to air quality during operations will be SMALL.

Based on the projected activities, Uranium One has calculated the total PM10 emissions is 15.5 tons per year. This level of emissions is small relative to surface mines and other industrial operations that generate dust from vehicles and disturbed areas.

For example, the larger surface coal mines in the Powder River Basin show PM10 emissions inventories in the thousands of tons per year. Sections of unpaved county roads can also exceed 15 tons per year emission rate by an order of magnitude or more. Viewed another way, atmospheric dispersion modeling generally shows that fugitive PM10 emissions on the order of 15 tons per year result in an insignificant impact to ambient air beyond a distance of a few hundred yards from the sources. 40 CFR 51.165(b)(2) defines the Significant Impact Level (SIL) for PM10 as 1.0 µg/m<sup>3</sup> or more. For reference purposes, 40 CFR 50.6(a) defines the national ambient standard for annual average PM10 as 150 µg/m<sup>3</sup>.

It is important to note that no control factors were assumed for the proposed project's emission calculations. This is a conservative effect resulting in overestimation of dust generation as periodic watering or chemical treatment of the unpaved roads will reduce emission factors by half or more.

Site specific operational potential air quality impact values, culminated along with the potential construction impacts, are discussed further in Section 4.6.”

## **Environmental Report**

### **“4.6 Potential Air Quality Impacts**

Air quality near the proposed project area has been monitored extensively due to the 12 active surface coal mines within approximately 50 miles of the proposed project area and has continuously demonstrated compliance with NAAQS and WAAQS standards for PM10 and PM2.5. The following sections provide a discussion of potential air quality impacts including impacts associated with combustion and fugitive dust emissions.

As noted in NUREG 1910 (GEIS Section 4.2.6), air quality impacts will be considered SMALL because the following three conditions will be met for all phases of the project:

- Gaseous emissions are within regulatory limits and requirements;
- Air quality in the region of influence is in compliance with NAAQS; and
- The facility is not classified as a major source under the New Source Review or Federal Operating (Title V) permit programs described in Section 1.7.2 of the GEIS.

#### **4.6.1 Potential Air Quality Impacts During Construction**

At a satellite facility such as the proposed Ludeman Project, the primary potential new emission source will be particulate matter with a diameter less than 10 micrometers (PM<sub>10</sub>) resulting from vehicle traffic within the Proposed Project area. Increased suspended particulates from vehicular traffic on unpaved roads, fugitive dust caused by wind erosion of areas cleared of vegetation, and diesel emissions from construction equipment would be the primary air quality impacts. The application of water to unpaved roads will reduce the amount of fugitive dust to levels equal to or less than the existing condition. Diesel emissions from construction equipment are expected to be short-term only, ceasing once the operational phase begins.

Uranium One estimated fugitive dust emissions from operation of the Ludeman Project area based on projected activity levels and using emission factors supplied by the WDEQ. Projected activities impacting dust emissions include ongoing wellfield construction activities, routine site traffic related to operations and maintenance, truck traffic delivering chemicals and material and shipping product, and employee traffic to and from the site. Based on these activities, the projected total PM<sub>10</sub> emissions is 15.5 tons per year. This level of emissions is small relative to surface mines and other industrial operations that generate dust from vehicles and disturbed areas.

The larger surface coal mines in the Powder River Basin show PM<sub>10</sub> emissions inventories in the thousands of tons per year. Sections of unpaved county roads can also exceed 15 tons per year emission rate by an order of magnitude or more. Viewed another way, atmospheric dispersion modeling generally shows that fugitive PM<sub>10</sub> emissions on the order of 15 tons per year result in an insignificant impact to ambient air beyond a distance of a few hundred yards from the sources. 40 CFR 51.165(b)(2) defines the Significant Impact Level (SIL) for PM<sub>10</sub> as 1.0 µg/m<sup>3</sup> or more. For reference purposes, 40 CFR 50.6(a) defines the national ambient standard for annual average PM<sub>10</sub> as 150 µg /m<sup>3</sup>.

It is important to note that no control factors were assumed for the Proposed Project's emission calculations. This is a conservative effect resulting in overestimation of dust generation as periodic watering or chemical treatment of the unpaved roads will reduce emission factors by half or more.

In summary, construction activities at the proposed project site will potentially cause small, short-term effects on local air quality. Increased suspended particulates from vehicular traffic on unpaved roads, fugitive dust caused by wind erosion of areas cleared of vegetation, and diesel emissions from construction equipment will be the primary potential air quality impacts. The application of water to unpaved roads will reduce the amount of fugitive dust to levels equal to or less than the existing condition. Diesel emissions from construction equipment are expected to be short term only, significantly declining once the operational phase begins.

#### **4.6.2 Potential Air Quality Impacts During Operations**

Satellite ISR facilities such as the Ludeman Project are not major point source emitters and are not expected to be classified as major sources under the operation (Title V) permitting program. Other potential emissions during operations include fugitive road dust and diesel combustion engine emissions from equipment, transport trucks, and other vehicles. For NAAQS attainment areas, it is expected that air quality impacts would be SMALL.

During the Proposed Project operations, potential impacts to air quality will be less than the impacts from construction because the use of diesel-powered construction equipment would be reduced and therefore pollutant levels will remain low. It is anticipated that the site-specific conditions at the proposed project are comparable to those described in the GEIS for air quality and incorporates by reference the GEIS conclusions that the impacts to air quality during operations will be SMALL.

Uranium One estimates the fugitive dust emissions from operations in the Proposed Project area based on projected activity levels and using emission factors supplied by the WDEQ. Projected activities impacting dust emissions included ongoing production unit construction activities, routine site traffic related to operations and maintenance, truck traffic delivering chemicals and material and shipping product, and employee traffic to and from the site. Based on these activities, the projected total particulate matter (PM10) emissions will be approximately 15.5 tons per year.

This level of emissions is small relative to surface mines and other industrial operations that generate dust from vehicles and disturbed areas. The larger surface coal mines in the PRB show PM10 emissions inventories in the thousands of tons per year. Sections of unpaved county roads can also exceed 15 tons per year emission rate. Atmospheric dispersion modeling generally shows that fugitive PM10 emissions on the order of less than 200 tons per year result are an insignificant impact to ambient air beyond a distance of a few hundred yards from the sources. 40 CFR 51.165(b)(2) defines the Significant Impact Level (SIL) for PM10 as 1.0  $\mu\text{g}/\text{m}^3$  or more. For reference purposes, 40 CFR 50.6(a) defines the national ambient standard for annual average PM10 as 150  $\mu\text{g}/\text{m}^3$ .

It is important to note that no control factors were assumed for the emission calculations of the proposed project. This is a conservative effect resulting in overestimation of dust generation as periodic watering or chemical treatment of the unpaved roads will reduce emission factors by half or more.

In summary, operational activities at the Proposed Project site will potentially cause small effects on local air quality. Increased suspended particulates from vehicular traffic on unpaved roads, fugitive dust caused by wind erosion of areas cleared of vegetation, and emissions from routine vehicular traffic will be the primary potential air quality impacts during operations. The application of water to unpaved roads will reduce the amount of fugitive dust to levels equal to or less than the existing condition.”

**Round 2 GEN-3**

*Please provide sufficient information on environmental justice to complete impact assessment*

**Round 2 GEN-2 Response**

Uranium One provided three new figures (Figures 10-12) utilizing 2010 census data in its Round 1 RAI responses. These figures depict the environmental justice study area (Figure 10), the census-block-group data within a 50-mile radius (Figure 11) and the census-block-group data within a 4-mile radius (Figure 12). Within Figures 10 and 11 are the accompanying tables which indicate the applicable percentages of minority and low-income populations. None of these percentages meet or exceed the threshold percentages outlined in NUREG-1748 Appendix C (III)(A)(2).

These data allow Uranium One to reach the conclusion that no further Environmental Justice analysis is required. Accordingly, Uranium One has updated ER Sec.3.10.4.3 (Environmental Justice Conclusions) of the Environmental Report which now reads:

**“3.10.4.3 Environmental Justice Conclusions**

In compliance with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, ethnicity and poverty status in the vicinity of the proposed project have been examined and compared to city, regional, state, and national data to determine if any minority or low-income communities could potentially experience disproportionately high and adverse impacts by implementation of the proposed action. Similarly, in compliance with Executive Order 13045 – *Protection of Children from Environmental Health Risks and Safety Risks*, the distribution of children and locations where numbers of children may be disproportionately high in the vicinity of the proposed project was determined to ensure that environmental risks and safety risks to children are addressed.

Three criteria must be met for potential impacts to minority/low income communities to be considered significant. **If any of these criteria are not met, then impacts with respect to environmental justice or protection of children are not significant:**

- 1) There must be one or more populations within the region of influence;**
- 2) There must be adverse (or significant) impacts from the Proposed Action; and**
- 3) The population under investigation must bear a disproportionate burden of those adverse impacts.**



According to the environmental justice guidance provided by the Nuclear Regulatory Commission, *“percentage differences greater than 20 percentage points may be considered significant, and if either the minority or low-income population percentage in the radius of influence exceeds 50 percent, environmental justice should be considered in greater detail”* (Nuclear Regulatory Commission 2008:6.3).

An examination of the 2010 census block groups indicates that the percentage of residents under the poverty level and the percentage of minority population surrounding the Proposed Project area, are significantly below the threshold. As noted in NUREG-1748, Appendix C (III)(A)(2), “If no minorities or low-income populations are identified in the potentially affected area or environmental impact area, then document the conclusion. The environmental justice review is complete” Therefore, the application will not further analyze data for the environmental justice information.”

***Round 2 GEN-4***

*Please provide clarification on cost benefit analysis info; respective response is unclear.*

**Round 2 GEN-3 Response**

Uranium One is currently updating the cost benefit analysis info to correlate with the new life of mine schedule. Once the analysis is complete, Uranium One will submit the updated tables and text for NRC review.

**Round 1 RAI GEN-5**

*Response is inadequate -Please provide documents requested needed to fully describe affected environment and evaluate cumulative effects (access to nonpublic documents cited in the ER and TR).*

**Round 1 GEN-4 Response**

The following document citations have been removed from the application as the documents are unavailable or are internal company reports that are not publically available:

- *Arizona Public Service Company (APS), 1980. Application for In Situ Research and Development Testing License, Peterson In Situ Uranium Extraction Project, Converse County, Wyoming. Wyoming Department of Environmental Quality (WDEQ) Application for In Situ Research and Development Testing License.*
- *W.E. Galloway and Walton, A.W., 1974. Stratigraphy of the Upper Fort Union Fluvial System, Southern Powder River Basin Relationships to Uranium Mineralization, Technical Service Report No. 1201-6-1-74, Conoco, Inc., November 1974.*
- *Jim Lemmers and Smith, Dave, 1981. Idaho Claims Geologic Evaluation, Powder River Basin, Converse County, Wyoming, UNC Teton Exploration Drilling, Inc., February 20, 1981.*
- *UNC Teton Exploration Drilling, Inc., 1983. Leuenberger In-Situ Pilot Project, M Zone Restoration Stability Report, Converse County, Wyoming, Permit No. 2RD-522, March 18, 1983.*
- *Conoco, 1982*

Uranium One contacted the NRC Public Document Room staff regarding the availability of documents cited in the application. Several documents are available in NRC's Legacy Library or via microfilm. Due to the length of these documents, they are not provided in this RAI response package. Uranium One urges NRC reviewers to utilize these resources to obtain the publically available records listed below:

- *COGEMA Mining, Inc., 2004. Wellfield Restoration Report, Irigaray Mine, prepared by Petrotek Engineering Corporation.*
- *Cogema Mining, Inc., 2008. Wellfield Restoration Report Christensen Ranch Project Wyoming, March 2008.*

- *Geomatrix Consultants, Inc., 1988. Seismotectonic Evaluation of the Wyoming Basin Geomorphic Province, prepared for the U.S. Bureau of Reclamation, Contract No. 6-CS-81-07310.*
- *Teton-Nedco Joint Venture, 1980. In-Situ Mining Permit Application, Leuenberger Site, Converse County, Wyoming.*
- *Uranium Resources Inc., 1981. North Platte Project Application and Technical Report.*

**Round 2 GEN-6**

*Please provide a breakdown for the direct, indirect, and induced employment effects for each phase of project activities. A revised Table 7-1 that shows the employment effects for each of the four phases of project activities would be helpful, because the ER currently does not describe employee effects for aquifer restoration or decommissioning phases.*

**Round 2 GEN-7 Response**

The modeling methodology where IMPLAN allocates the projected project staff does not output the separate employment effects for each phase of project activities due to the restricted input/output options. The IMPLAN input for operations is the number of staff dedicated only to operations which is the number of operational staff. Staff allocated to construction and decommissioning activities are input in *conjunction* with all other aspects of the project such as contracted work, supplies and equipment within the IMPLAN model and are not separately identified. Therefore, a direct comparison of total number of staff for the project cannot be isolated between the various project phases.

## **Land Use**

### ***RAI LU-1***

*Response is inadequate. Please provide clarification needed for disturbance calculations: Table 2. Disturbance options are listed but not explained.*

### **RAI LU-2 (A)(B)(C) Response**

The Estimated Disturbance Calculations Table 1 (shown below) was included in the Round 1 ER Response Package as Table 2. A portion of the table depicts two potential liquid 11e.(2) byproduct disposal options as part of the proposed project's effluent control program:

- Option 1 utilizes a combination of both surge ponds and deep disposal wells (DDW); and
- Option 2 utilizes evaporation ponds only and no DDWs.

The table also defines two separate calculations: red cells indicate total acreage that is controlled (fenced); blue cells represent total acreage of potential surface disturbance. Together they provide key elements for the estimated disturbance calculations table.

For instance, Option 2 shows the total controlled area encompassing the evaporation ponds would be approximately 60 acres. This compares to the Proposed Project's 1,287 total acres of controlled areas. In addition, for this option, the pond's total disturbed surface area is calculated at 56 acres. This compares to the project's 909 acres of total disturbed surface area.



**Table 1: Estimated Disturbance Calculations**

					Project Acres
Component	Dimensions		Area of Disturbance		18,850
	Width (ft)	Length (ft)	ft <sup>2</sup>	Acres	(%)
<b>Satellite Area</b>					
Satellite Building	80	190	15,200	0.35	0.002
Laydown/Parking/Septic Area				4.25	0.023
Fenced Area				4.6	0.02
<b>Option 1: Liquid 11e.(2) Byproduct: Surge Ponds / Deep Disposal Wells (DDW) <sup>1</sup></b>					
Surge Pond Surface Area (2 total)	130	300	78,000	1.8	0.010
Surge Pond Fenced Area				2.9	0.02
Deep Disposal Well pipe lines	8	21,301	170,411	3.9	0.02
Deep Disposal Well Pad (6 total)				6	0.032
<b>Option 2: Liquid 11e.(2) Byproduct: Evaporation Ponds<sup>2</sup></b>					
Evaporation Pond Surface Area				56	0.30
Fenced Area				60	0.32
<b>Roads</b>					
Secondary Access (outside wellfields)	12	76,976	923,712	21.2	0.11
Wellfield Roads (within wellfields)	12	53,745	644,940	14.8	0.08
<b>Trunk lines / Pipe Lines</b>					
Main Trunk Lines (outside wellfields)	25	81,775	2,044,375	46.9	0.25
<b>Booster Stations</b>					
Building Area (3 total)	20	30	1,800	0.04	0.000
Total Booster Station Disturbance	40	50	6,000	0.14	0.001
<b>Wellfield Areas</b>					
Wellfield (All area within wellfields - includes roads, piping, structures, etc.)				764	4.05
Fenced Wellfield Area				1,222	6.48
Monitor Ring Wells (232 total)	7	20	34,300	1	0.004
Header Houses (87 total)	10	20	17,400	0.4	0.002
				<b>Acres</b>	<b>% of Project</b>
<b>Total Controlled Area (Option 1)</b>				<b>1,236</b>	<b>6.55</b>
<b>Total Controlled Area (Option 2)</b>				<b>1,287</b>	<b>6.83</b>
<b>Total Disturbance Area (Option 1)</b>				<b>859</b>	<b>4.55</b>
<b>Total Disturbance Area (Option 2)</b>				<b>909</b>	<b>4.82</b>

<sup>1</sup>: Surge ponds and DDWs; <sup>2</sup>: Evaporation ponds only (no DDWs)

## **Transportation**

### ***RAI TR-1***

*Response to TR-1 (A) is inadequate. Please provide information regarding the width and design speed of County Road 26 (Ellenberger Lane).*

### **RAI TR-1(A) Response**

The following paragraph has been added to both ER Sec. 3.2.1.1 and TR Sec. 2.1.

#### **“ 3.2.1.1 Main Access Roads**

Converse County Road 26 (Leuenberger Lane) is the only county road within the Proposed Project boundary. It is an improved but unpaved all-weather road with year-round maintenance provided by the Converse County Road and Bridge Department. The road is 30-foot wide and has a posted speed limit of 40 mph. Uranium One has no control regarding the general public on this road; although, will enforce the posted speed limit with its employees and contractors. In addition, Uranium One will maintain contact with the Converse County government to assist with maintenance as necessary.”

## **Water Resources**

### ***RAI WR-1***

*Response to WR-1 (A)(B) is inadequate- Please provide revised isopach maps extended to the North Platte River with an outline of the production zone.).*

### **RAI WR-1 (A)(B)Response**

Uranium One provided isopach maps with projected sand isopachs to the river in November, 2013. Discussions with NRC during PM to PM meetings, both parties were in agreement that a more detailed hydrogeologic analysis will be submitted as part of the Wellfield Data Package for the Peterson wellfield area for NRC review and verification prior to commencing mining activities in this area. The Wyoming Department of Environmental Quality Land Quality Division will also require a more detailed hydrogeologic analysis before they will approve mining activities for this area.

***RAI WR-2(b)***

*Response to WR-5B is inadequate- Please provide more information on the targeted aquifer zone(s) for non-production water.*

**RAI WR-5(b) Response**

The target aquifer formation for the non-production water well, located at or near the satellite location, will be the Fort Union formation and the 50 sands. The estimated completion depth for this non-production water well is approximately 800 feet.

**RAI WR-3**

*Response is inadequate. Please provide revised map/table and text describing the abandonment of historic drill holes.*

**RAI WR-7 Response**

Uranium One is aware of license conditions consistent with previous ISR licenses which requires abandonment and plugging of all known wells within a wellfield prior to hydrogeologic testing for the Wellfield Data Package. For instance, License Condition 10.12 for the Strata Energy license (SUA-1601) states:

“Prior to conducting tests for a wellfield data package, the licensee will attempt to locate and abandon all historic drill holes located within the perimeter well ring for the Wellfield. The licensee will document such efforts to identify and properly abandon all drill holes in the wellfield data package.”

Uranium One agrees with such language and finds it acceptable subject to finalizing the actual wording of the condition.

Additionally, Uranium One has included the following language in TR Sec. 2.6.4:

“Uranium One proposes to use the following procedures for plugging historic drill holes discovered during future working operations in the proposed wellfield areas:

- A search for historic holes will be conducted while working within the area of each proposed wellfield. The search will be based on the most current data available regarding the location of historic drill holes. The data used in the search (maps, tables, etc.) will be included in the Wellfield Data Package;
- Any historic drill hole discovered will be plugged and abandoned in accordance with WDEQ procedures prior to hydrogeologic testing for the Wellfield Data Package; and
- Each drill hole will be documented within the Wellfield Data Package.”

## **Cumulative Impacts**

### ***RAI CI-1D***

Please provide traffic generated by other foreseeable projects within the study area-use any local roads by other projects is necessary to evaluate cumulative impacts to the local road system.

### **RAI CI-1D Response**

Uranium One has provided a cumulative impact analysis for all resource areas in addition to the requested traffic analysis. The spatial scope of the cumulative impact review is the Wyoming portion of the Powder River Basin. Additionally and more specifically, past, present, and reasonably foreseeable uranium projects within 80 km (50 mi) are described and illustrated in the cumulative impacts analysis. These parameters were chosen to both meet the requirements of NUREG 1748.

Due to the length of text, a new section has been added to the ER to address cumulative impacts. The new Section 5 (Cumulative Impacts) will follow the Environmental Effects analysis in Section 4 and all subsequent sections will advance a section number. The new cumulative impacts section can be found in Appendix A.



## **Air Quality**

### ***RAI AQ-1(a)(b)(c)***

*Please provide justification for the assertion that the Ludeman Project is “similar” enough to Moore Ranch that the air quality data and impact conclusions assessments can be used for the Ludeman Project.*

### **RAI AQ-1(a)(b)(c) Response**

See ER RAI GEN-1 and AQ-2 for response to this RAI.

***RAI AQ-2***

*Please provide justification for the assertion that the air quality impact conclusions made in NUREG-1910 would also result in small impacts for the Ludeman Project.*

**RAI AQ-2 Response**

Uranium One assumes the response in this ER Response Package to Round 2 GEN-1 justifies the assertion for the site-specific air quality impacts. When combined with the air quality cumulative impact analysis, Uranium One believes its initial assertion of SMALL air quality impacts remains unchanged as is described in NUREG-1910. The cumulative impact analysis can be found in Appendix A.

## **Cultural Resources**

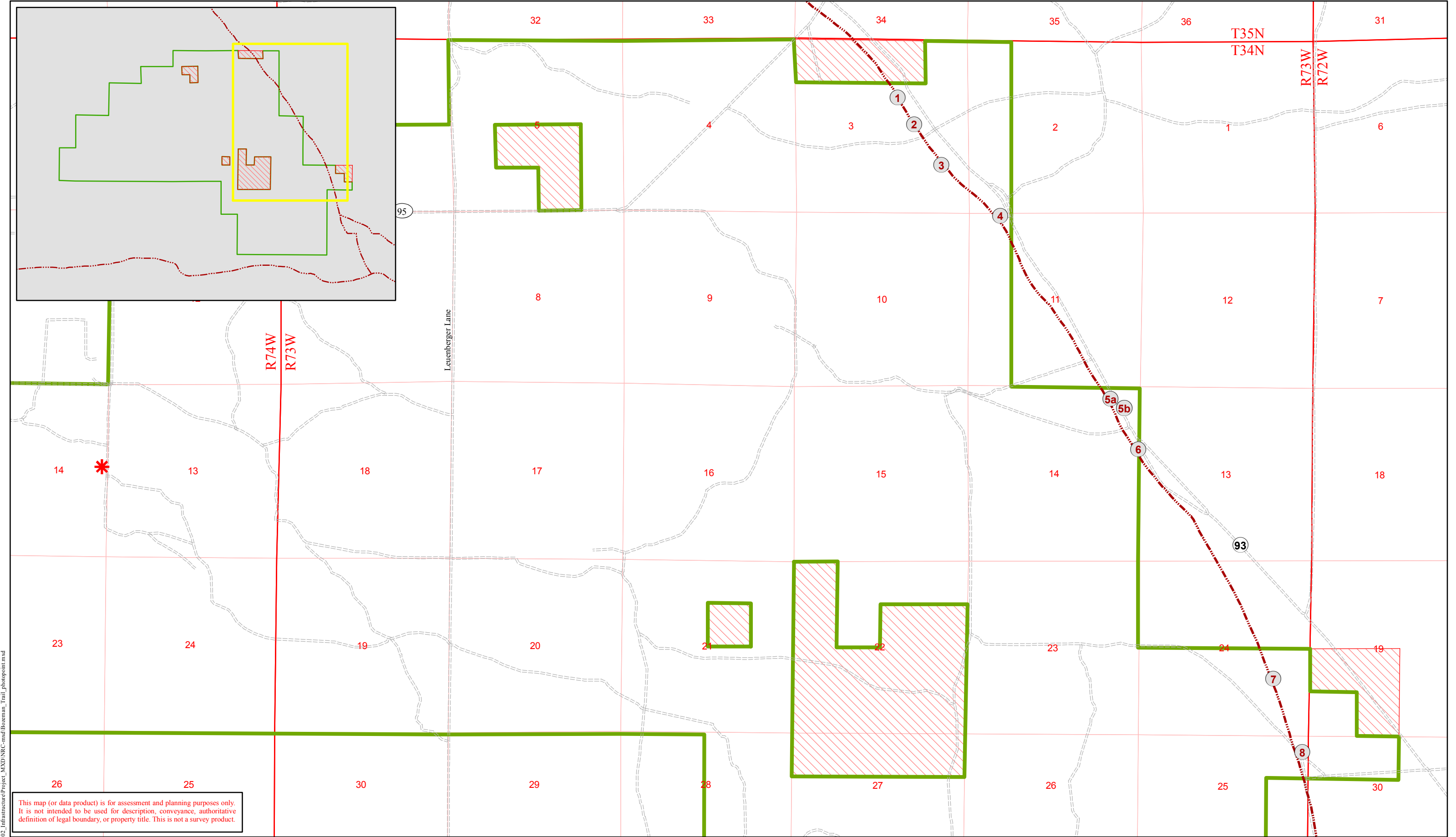
### ***RAI CR-3(a)***

*Please provide information in response to original RAI requests for maps, photographs, and comprehensive justifications for the eligibility recommendations of sites.*

### **RAI CR-3(a) Response**

As per discussions in the April 23, 2015 public meeting and conveyed in a follow up correspondence from K. Jamerson to S. Schierman dated May 1, 2015, NRC deemed the comprehensive justification in the initial response (June 2013) adequate. However, it was requested to provide photographs of the segment of the Bozeman Trail and surrounding view shed in Sections 30 and 19, T34N, R72W. To support Uranium One's recommendation this segment of the trail is a non-contributing element of the NRHP eligible site, pictures of the Bozeman Trail and associated locations are provided below. The information provided below is publically available; thus, is not submitted as Confidential Information under 10 CFR 2.390.

Path: O:\WV\_Projects\8201-2013-102\_Infrastructure\Project\_MXD\NRC-mxd\Bozeman\_Trail\_photoshoot.mxd




This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

PREPARED FOR







uraniumone  
investing in our energy

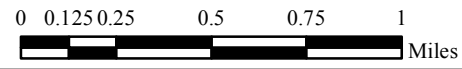

**LUDEMAN PROJECT**  
CONVERSE COUNTY, WY



**TREC, Inc.**  
Engineering & Environmental Management

900 Werner Court  
Suite 150  
Casper, Wyoming 82601  
Phone: (307) 265-0696  
Fax: (307) 265-2498

-  Project Boundary
-  Bozeman Trail
-  Excluded Areas
-  Aerial Image Point

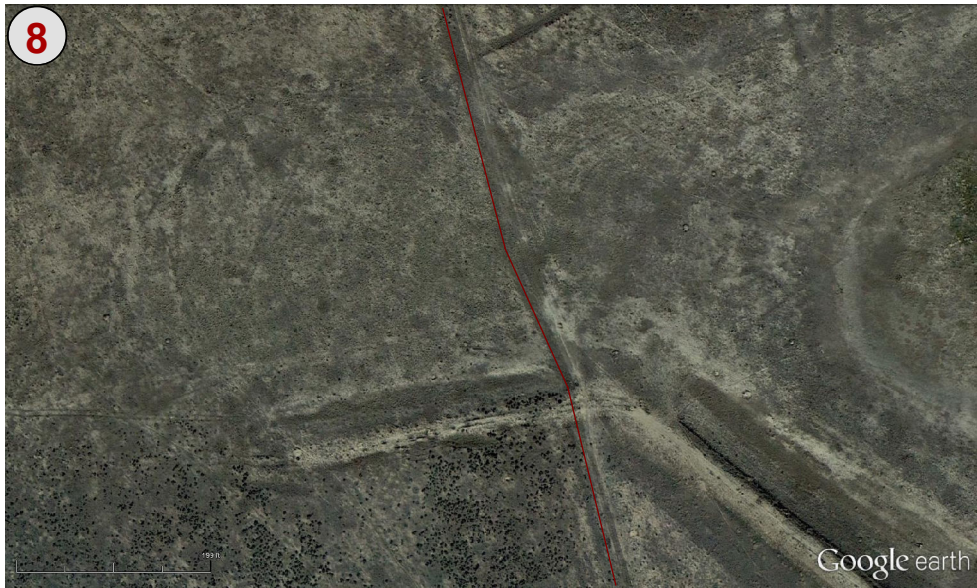
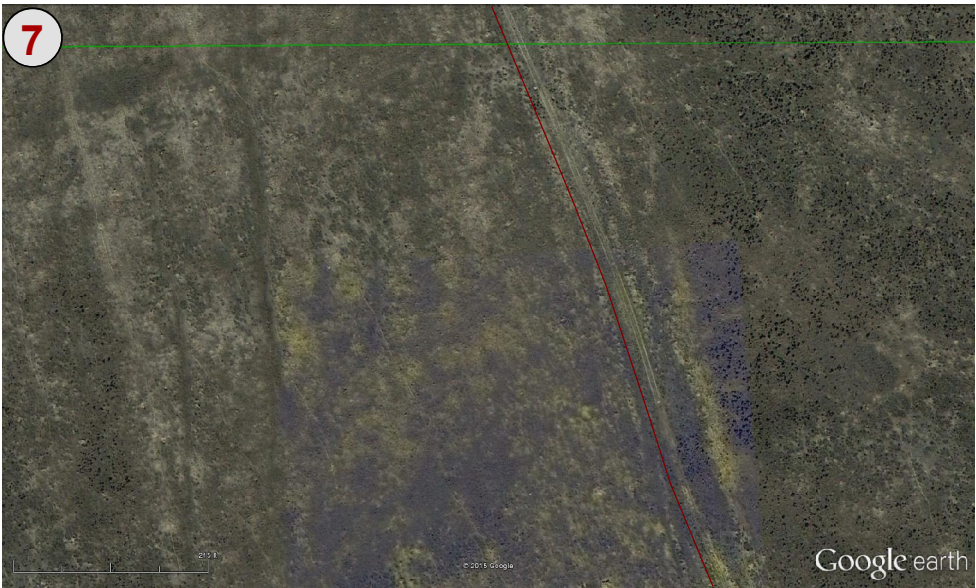
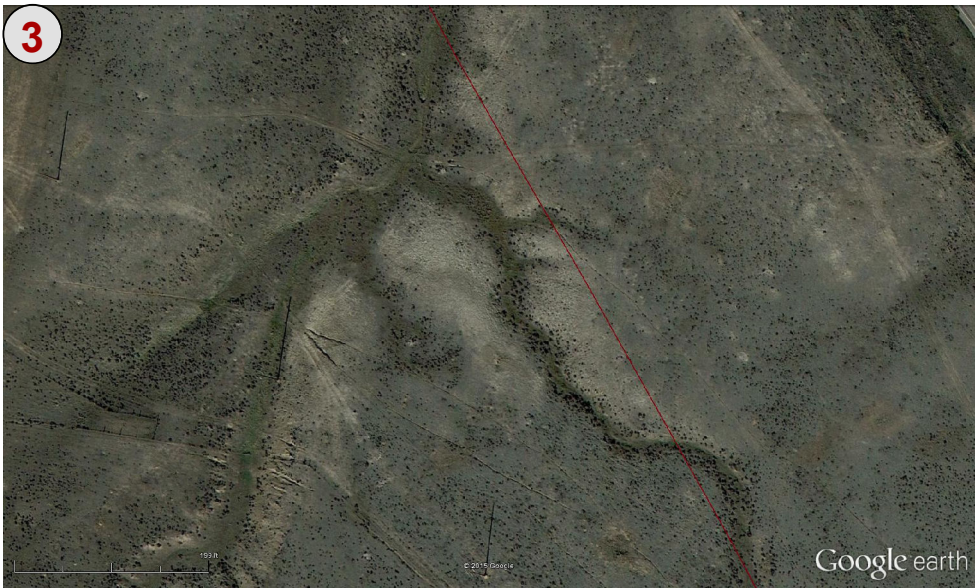


0 0.125 0.25 0.5 0.75 1 Miles

DRAWN BY: EGS	Bozeman Trail				
CHECKED BY: CT	REV #	DESCRIPTION	BY	DATE	FIGURE
	0	For Submittal	EGS	6-2-15	1
APPROVED BY: RMD					



Path: O:\WV\_Projects\8201-2013-102\_Infrastructure\Project\_MXD\NRC-mxd\Bozeman\_Trail\_photos.mxd





***RAI CR-4(a)***

*Please provide rational for the “not eligible” recommendations for 18 prehistoric sites in absence of formal testing*

**RAI CR-4(a) Response**

As per the May 1, 2015 correspondence from K. Jamerson to S. Schierman, the NRC has stated the June 2013 response to RAI CR 4(a) is adequate.



### **Change of Design RAIs**

#### ***RAI COD-4***

*Please provide fully revised application (environmental report) with updated maps, tables, and text regarding the utilization of a single satellite plant vs. the three satellites in the original amendment application.*

#### **RAI COD-1 Response**

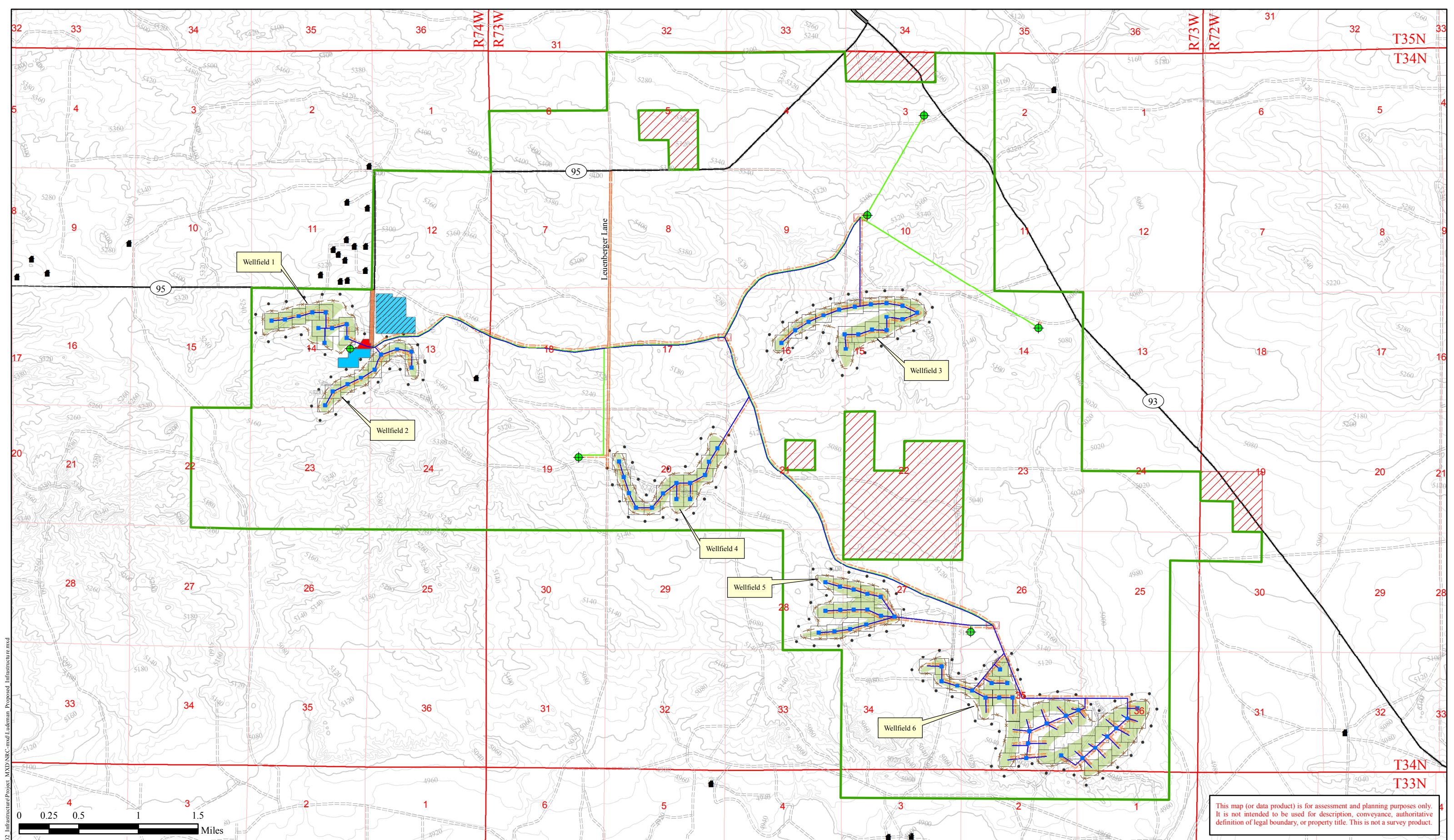
Please refer to Appendix B of the Round 2 TR Response Package which accompanies this ER package. The Appendix include applicable information regarding the proposed design changes (single satellite plant and evaporation ponds). Upon successful conclusion of all Requests for Additional Information, Uranium One will submit to NRC the final amended application to include both revised Technical and Environmental Reports.

***RAI COD-2***

*Please provide the location and design of all evaporation ponds to be installed as part of the “Change of Design” request updated Figure TR 3-1.*


**RAI COD-2 Response**

Figure 3-1 (Figure 3) has been updated to depict design changes for the Proposed Project and is shown below:




This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

PREPARED FOR




uranium one  
investing in our energy


**LUDEMAN PROJECT**  
CONVERSE COUNTY, WY





**TREC, Inc.**  
900 Werner Court  
Suite 150  
Casper, Wyoming 82601  
Phone: (307) 265-0696  
Fax: (307) 265-2498  
Engineering & Environmental Management


**Legend**


 Ludeman Project Boundary


 Excluded Area


 Fenced Area


 Residence


 Plant Facility Site Area


 Permeate Pond Area


 Evaporation Ponds


 Header House


 Trunkline


 Deep Disposal Well


 Deep Disposal Well Pipeline


 Well Pattern


 Wellfield

 Monitor Well Ring

 Primary Access

 Secondary Access Road

 Booster Station



N  
W E  
S

DRAWN BY: RMD

CHECKED BY: CT

APPROVED BY: RMD

**Conceptual Infrastructure**

REV #	DESCRIPTION	BY	DATE	FIGURE
0	For Submittal	RMD	3-22-13	3
1	Revisions made - Final Draft for Review	EGS	6-4-15	

***RAI COD -8***

*Please provide revised status of environmental approvals*

**RAI COD-3 Response**

The revised Environmental Approvals table is provided below:



Issuing Agency	Description	Status
Wyoming Department of Environmental Quality 122 West 25 <sup>th</sup> St Herschler Building Cheyenne, Wyoming 82001	Underground Injection Control Class III Permit (WDEQ Title 35-11)	Permit to Mine Application – submitted February 10, 2010, Application was deemed complete on August 12, 2011, currently under technical review by WDEQ/LQD.
	Groundwater Reclassification (EPA- Aquifer Exemption) (WDEQ Title 35-11)	Groundwater reclassification will be completed (information in application) by WDEQ prior to issuance of final Permit, and confer with EPA's on their Aquifer Exemption process.
	Underground Injection Control Permit (Deep Disposal Well) (WDEQ Title 35-11)	Class I UIC Permit application would be developed and submitted if necessary..
	Industrial Stormwater NPDES Permit (WDEQ Title 35-11)	An Industrial State Stormwater WPDES Permit will be required for the satellite and wellfield facilities. Expected application submittal 90 days prior to start of operations.
	Construction Stormwater NPDES Permit (WDEQ Title 35-11)	Construction Stormwater NPDES authorizations are applied for and issued annually under a general permit based on projected construction activities. The Notice of Intent will be filed at least 90 days before construction activities begin in accordance with WDEQ requirements.
	Mineral Exploration Permit (WDEQ Title 35-11)	Approved Mineral Exploration Permit 339DN is currently in place for the Ludeman area.
	Underground Injection Control Class V, Septic System (WDEQ Title 35-11)	The Class V UIC permit will be applied for following installation of an approved site septic system during facility construction.
	Construction Air Quality Permit	Application will be submitted six months prior to start of construction.
U.S. Nuclear Regulatory Commission Washington, DC 20555	Amendment of Materials License SUA- 1341 (10 CFR 40)	Application submitted herein

Issuing Agency	Description	Status
U.S. Environmental Protection Agency 1200 Pennsylvania Ave, NW, Washington, DC 20460	Aquifer Exemption (40 CFR 144, 146)	See Groundwater reclassification process above
U.S. Army Corps of Engineers 2232 Dell Range BLVD., Suite 210 Cheyenne, WY 82009-4942	Nationwide Permit Authorization, Wetlands	All necessary information has been provided to the USACE, USACE has determined (May 11, 2011) the methods used to identify wetlands within the permit are consistent with the Corps of Engineers Wetland Delineation Manual. Activities can be covered under nationwide permits.

***RAI COD-9***

*Please provide updated facility-design information to be included in a revised TR.*

**RAI COD-10 Response**

Please refer to Appendix B of the Round 2 TR Response Package which accompanies this ER package. The Appendix includes a matrix that identifies all areas of the application that will be impacted/revised per the design changes. During discussions with the NRC during the Public Meeting (April 23, 2015), both parties were in agreement that upon conclusion of all Requests for Additional Information, Uranium One will submit to NRC the final amended application to include both revised Technical and Environmental Reports.

## **APPENDIX A: Cumulative Impacts**



## **5 Cumulative Impacts**

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time. Thus, the proposed Ludeman Project (Proposed Project) could contribute to cumulative impacts when its impacts overlap with those of other past, present, or reasonably foreseeable future actions. This section summarizes the cumulative impacts that are occurring as a result of existing development in the Powder River Basin (PRB) and considers how those impacts may change if the Proposed Project and other projected development in the area occurs.

### ***5.1 Introduction***

The BLM released a regional technical study, called the PRB Coal Review (BLM, 2005a,b,c), to help evaluate the cumulative impacts of coal and other mineral development in the PRB. This Coal Review was reviewed to evaluate whether the cumulative impacts of existing and reasonably foreseeable development evaluated by BLM will occur within the Proposed Project area of influence. The PRB Coal Review consisted of three tasks:

- Identify existing resource conditions in the PRB for the baseline year (2003) and, for applicable resources, update the BLM's 1996 status check for coal development in the PRB;
- Define past and present development activities in the PRB and their associated development levels as of 2003, and develop a forecast of reasonably foreseeable development in the PRB through 2030. The reasonably foreseeable activities fall into three broad categories: coal development; oil and gas development, including major transportation pipelines; and other development, which includes development that is not energy-related as well as other energy-related development; and
- Predict cumulative impacts that could be expected to occur to air, water, socioeconomics, and other resources if the development occurs as projected in the forecast developed under the second task.

Results of the PRB Coal Review task study were presented in a series of reports. The Initiated in 2003, Phase I of the PRB Coal Review included the identification of current conditions (Task 1 reports); identification of RFD and future coal production scenarios for

2010, 2015, and 2020 (Task 2 report); and predicted future cumulative impacts (Task 3 reports) in the PRB. Phase II of the PRB Coal Review was initiated in January 2010 to update the Phase I analyses. Under Phase II, base year information will be updated through 2008, new RFD and future coal production scenarios will be developed, and projected cumulative impacts will be analyzed for 2020 and 2030. These reports do not evaluate specific proposed projects, but they provide information that BLM is using to evaluate the cumulative impacts that will be expected to occur if specific projects or applications are approved. The following discussion presents summarized information from this Coal Review where such information indicates that the cumulative impacts identified by BLM might affect the Proposed Project region of influence or might act with the Proposed Project to increase the severity or duration of any identified impacts.

The Wyoming portion of the PRB is the primary focus of the PRB Coal Review and encompasses Campbell, Sheridan, Johnson (outside of the Bighorn National Forest), and Converse County. The review study area incorporates the four counties surrounding the Proposed Project and is utilized for the cumulative analysis of resources.

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

The Proposed Project area is located in the middle 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.

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 5-1). 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.

#### **5.1.1.1 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 Power 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 10 years, as shown in Table 5-2. Table 5-2 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 5-2, 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.

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.

#### **5.1.1.2 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 5-3 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.

#### **5.1.1.3 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).

#### **5.1.1.4 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).

#### **5.1.1.5 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).

#### **5.1.1.6 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.

### ***5.2 Land Use***

The PRB is a predominantly rural, wide open landscape. With little rainfall and limited alternative sources of water, the primary land use is grazing. Nevertheless, there is a range of other land uses. The major categories include agriculture, forested, mixed rangeland, urban, water, wetlands, coal mines, and barren land.

A large part of the PRB consists of split estate lands (privately owned surface lands underlain by federally owned minerals). Although federal grasslands and forests cover approximately 21 percent of the PRB area, most rangeland is privately owned (68 percent). Figure 5-2 shows the extent of surface ownership in the region. Future land uses are anticipated to remain the same as historic and current land uses. The dominant land use in terms of area is livestock grazing on rangeland. Very small but important amounts of land are used for roads to provide access to the local residences and for truck traffic for oil and



gas production and CBM production areas. Recreational use of the land for hunting deer, antelope, and small game is limited since the land is nearly all privately owned.

Within the land use study area, activities on both public and private lands, including oil, gas, CBM, and coal development, are ongoing and projected to expand in the future. Potential land use impacts could result from interruption to, reduction of, or impedance of livestock grazing areas, open wildlife areas, and land access. At the completion of decommissioning, AUC will restore the land to pre-existing conditions and uses, including all roads, except those the landowners have requested to remain.

Federal actions regarding land uses in the general region of the Proposed Project have been analyzed for environmental effects in numerous programmatic and project-specific Environmental Impact Statements (EISs) as listed in Table 5-1. Due to the small quantity of surface disturbance associated with the Proposed Action and the release of the Proposed Project area for unrestricted use following decommissioning, potential land use conflicts are expected to be small.

### ***5.3 Transportation***

As indicated previously in Section 5.1, there are other ongoing or planned activities occurring within the PRB and within the vicinity of the Proposed Project that contribute to the analysis of cumulative impacts. These activities, which include CBM development, oil and gas extraction activities, and large surface mining operations that have railways and roadways to support the transport of coal among others, all have associated transportation impacts. Impacts could occur from fugitive dust, noise, incidental wildlife or livestock kills, increased traffic on local roads, and accidents.

The PRB Coal Review cumulative impact assessment of activities occurring within the PRB, including coal development, power generation, oil and gas, coal bed natural gas, and other mining activities, evaluated the potential transportation impacts to Campbell County roads, including the region surrounding the town Glenrock (BLM, 2010a). That study concluded potential regional direct effects to roads and highways will include increased vehicular traffic and risk of traffic accidents on existing roadways in the BLM cumulative effects study area from daily travel by workers and their families. Indirect effects will include increased wear and tear on existing roads, additional air emissions, fugitive dust from roads, noise, increased potential access to remote areas, and an increased risk of vehicle collisions with livestock and wildlife. A lower and upper coal production model



was used to forecast potential cumulative effects through 2020. The study projected increases in future traffic by assuming cumulative transportation impacts are largely tied to population increases (BLM, 2009b). BLM evaluated the impact of an estimated 48 percent increase in population (and therefore traffic) for Converse County roads from year 2003 to 2020 based on high coal production population projections and concluded highways along major routes will not be affected but urban areas such as Gillette could experience additional traffic delays (BLM, 2010a).

In addition to the aforementioned ongoing or planned activities, there are numerous ISR sites either operating or planned within a 50-mile radius of the Proposed Project (Table 5-2) (Figure 5-1), each with transportation requirements comparable to the Proposed Project. The increases in projected traffic from the operating or planned ISR facilities combined with the other ongoing or planned activities in the region, and projected increases in population over time, could lead to regional traffic impacts that are similar to those evaluated by the aforementioned BLM study (that concluded no impacts to highways along major routes but an increased potential for traffic delays in urban areas such as Glenrock).

In addition to potential traffic impacts, the existing or planned ISR facilities will require construction of new road surfaces or improvement of existing roads within the vicinity of the Proposed Project. Therefore, the number of roads and road networks will grow concurrently with the natural resource exploration and extraction activities with an associated increase in traffic and the potential for accidents.

The number of commuting construction workers and equipment and supply shipments will be reduced during operations along with the fugitive dust that the construction activities will generate. During operations there resin will be shipped from the Proposed Project to the Willow Creek facility for tolling. This will produce more yellowcake annually, and will result in increased commuting workers and shipments of supplies, yellowcake, and byproduct materials each year. Therefore, operational traffic impacts and accident risks will be increased under the Proposed Action.

Based on the low volume of operational traffic, the low radiological risks from transportation accidents, and the implementation of Uranium One's safety practices the potential impacts from accidents will be minimal. Based on the low volume of traffic generated and required road dust mitigation, road dust impacts will also be minimal. Furthermore, the transportation system constructed to support the Proposed Project will be reclaimed; therefore, the project-related road construction impacts will be minimal.

#### 5.4 Air Quality

Past, present, and reasonably foreseeable future actions in the vicinity of the Proposed Project that emit air pollutants include other uranium ISR operations, CBM, coal mining, coal power plant, and oil and gas operations (Section 5.1). Emissions from projected development of future oil and gas exploration and production, including CBM and coal mining, have been evaluated for impacts to air in previous EISs and SEISs and supporting documents for proposed developments in the PRB area (Table 5-3) where the Proposed Project is located.

In February of 2014 the PRB Coal Review Phase II Task 3A report was issued (BLM 2014). The cumulative air quality analysis in the Phase II Task 3A report is based on “reasonably foreseeable development” (RFD) in the region as updated in the Phase II Task 2 report (BLM 2011). The RFD projections for the PRB extend through year 2030, and concentrate on major industries such as coal mining, coal bed methane, conventional oil and gas, in-situ uranium recovery, and power generation.

The future year (2020 and 2030) cumulative air quality impact analysis in Phase II Task 3A focuses on the projected change in impacts (air quality, visibility, atmospheric deposition) resulting from the projected RFD activities in the Wyoming and Montana PRB study areas under the upper development scenario (BLM 2014). A lower RFD scenario was studied but not modeled in Phase II. The Phase II Task 3A report concludes, “*Model predicted cumulative air quality impacts remain unchanged or tend to show improvement between 2020 and 2030.*”

The Phase II Task 3A report also shows general improvement in air quality from the base year (2008) to 2030 (BLM 2014). Table 3-2 of the Phase II Task 3A report states that in general, criteria pollutant concentrations are projected to be lower than both the base year (2008) and future year 2020 impacts. The ozone modeling predicted exceedances of the national ambient standard at certain locations in 2008, but predicted those locations to be in compliance in 2020 and 2030. Referring to visibility impacts, Table 3-2 further projects light extinction values to be lower than for both the base year (2008) and the year 2020. Table 3-2 projects acid deposition rates in 2030 to be less than or equal to those predicted for 2020. The percent change in lake acid neutralizing capacity (ANC) in 2030 is predicted to be less than both the base year (2008) and the year 2020. The Phase II Task 3A report addresses Class I and sensitive Class II areas, concluding that modeled

concentrations for all pollutants remain unchanged or tend to decrease relative to the base year (2008). Moreover, no model-predicted changes in concentration exceed the Prevention of Significant Deterioration (PSD) increments.

The principal cause of the predicted long-term improvement in air quality in the PRB is the reduced industrial activity reflected in the Phase II Task 3A report (BLM 2014). Predicted regional coal production in 2030 decreased from 752 million tons in the Task 2 RFD report to 651 million tons in the Phase II Task 3A report, reflecting a slower rate of increase in coal demand over the next few decades. Another source of predicted emissions reduction in 2030 is the revised outlook for coal bed methane (CBM) production. The Phase I RFD analysis shows 631 billion cubic feet (BCF) in 2020, compared to 160 BCF predicted for that year in the Phase II Task 3A report.

Even with these adjustments, the Phase II Task 3A report may still overstate long-term cumulative impacts. More recent forecasts by SNL Energy (Gilbert 2014) and the Energy Information Administration (EIA 2014a) show US coal production flattening over the next few decades. Since the PRB share of that production is currently about 450 million tons per year, these projections could lower 2030 coal production in the PRB by another 200 million tons. Among the causes are the newfound abundance and relatively low cost of natural gas, the tightening of emission standards for fossil fuel burning power plants, and the expected retirement of aging coal plants in the Midwest and Southeast (many of which burn PRB coal). Coal markets have also been suppressed by the softening of electric power demand due to conservation, energy efficiency and the growth in renewable energy. These more recent projections are not accounted for in the PRB Coal Review II analysis, and presumably would reduce cumulative air quality impacts even further. The Phase II Task 3A report states that model predicted improvement to ambient air quality concentrations between the base year (2008) and the future years could be greater if actual coal mine development is less than the upper development scenario (BLM 2014).

The Phase II Task 3A report shows a slight rebound in CBM production in the PRB, to 283 BCF in 2030. At present, however, this appears unlikely since CBM production peaked at 573 BCF in 2008 (EIA 2014b) and has steadily declined since then to about half that value projected in 2014. According to WOGCC data, production has declined to an equivalent annual rate less than 300 BCF as of October 2013 (PLATTS 2013). CBM reserves dropped 36% during a recent 5-year period (EIA 2014b).

For modeling purposes, the Phase II Task 3A analysis assumed an increase of 700 megawatts in coal-fired power generation capacity by 2030. More recent forecasts show zero growth in coal-fired power generation in the PRB. The Dry Fork Station came on line in 2011, and no new coal-fired power plants have been proposed or permitted since then. The Energy Information Administration recently forecast no new coal-fired generation in the U.S. after 2016 (EIA 2014a). If this holds true, modeled 2030 impacts from power plants should be less than predicted in the Phase II Task 3A report.

It should be noted that recent forecasts call for growth in conventional oil and gas activity in the PRB, primarily due to new drilling and completion technologies that make shale gas and shale oil economical to produce. The Phase II Task 3A report predicts that conventional oil and gas production will decrease through 2030 relative to the base year 2008. As a result, the report states that “the contribution to ozone nearby and downwind of the PRB study area is likely to decrease.” This statement should be qualified in light of more recent predictions of oil and gas growth in the PRB.

Based on the RFD and modeling results, the Phase II analysis predicts lower cumulative impacts to ambient air quality in 2020 and in 2030 than in the base year of 2008. By contrast, the Phase I analysis predicts higher cumulative impacts in 2020 than in the base year of 2004. For the Wyoming near-field receptors, the Phase I predicted impact of the 24-hour PM10 and PM2.5 concentrations show localized exceedences of the National Ambient Air Quality Standard (NAAQS) for the base year (2004), as well as for both the upper and lower development scenarios for 2020. The 2020 development scenarios show the concentration increases by a factor of 2.5 relative to the base year for these parameters. Additionally, 2020 development scenarios show a 20 percent increase of annual PM10 and PM2.5 concentrations at peak Wyoming near-field receptors (BLM 2009).

Because different dispersion models were used in the PRB Coal Review Phase I and Phase II analyses, a direct comparison between numerical model results is not advisable. In relative terms, however, the Phase I analysis predicts long-term degradation in air quality through 2020, particularly in the Wyoming portion of the PRB. On the other hand, the Phase II analysis predicts long-term improvement in air quality through 2030. Therefore, the original cumulative impact analysis in ER Section 5.4 represents an upper bound.

Overall, based on the preceding analysis, the Proposed Project will have a small incremental effect on the moderate cumulative impacts to air quality resulting from past,

ongoing, and future ISR projects, CBM projects, oil and gas operations, surface coal mining activities, and other development identified in Section 5.1.1.

### ***5.5 Geology and Soils***

Cumulative impacts on soils and geology were assessed within the planning area administered by the BLM Buffalo Field Office (herein referred to as the “Buffalo Planning Area”). This area was chosen as the geographic boundary for the analysis of cumulative impacts on soils and geology because the Proposed Project is centrally located within the area administered by this office. There are no BLM lands but some federal mineral rights are located within the Proposed Project area. Within the Buffalo Planning Area, which encompasses Johnson, Campbell, and Sheridan Counties, the BLM administers 780,291 acres of public land and 4.7 million acres of the mineral rights in these counties. Within the Buffalo Planning Area, energy extraction activities affecting the geology and soils include oil and gas and CBM development, coal mining, and uranium extraction. Impacts to soils result from earthmoving activities associated with these energy extraction activities, and the subsurface geology is affected by the removal of a resource or by the injection of fluids to recover a resource. Recent BLM reports, discussed in the following paragraphs, provide valuable information on past, present, and reasonably foreseeable future development activities within the Buffalo Planning Area. These reports were used to assess the cumulative impact on geology and soils.

The past, ongoing, and reasonably future foreseeable actions to explore for and extract minerals within the region contribute to the cumulative impact on geology and soils (BLM, 2008a). As of 2009, there were a total of 6,421 conventional oil and gas wells in the Buffalo Planning Area. An additional 1,359 conventional wells are projected to be drilled between 2009 and 2028, resulting in the potential disturbance of soils covering an area of approximately 19,090 acres (BLM, 2009a). BLM has estimated the potential surface disturbance of soils from the development of coal bed methane within the same area as 64,144 acres (BLM, 2009a). BLM (2005a) reported that coal mining across the PRB, which comprises all of Campbell, Johnson, and Sheridan Counties less the land comprising the Bighorn National Forest, had disturbed 51,107 acres; some of which has occurred within the Proposed Project watershed.

BLM (2005c) evaluated the cumulative impact on geology and soils from past, present, and reasonably foreseeable future actions in the PRB under two different coal production scenarios. Under the upper coal production scenario, a total of 149,089 acres of disturbed

land are projected for the year 2020, versus the 2003 baseline total of 68,794 acres. There are other ISR projects either licensed or planned within a 50 mile radius of the Proposed Project, as shown in Figure 5-1 and Table 5-2 and that could impact geology and soils at an intensity comparable to that which will occur at the Proposed Project. Increased vehicle traffic, clearing of vegetated areas, salvaging and redistributing soils, discharging CBM produced groundwater, and constructing and maintaining project specific components (e.g., roads, well pads, industrial sites, and associated ancillary facilities) all contribute to the cumulative impacts on soils from both energy-related projects. The removal of uranium from the target sandstones during ISR operations will result in a permanent change to the composition of uranium-bearing rock formations. However, the uranium mobilization and recovery process in the target sandstones does not result in the removal of rock matrix or structure, and therefore no significant matrix compression or ground subsidence is expected.

The main soil resource concerns within the Buffalo Planning Area are wind erosion and water erosion that occur where the ground cover has deteriorated (BLM, 2009h). Long-term and short-term impacts on soils include accelerated wind or water erosion; declining soil-quality factors; declining microbial populations, fertility, and organic matter; compaction; and the permanent removal of soil (BLM, 2005c). Some degree of soil reclamation is possible, although not all overburden materials can be used to reestablish vegetation. Potential impacts on soils can also include a change in alkalinity due to discharge of CBM-produced water. The principal impact on soils from the Proposed Project will result from earthmoving activities. Earthmoving activities that could impact soils include clearing of ground or topsoil and preparing surfaces for the satellite plant, header houses, access roads, drilling pads, and pipeline trenching. Soil covering approximately 859 acres will be affected by the Proposed Project. These potential impacts will be further reduced by the Uranium one's implementation of best management practices (BMPs).

The soil disturbance over the life of the project accounts for less than 4.55 percent of the soil disturbance occurring in Proposed Project area. Furthermore, the ways in which soils will be impacted during the Proposed Project are also far less damaging or adverse than soil impacts that result from surface coal mining, which is more invasive and removes much larger amounts of soil.



## **5.6 Water Resources**

Surface and groundwater are used extensively throughout the PRB for agricultural water supply, municipal water supply, and both domestic and industrial water supply. Surface water use is limited to major perennial drainages and agricultural areas within the basin are found mainly along these drainages. Municipal water supply comes from a combination of surface and groundwater. Domestic and industrial water supply primarily is from groundwater.

### **5.6.1 Surface Waters and Wetlands**

All streams in the area are ephemeral, flowing only during rainfall or snow melt events. Potential impacts to surface water include the possibility of increased sediment from disturbed areas reaching the streams or the possibility of a leak or spill of chemicals near the streams. These potential impacts will be minimized through the use of BMPs for erosion and sediment control and adhering to strict safety protocols for handling chemicals. Because of the infrequency of runoff events in this semiarid region it is unlikely that a spill will be transported off site and reach a watercourse downstream.

As previously mentioned, CBM activity is prominent across the entire PRB. The BLM estimated that nine to 52 percent of CBM-produced water will contribute to surface water flows and perennial flows will be likely to develop in former ephemeral channels (BLM, 2003). CBM-produced water will increase the availability of surface waters for irrigation and other purposes for downstream users. BLM noted that noticeable changes in water quality will occur in the main channel drainages during periods of low flow and that sodicity and salinity are key water quality parameters because of their impact on water used for irrigation. BLM projected that the concentrations of suspended sediments in surface water will likely rise above baseline levels from increased flow and surface water runoff from disturbed areas. WDEQ adopted the Most Restrictive Proposed Limit for sodicity and salinity into its WYPDES permitting process to mitigate potential water quality impacts to downstream users.

Smith Ranch/Highland (operated by Power Resources, Inc.) is the only operating ISR projects within 50 miles of the Proposed Project. Due to the distance to this facility from the Proposed Project, impacts associated with those facilities will not create adverse effects to this Proposed Project, and vice versa.

For all projects mentioned, industrial and construction permits from WDEQ are required prior to project construction. For all permits, BMPs are required in order to reduce the risk to waterways caused by proposed activities. Furthermore, permits issued by the U.S. Army Corps of Engineers (USACE) are required for surface waters and wetlands that are jurisdictional.

### ***5.6.2 Groundwater***

The potential for groundwater impacts created by the Proposed Project will most likely occur during the operation and restoration phases of the Proposed Project. To reduce the risk of any groundwater impact, monitoring wells will be installed around the perimeter of the wellfields and for early detection and control of possible excursions. This method for detection and control is widely used and accepted at other ISR projects, and has shown to be very effective.

As previously mentioned, other uranium ISR projects are licensed within the vicinity of the Proposed Project (Figure 5-1). The DOE Spook facility is the only decommissioned conventional mill within a 50-mile radius of the Proposed Project. Given that the facility has been decommissioned and therefore meets NRC regulatory standards which demonstrate it does not pose a significant potential impact on public health, safety, or environment, the potential contribution to a cumulative impact on groundwater will be minimal. Another conventional mill, Bear Creek, resides within a 50 mile radius. It is a legacy site that is no longer in production and is awaiting DOE transfer of ownership. Both of these projects, including the aforementioned ISR projects, are located at sufficient distances from the Proposed Project for cumulative impacts to be minimal.

At present, some oil/gas wells occur on the lands within and adjacent to the Proposed Project. Oil wells are completed at much greater depths than the targeted ore-bearing aquifers for ISR uranium production. The ISR uranium production wells are completed at thousands of feet above the oil-producing horizons. Therefore, the potential cumulative impact on oil production in the PRB from the Proposed Project will be minimal.

## ***5.7 Ecological Resources***



### ***5.7.1 Terrestrial Ecology***

The potential exists for cumulative impacts to both flora and fauna due to land disturbance. Disturbance of the land may lead to loss of habitat and food source for a variety of species. The potential disturbance for the Proposed Project will not be continuous but rather small tracts distributed across the entire Proposed Project area. Sagebrush and mixed grasses cover the majority of the Proposed Project and these vegetative plant communities will be most affected by the Proposed Action. Disturbance from the construction and operations activities of the Proposed Project and others in the surrounding area could result in the spread of invasive and noxious weeds. However, it is a priority to ensure that any areas disturbed within the project area are promptly reseeded and reclaimed. Furthermore only areas that development is unavoidable will be disturbed, representing a small percentage of the entire Proposed Project area.

Big game usually travel large expanses of land; therefore, the minimal impact from the Proposed Project will have minimal cumulative impacts on their range. Reptiles and amphibians will experience the greatest impact, albeit minimal, due to limited mobility during construction, however only a small area of the Proposed Project will be disturbed at any one time.

### ***5.7.2 Aquatic Ecology***

As previously mentioned, all streams within and adjacent to the Proposed Project are ephemeral. Cumulative impacts from other sources, primarily oil and gas activity, create the potential for disturbing the aquatic ecology. Currently, oil and gas production has not had any effect on aquatic ecosystems, and despite their dominance, the USGS concluded that, with a few exceptions, that water quality does not exceed state nor federal acute and chronic criteria for the protection of aquatic life (Peterson, 2010).

### ***5.7.3 Threatened and Endangered Species***

No Threatened or Endangered vertebrate species have been documented in the proposed project survey area nor observed during baseline wildlife surveys. Additionally, no T&E plant species were encountered during the baseline vegetation assessment.

Fragmentation and degradation of the surrounding landscape has led to the decline of critical habitat for potential threatened and endangered species. The landscape is dominated by sagebrush and mixed grasses. And although this ecosystem encompasses a high

percentage of the expansive PRB, recent increases in diverse industrial activities create the potential for cumulative and compounding effects on the environment.

The Greater sage-grouse is a species that requires a very distinct ecosystem; one that is dominated by sagebrush during all seasons and required for every phase of their lifecycle. Mineral extraction, irrigation, and grazing have altered the native canvas creating fragmented habitat to fill their niche. In the short-term, sage-grouse have declined. In the years between 1965 to 2007, their populations have been declining with the greatest decline in populations occurring before the mid-1980s. Compared to historic levels, total population decline is estimated at 45 to 80 percent (Becker, et al., 2009). From 1956 to 2003, sage-grouse populations have been declining at two percent each year (Connelly, et al., 2009). To date, the USFWS has listed the sage-grouse as a “candidate species” under the Endangered Species Act of 1973. The USFWS and State of Wyoming continues to monitor this species status. Doherty (Doherty, et al., 2009) found that the State of Wyoming currently contains 64 percent of all known sage-grouse habitat and more active leks than any other state.

Oil and gas development is regarded as playing a major role in the decline of sage-grouse (Becker, et al., 2009). The direct adverse impacts of energy development projects, especially CBM related exploration/production, on sage-grouse have been well documented (Doherty, et al., 2008; Walker, et al., 2007; Holloran, 2005; Braun et al., 2002.). Future oil and gas development is projected to cause a seven to 19 percent decline in sage-grouse lek population counts throughout much of the current and historic sage-grouse range (Connelly, et al., 2009). If current trends of development continue, forecasts of future sage-grouse populations across 23 populations and seven sage-grouse management zones (SMZs) suggest that 75 percent of the populations and 29 percent of the SMZs to decline below breeding population sizes of 500 within 100 years.

Black-tailed prairie dog complexes are known to exist throughout the PRB. However, none were found within or adjacent to the Proposed Project. The black-tailed prairie dog is important to the federally endangered black-footed ferret by means of forage and habitat. The closest successful reintroduced population of the black-footed ferret is in the Shirley Basin, Wyoming, approximately 100 miles south-southwest of the Proposed Project.

The cumulative impacts on threatened and endangered species caused by industrial activities and other anthropogenic sources can directly impact a species survival and reproductive capacity. Indirectly, habitat quality and quantity, as well as increased

predation, can impact a species. In the case of the sage-grouse, this already weakened population could experience even greater reductions in populations due to an already fragmented ecosystem. Furthermore, the cluster of oil and gas wells far exceed the species' threshold of tolerance and energy development threatens to extirpate birds from otherwise suitable habitats and further isolate remaining populations (Naugle, et al., 2006). With an estimated 13,800 additional CBM wells projected to be drilled in the area by year end 2028, cumulative impacts to sage-grouse across the study area will be further increased.

Overall, based on the preceding analysis, the Proposed Project will have a small incremental effect on ecological resources compared to the moderate cumulative impacts from past, ongoing, and future ISR projects, oil and gas operations, surface coal mining activities, and other development identified in Section 5.1.1.

### **5.8 Noise**

Cumulative impacts from noise are assessed within a five mile review radius of the Proposed Project. This area served as the cumulative assessment geographic boundary and was chosen because noise dissipates rapidly with distance from the source. GEIS Section 4.3.7 stated that sound levels as high as 132 dBA will taper off to the lower limit of human hearing (20 dBA) at a distance of 3.7 miles in this region.

Past, present, and reasonably foreseeable future noise-generating activities in the vicinity of the Proposed Project will primarily be from traffic noise, uranium recovery operations, and oil and gas operations. Oil and gas operations are also active near the Proposed Project area. The FEIS noted that oil and gas operations will generate noise during well drilling, which decreases to 54 decibels (dBA) at 2,000 feet from the drill rig. Oil and gas operations generate noise during the, ongoing operations of compressor stations, although noise levels were anticipated to be below 55 dBA at distances of 1,600 feet and beyond (BLM, 2003). According to EPA, 55 dBA is the level that protects against interference and annoyance with a margin of safety (EPA, 1978).

The Proposed Project area does not overlap with any of the core or connectivity areas for sage-grouse as designated by the State of Wyoming. No known sage-grouse leks are present within the Proposed Project area. Mitigation measures to potential ecological resources impacts include:

- Implementing speed limits on access roads within the Proposed Project area and enforcement of speed limits on county roads for AUC employees and contractors; and
- Minimize vegetation impacts by ensuring employees use only existing and proposed roads in the Proposed Project area.

These actions should reduce potential noise impacts on wildlife in and around the Proposed Project area.

### ***5.9 Historical and Cultural Resources***

Since the emergence of CBM activities in the late 1990s, over one thousand archaeological sites are evaluated each year (BLM, 2009h – RMP Revision dated March 27, 2009). Hundreds of archaeological sites are discovered and recorded each year as the result of cultural resource investigations associated with energy development projects (BLM, 2009 –RMP). The revised RMP states as the demand for federally-owned minerals increases, there will be a demand to identify cultural resources. Within the study area, activities on both public and private lands include oil and gas development. These activities are ongoing and are projected to expand in the future. However, any potential impacts to historic and cultural resources will likely be minimized for projects occurring on federal or state lands, licensed or permitted by Federal agencies, or which are licensed or funded in part by the government because these projects will be subject to the National Historic Preservation Act (NHPA), Section 106 consultation process, and applicable statutes.

As discussed in Section 3.8 of the ER, a thorough survey of the historical and cultural resources, pertinent to the Proposed Project, was conducted. None of the cultural remains in the Proposed Project are considered eligible for the National Register. Uranium One has committed to cultural resource mitigation measures identified in Section 6 of this ER.

### ***5.10 Visual and Scenic Resources***

Within the area administered by the BLM Field Office and with the PRB region, energy development is expected to grow over the next 20 years and could involve constructing uranium recovery facilities, transportation infrastructure, coal fired power plants, major transmission lines (230kV), coal technology projects, oil and gas facilities, and CBM processing plants all that have an impact on visual and scenic resources.

A viewshed analysis was conducted for an area extending two miles from the Proposed Project boundary, and the general area from where the proposed satellite plant can be viewed is classified as BLM Visual Resource Management (VRM) Class III and IV with no Class I areas in the vicinity. Oil and gas production facilities are visible from great distances due to their taller profile and are located within and adjacent to the Proposed Project. However, there are very few of them and they are not clustered together. Other existing facilities that are visible from the Proposed Project include: roads, telephone/electric lines and poles, fences, pump jacks, and ranch buildings.

The Proposed Project is projected to have a small incremental impact on visual and scenic resources when added to the other past, present, and foreseeable future actions.

### ***5.11 Socioeconomics***

A regional economic model (Regional Economic Model, Inc. Policy Insight) that was part of BLM Powder River Basin Coal Review Task 3C Report: Cumulative Social and Economic Effects (BLM, 2005d), was used to develop reasonably foreseeable cumulative employment and population projections. Two future scenarios were modeled showing a lower and upper coal production scenario in the Powder River Basin. The two scenarios represent a projected range of economic activity derived by combining the range of future coal production with other identified foreseeable activities, including oil and gas production and other mining operations. The timeframe for the model analysis spans from 2007 to 2020, and older data were incorporated into the model to build upon historic employment and population trends.

The Powder River Basin BLM coal review study area served as the geographic boundary for the coal-review study. Across the entire six-county Powder River Basin (Campbell, Johnson, Converse, Crook, Sheridan, and Wetson), projected increases in employment from coal mining operations and oil and gas development will range from 12,120 to 28,625 jobs under the lower and upper coal-production scenarios between 2003 and 2020. Most of this gain is expected to take place in Campbell County, which is projected to capture 60 percent of the new jobs under the lower projection scenario and 65 percent under the upper coal-production scenario (BLM, 2009e). Based on the relatively small number of workers expected at the Proposed Project, it will have a small incremental contributory impact on employment.



While Converse County and the entire PRB have been described as possessing an enhanced capacity to respond to and accommodate growth, periods of rapid growth have been known to stress communities and their social structures, housing resources, and public infrastructure and service systems.

Both the lower and upper coal-production scenarios indicate a strong demand for housing resources through the year 2020. This demand is anticipated to exert substantial pressure on housing markets, prices, and the real estate development and construction industries, all at a time when demand for labor and other resources will also be high. However, the incremental impact to housing demand from the proposed construction and operation of the Proposed Project will be small, based on the small number of expected workers.

Based on assessments of population, employment, housing, school enrollment, public services, and local finances, the Proposed Project is projected to have a minimal incremental socioeconomic effect on the region when added to the moderate impacts expected from other past, present, and reasonably foreseeable future actions described in Section 5.1.1. This conclusion is based on the small number of workers required to support the Proposed Action.

### ***5.12 Environmental Justice***

The percentage of minority populations living in the two nearest block groups are very small when compared to the percentage of minority populations recorded at the state level and much less than the national level. The economic base of the region is largely comprised of ranching and resource extraction. Low income populations are generally dispersed throughout the study area. Potential impacts to minority and low-income populations from the construction, operation, restoration, and decommissioning of the Proposed Project including other past, present, and reasonably foreseeable future actions, will not be disproportionately high and adverse.

### ***5.13 Public and Occupational Health and Safety***

The cumulative impact on public and occupational health and safety was considered within a 50 mile radius of the Proposed Project. Historically, NRC has used the 50 mile radius as a standard bounding geographic area to evaluate population radiation doses from releases at ISR facilities. This section considers both radiological and non-radiological impacts from normal operations and accidents.

The highest calculated dose to a member of the public for the Proposed Project is 1.59 mrem per year. Table 4.2-2 of the NUREG-1910 (GEIS) shows the offsite maximum dose to a member of the public could range from less than 1 mrem per year to 31.7 mrem per year. Because the range of the doses for these facilities are well below the 100 mrem/yr limit in 10 CFR 20.1301(a)(1), the cumulative impacts from other similar facilities located within 50 miles will be minimal.

A radiological hazard assessment (Mackin, et al., 2008) considers three types of accidents, representing the sources containing the higher levels of radioactivity for all aspects of uranium recovery operations: thickener failure and spill, pregnant lixiviant and loaded resin spills (radon release), yellowcake dryer accident release. The impacts to workers from these accidents are considered minimal except in the unlikely event that the accidents will not be mitigated. Under that circumstance, the dose impacts could be considered moderate.

The types and quantities of chemicals (hazardous and nonhazardous) for proposed use at the Proposed Project do not differ from those evaluated in the ISR GEIS. The use of hazardous chemicals at ISR facilities is controlled under several regulations that are designed to provide adequate protection to workers and the public. The handling and storage of chemicals at the facility will follow standard industrial safety standards and practices. Industrial safety aspects associated with the use of hazardous chemicals are regulated by the Wyoming Occupational Safety and Health Administration. Non-radiological worker safety will be addressed through occupational health and safety regulations and practices.

Since the Proposed Project is located in a remote, sparsely populated area with limited public access, the exposure to members of the public will be limited. Occupational health hazards will be limited because applicants are required to implement an NRC-approved radiation protection program to protect occupational workers. Additionally, ISR facilities will follow standard industrial safety standards and practices.

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**Table 5-1: 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

**Table 5-2: Past, Existing, and Potential Uranium Recovery Sites Within 50-miles of the Proposed 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

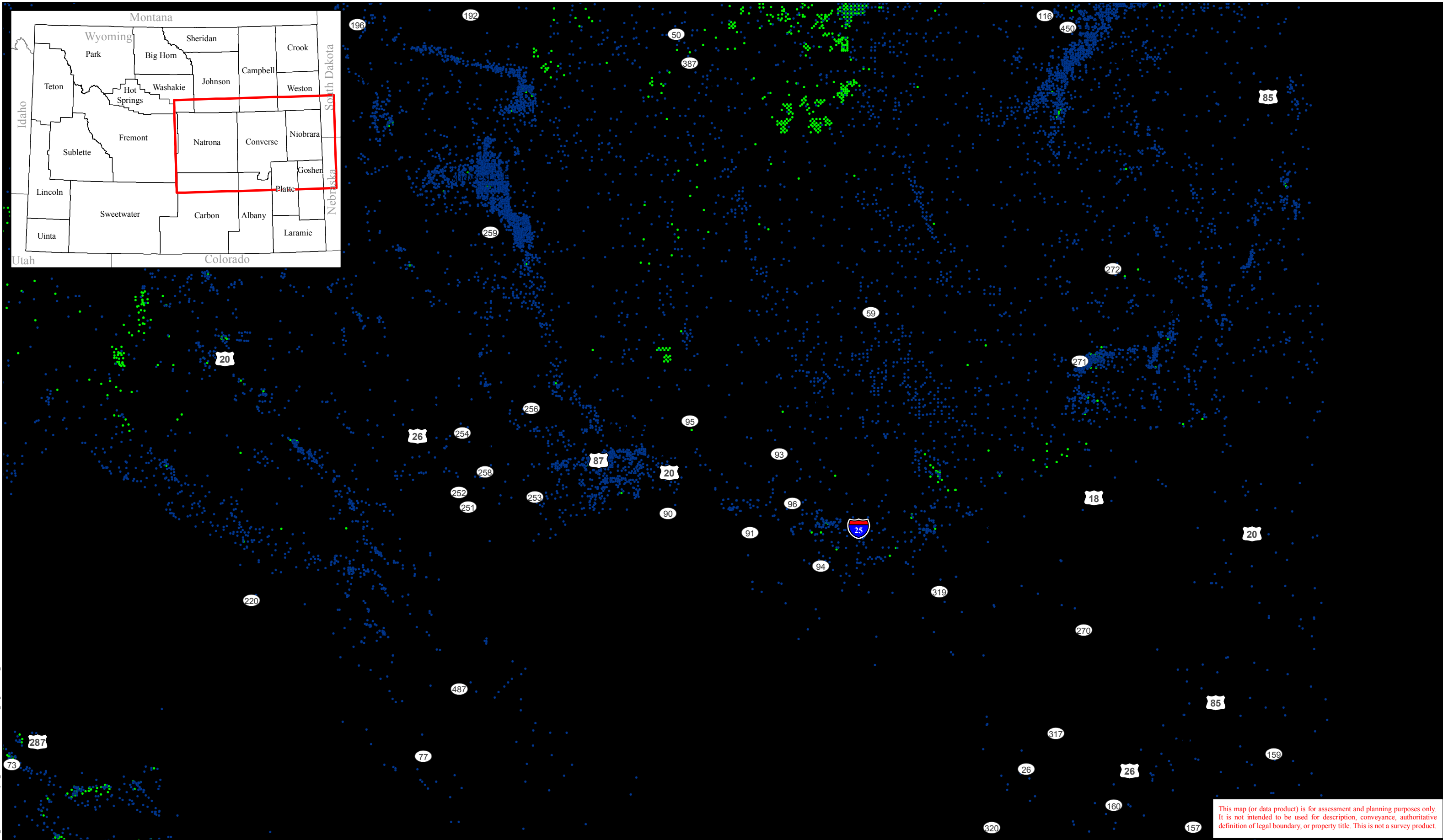
**Table 4-3: Wyoming Coal Mines Near the Proposed Project**

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





Path: O:\WY\_Projects\8201-2013-102\_Infrastructure\Project\_MXD\NRC-mxd\Ludeman\_RegionalWells\_SurfaceOwner.mxd



This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

PREPARED FOR

**LUDEMAN PROJECT**  
CONVERSE COUNTY, WY

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Casper, Wyoming 82601  
Phone: (307) 265-0696  
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**Legend**

Ludeman Project Boundary

Ludeman 50 Mile Review Boundary

Oil Well

Gas Well

**Surface Ownership**

Bureau of Land Management

Bureau of Reclamation

Department of Defense

Forest Service

State

Interstate

Highway

Major Road

Minor Road

1:750,000

02.5510152025

Miles

DRAWN BY: EGS

CHECKED BY: CT

APPROVED BY: RMD

**Regional Wells and Surface Ownership**

REV #	DESCRIPTION	BY	DATE	FIGURE
0	For Submittal	EGS	6/4/2015	5-2