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40-9073

February 25, 2009

Attn: Document Control Desk
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RE: Additional Information Concerning Proposed Moore Ranch Uranium Project
Comparison of Environmental Report and NUREG-1910

Dear Mr. Shroff:

Enclosed please find a study entitled *Comparison of the Moore Ranch NRC License Application Environmental Report with the Bounding Analysis Contained in NUREG-1910 "Draft Generic Environmental Impact Statement for In Situ Leach Uranium Milling Facilities"*. The purpose of this document is to provide a comparison of the proposed action for the Moore Ranch Uranium Project and the associated potential environmental impacts with the analysis prepared by the U.S. Nuclear Regulatory Commission (NRC) in NUREG-1910[1]. The study compares pertinent sections of the Moore Ranch Environmental Report submitted to NRC in October, 2007 with the review basis and evaluations prepared by NRC in NUREG-1910. A summary comparison table is included in Addendum 1 at the end of the document.

[1] U.S. Nuclear Regulatory Commission, *Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities, Draft Report for Comment*, NUREG-1910, July 2008

Add: Behram Shroff
E. Rios

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If you should have any questions concerning this document, please contact me by phone at (307) 234-8235 ext. 329 or by email at mike.griffin@uranium1.com.

Sincerely,

Mike Griffin
Director of Environmental and Regulatory Affairs

Enclosure: *Comparison of the Moore Ranch NRC License Application Environmental Report with the Bounding Analysis Contained in NUREG-1910 "Draft Generic Environmental Impact Statement for In Situ Leach Uranium Milling Facilities"*

Cc (w/ enclosure): Myron Fliegel, Senior Project Manager
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Comparison of the Moore Ranch NRC License Application Environmental Report with the Bounding Analysis Contained in NUREG-1910 "Draft Generic Environmental Impact Statement for In Situ Leach Uranium Milling Facilities"

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1 INTRODUCTION

1.1 Purpose

The purpose of this document is to provide a comparison of the proposed action for the Moore Ranch Uranium Project and the associated potential environmental impacts with the analysis prepared by the U.S. Nuclear Regulatory Commission (NRC) in NUREG-1910[1]. In situ leach (ISL) mining has been performed in the United States for over 30 years. As a result, standard mining and environmental protection methods have been developed by industry and the NRC has gained significant experience with licensing and regulating these facilities. In most instances, ISL mining results in minimal environmental impacts that are common amongst facilities. In these cases, NRC Staff may inform their evaluation of a proposed project with the analysis provided in NUREG-1910, resulting in a more efficient and thorough analysis. Some aspects of the proposed Moore Ranch project are unique due to site-specific factors and do not fall within the bounds of the analysis provided in NUREG-1910. These aspects will require additional evaluation by NRC Staff.

This document discusses each aspect of the Moore Ranch project in comparison with the analysis in NUREG-1910 and identifies those that may require additional analysis by NRC Staff. The discussion contained in this comparison is not intended to be exhaustive. References are contained within each aspect to the appropriate sections of the Moore Ranch ER and NUREG-1910 for detailed information.

1.2 NRC Draft Generic Environmental Impact Statement

The NRC has prepared NUREG-1910 to identify and evaluate potential environmental impacts associated with the construction, operation, aquifer restoration, and decommissioning of ISL uranium recovery facilities for identified regions in the western United States. The purpose of developing NUREG-1910 was to improve the efficiency of NRC's environmental reviews for ISL license applications required under the National Environmental Policy Act of 1969, as amended (NEPA).

NUREG-1910 was published in July 2008 as a draft report for comment. NRC is currently preparing the final version of the GEIS based on input received from industry, other government agencies, and the interested public. NUREG-1910 documents the results of the systematic approach that was taken to evaluate the environmental consequences of ISL uranium recovery in four principal regions. For each potential

[1] U.S. Nuclear Regulatory Commission, *Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities, Draft Report for Comment*, NUREG-1910, July 2008

environmental issue, NUREG-1910 (1) describes the activity that affects the environment, (2) identifies the population or resource that is affected, (3) assesses the nature and magnitude of the impact on the affected population or resource, and (4) characterizes the significance of the effect for both beneficial and adverse effects.

The NRC's standard of significance for impacts was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR §1508.27, which requires consideration of both "context" and "intensity"). Using the CEQ terminology, the NRC established three significance levels – SMALL, MODERATE, or LARGE. These significance levels are identified in NUREG-1748[2]:

- SMALL Impact: The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource considered.

- MODERATE Impact: The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource considered.

- LARGE Impact: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource considered.

NUREG-1910 assigns a significance level to each environmental issue.

To meet its NEPA obligations for a site-specific license application, the NRC staff will conduct an independent, detailed evaluation of the potential environmental impacts of each proposed action to construct, operate, and decommission an ISL facility. NRC has stated that this evaluation will use the conclusions reached in NUREG-1910 to the extent applicable to the specific site. The NRC staff will compare the relevant aspects of the description of the proposed facility, its use of the ISL process, and the affected environment to the descriptions of these aspects in NUREG-1910. To the extent applicable, the NRC staff may then incorporate by reference these descriptions into the site-specific environmental document.

1.3 Moore Ranch ISL License Application

In October 2007, Energy Metals Corp. (EMC) submitted a license application to the NRC for the proposed Moore Ranch Uranium Project in the central Powder River Basin in Wyoming. The proposed Moore Ranch project consists of a central processing plant and several production wellfields employing standard ISL uranium mining techniques. The central plant will also accept ion exchange resin from satellite facilities. The license

[2] U.S. Nuclear Regulatory Commission, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*, NUREG-1748, August 2003.

application consisted of a Technical Report to support preparation of a Safety Evaluation by NRC Staff and an Environmental Report (ER) to support the required NEPA analysis. The ER was prepared following the guidance provided by NRC in NUREG-1748 and NUREG-1569[3] and contains the following information:

- Section 2 provides a detailed description of the proposed action and alternatives;
- Section 3 describes the affected environment;
- Section 4 provides an evaluation of the potential environmental impacts of constructing, operating, aquifer restoration, and decommissioning;
- Section 5 details the mitigation measures that EMC plans to employ to reduce or eliminate environmental impacts;
- Section 6 describes the environmental monitoring and measurement programs; and
- Section 7 provides a benefit-cost analysis.

1.4 Scope of this Comparison

As noted in Section 1.1, this document compares pertinent sections of the Moore Ranch ER with the review basis and evaluations prepared by NRC in NUREG-1910. The comparison follows the outline of the Moore Ranch ER and provides references to the appropriate sections of NUREG-1910. A summary comparison table is included in Addendum 1 at the end of this document.

This comparison concentrates on several sections of the Moore Ranch ER. Section 2 of the ER, Alternatives, provides a detailed discussion of the proposed action including the ISL mining process and equipment. Comparison of this information is important to ensure that the proposed alternative is bounded by the analysis completed by NRC in NUREG-1910. Following the review of the proposed alternative, the environmental impacts described in Section 4 of the ER are compared with those developed by NRC based on the model ISL mine and geographic region considered in NUREG-1910. Where appropriate, proposed mitigation measures from Section 5 of the ER are discussed for each resource impact discussion.

Portions of the Moore Ranch ER were not considered in this comparison.

- Section 3 of the ER describes the affected environment based on extensive characterization performed by EMC. In NUREG-1910, NRC identified four geographic regions where ISL mining is expected to occur in the near future and developed descriptions of the affected environment for each region. While the characteristics of the Moore Ranch project generally are similar to those described

[3] U.S. Nuclear Regulatory Commission, *Standard Review Plan for In Situ Leach Uranium Extraction License Applications*, NUREG-1569, June 2003

in NUREG-1910 for the Wyoming East Uranium Milling Region, the analysis of impacts completed by NRC to meet their obligations under NEPA must be based on actual site conditions.

- Section 7 of the ER provides a benefit-cost analysis for the proposed project. This analysis is necessarily project specific in nature and does not lend itself to a general analysis. However, portions of this analysis were used to support the discussion of the socioeconomics impacts of the proposed project in Section 3.10 of this document.

2 ANALYSIS OF PROPOSED ACTION

Section 2.2 of the Moore Ranch ER provides a detailed description of the proposed action. The proposed project would develop uranium resources at Moore Ranch using the ISL recovery method. Proposed facilities consist of injection/production wellfields, a central plant with ion exchange, resin unloading, elution, precipitation, and yellowcake drying capabilities, and deep injection disposal well(s).

This section compares the proposed action from the Moore Ranch ER with the information on uranium recovery using the ISL process contained in Section 2 of NUREG-1910. Section 2 of NUREG-1910 gives basic information on the type of uranium deposits that are amenable to ISL technology and an overview description of the different parts of an ISL facility. Sections 2.2 through 2.6 describe different stages of an ISL facility's lifecycle, including pre-construction, construction, operation, aquifer restoration, and decommissioning. Sections 2.7 through 2.10 include discussions of aspects such as occupational health radiation monitoring, waste management, transportation, and financial assurance that are common to all ISL uranium facilities.

2.1 Site Location and Description

2.1.1 Proposed Site Location and Description

Section 2.2.4 of the ER provides the site location and description of the proposed project. The location of the proposed Moore Ranch Uranium Project is in Campbell County, Wyoming, in the central Powder River Basin. Specifically, the proposed license area is located in all or portions of Township 42 North, Range 75 West, Sections 26, 27, 33, 34, 35, 36 and Township 41 North, Range 75 West, Sections 1, 2, 3, and 4, and Township 42 North, Range 74 West, Section 31.

2.1.2 NUREG-1910 Discussion

In NUREG-1910, Figure 3.1.2, *Wyoming East Uranium Milling Region with Current and Potential ISL Milling Sites*, NRC includes the proposed Moore Ranch location in the Wyoming East Region.

2.1.3 Conclusion

The proposed Moore Ranch Project location is included within the Wyoming East Region, which is one of the four regions considered by NRC in NUREG-1910.

Reference: NUREG-1910, Section 3.1.1; Figures 3.1.2 and 3.3.3.

2.2 Orebody Characteristics

2.2.1 Proposed Orebody Characteristics

Section 2.2.5 of the ER provides a discussion of the general orebody characteristics for the proposed project. The site is situated in the southwestern part of the Powder River Basin approximately 12 miles east-northeast of the Tertiary Wasatch-Fort Union formation contact. The Wasatch formation, which is the surface geologic unit in this area, is part of the thick Powder River sedimentary series and consists of interbedded sandstones, siltstones, claystones and coals. The 70 sand is the proposed ore production sand. It is laterally extensive and ranges from 40 to 120 feet thick. The average depth to the ore zone is 180 feet.

2.2.2 NUREG-1910 Discussion

Section 2.1.2 of NUREG-1910 noted that deposits that are generally amenable to ISL recovery are stratabound deposits. These deposits are contained within a single layer (strata) of sedimentary rock and were formed through the transport of uranium by oxidizing groundwater. Depending upon the environmental conditions, stratabound deposits can take different physical forms and are typically described as either roll-front deposits or tabular deposits. Roll-front deposits (shown in NUREG-1910, Figure 2.1-1) are found in the basins in Wyoming.

2.2.3 Conclusion

The ore body at the proposed Moore Ranch Project is contained within a single stratum (the 70 Sand) and is a roll-front deposit as described in NUREG-1910.

Reference: NUREG-1910, Section 2.1.2 and Figure 2.1-1.

2.3 Well Construction and Integrity Testing

2.3.1 Proposed Well Construction and Integrity Testing Methods

Section 2.2.6 of the Moore Ranch ER describes well construction and testing methods. Pilot holes for monitor, recovery, and injection wells are drilled to the bottom of the target completion interval with a small rotary drilling unit using native mud and a small amount of commercial drilling fluid additive for viscosity control. The hole is logged, reamed, casing set, and cemented to isolate the completion interval from all other aquifers. The well casing material will be polyvinyl chloride (PVC) with schedule 40 wall thickness and a nominal 5-inch outside diameter, although a larger diameter casing may be utilized if a larger pump size is necessary.

Casing centralizers are located approximately every 40 feet above the casing shoe and are normally run on the casing to ensure it is centered in the drill hole. Effective sealing materials consist of neat cement slurry, sand-cement grout, or bentonite clay mixtures meeting Wyoming Land Quality Division requirements.

After the well is cemented to the surface and the cement has set, the well is drilled out and completed either as an open hole or it is fitted with a screen assembly (slotted liner), which may have a sand filter pack installed between the screen and the underreamed formation.

Following construction the wells must be developed to restore the natural hydraulic conductivity and geochemical equilibrium of the aquifer. All wells are initially developed immediately after construction using air lifting, swabbing or other accepted development techniques. The primary goal for well development is to allow formation water to enter the well screen. This process is necessary to allow representative samples of groundwater to be collected, and to ensure efficient injection and recovery operations.

Field-testing of all wells is performed to demonstrate the mechanical integrity of the well casing. This mechanical integrity test (MIT) is performed using pressure-packer tests. The sealed casing is tested 120% of the maximum operating pressure.

2.3.2 NUREG-1910 Discussion

Section 2.3.1.1 of NUREG-1910 describes the well construction and testing methods that were considered. NRC notes that at most ISL well fields, injection, production, and monitoring wells are drilled to the desired depth (e.g., 328-984 ft) for a target uranium production zone by a standard method such as mud rotary drilling. The well construction method considered by NRC includes the following steps:

- Sections of the uranium mineralized aquifers are left as open holes and screened with either steel or PVC screen material.
- Screens are then connected to the ground surface with steel or PVC riser pipes.
- The space between the casing and the borehole (i.e., the annulus) is filled with properly graded sand or gravel pack material, or the formation is simply left to collapse around the screen.
- A seal of bentonite clay is installed above the top of the screen.
- The annulus above the bentonite seal between the screen/riser pipe assembly and the borehole is grouted to the ground surface with a mixture of cement, bentonite, and water.

Figure 2.3.4 in NUREG-1910 presents a cross section of a typical ISL well depicting fiberglass, PVC, or steel casing with a nominal diameter of 4 to 6 inches and with centralizers located every 100 feet. The production zone is shown with an underreamed completion. Although the text in this description discusses the use of graded sand or gravel pack material to fill the annulus, Figure 2.3.4 depicts the use of cement fill in the annular space.

Following construction, NRC notes that wells are usually developed using an air lift method or other pumping method appropriate for the local conditions. An MIT is then performed. The bottom and top of the casing plugged (sealed) and the well is pressurized. Pressure gauges are employed to monitor pressure changes inside the casing. Based on site-specific conditions, after maintaining a specified pressure for a specified period without a measurable decrease, the well casing is considered to have passed an MIT and the well is fit for injection or production operations.

2.3.3 Conclusion

The well drilling, construction, development, and testing methods described in the Moore Ranch ER meet or exceed the methods contained in NUREG-1910.

Reference: NUREG-1910, Section 2.3.1.1 and Figure 2.3-4.

2.4 Wellfield Design and Operation

2.4.1 Proposed Wellfield Design and Operation

Wellfield design and operation is discussed in Section 2.2.7 of the Moore Ranch ER. The wellfield injection/recovery pattern proposed for Moore Ranch is based on the conventional square five spot pattern which is modified as needed to fit the characteristics of the orebody. A typical pattern design is shown in Figure 2.2-3.

Each injection well and recovery well is connected to the respective injection or recovery manifold in a wellfield header house building. The manifolds deliver the recovery solutions to the pipelines carrying the solutions to and from the ion exchange facilities. Flow meters and control valves are installed in the individual well lines to monitor and control the individual well flow rates and pressures.

Wellfield piping is constructed of high density polyethylene (HDPE), polyvinyl chloride (PVC), and/or steel. The wellfield piping will typically be designed for an operating pressure of 150-300 psig, and it will be operated at pressures equal to or less than the rated operating pressure of the pipe and other in-line equipment. The individual well lines and the trunk lines to the ion exchange facility are buried to prevent freezing.

Within each wellfield, more water is produced than injected to create an overall hydraulic cone of depression in the production zone. Under this pressure gradient the natural groundwater movement from the surrounding area is toward the wellfield providing additional control of the recovery solution movement. The minimum over production or bleed rates will be a nominal 0.5% of the total wellfield production rate and the maximum bleed rate typically approaches 1.5%. Bleed rates will be adjusted as necessary to ensure that the wellfield cone of depression is maintained.

2.4.2 NUREG-1910 Discussion

Section 2.3.1.1 of NUREG-1910 describes the various pattern shapes used in ISL operations, including the five-spot and seven-spot patterns. A typical well arrangement using five- and seven-spot patterns is shown in Figure 2.3-1. NUREG-1910 notes that since roll-front uranium deposits normally have irregular shapes, some of the well patterns in a given well field may also be irregular and that the licensee may alter well patterns to fit the size, shape, and boundaries of individual ore bodies.

Injection and production wells are connected to manifolds in a nearby header house. These manifolds connect to a series of pipelines that carry solutions to and from the recovery plant or satellite facility. Meters and control valves in individual well lines monitor and control flow rates and pressures for each well to maintain water balance and to aid in identifying leaks in the system.

The well field piping is typically high-density polyethylene, polyvinyl chloride (PVC), and/or steel pipe. Individual well lines and larger trunk lines to the recovery plant are buried below the frost line (e.g., as deep as 6 ft. in Wyoming) to prevent transferred solutions from freezing.

Section 2.4.1.2 of NUREG-1910 considers wellfield control. NRC notes that after processing but before reinjection, about 1-3 percent of the lixiviant, called the production bleed, is removed from the circuit and disposed of. The purpose of the production bleed is to ensure that more groundwater is extracted than reinjected. Figure 2.4-1 depicts an exaggerated potentiometric surface that results from this production bleed.

2.4.3 Conclusion

The wellfield pattern design, piping construction and installation described in the Moore Ranch ER are comparable to the methods contained in NUREG-1910. The proposed wellfield control method is comparable.

Reference: NUREG-1910, Section 2.3.1.1 and Figure 2.3-1
NUREG-1910, Section 2.4.1.2 and Figure 2.4-1

2.5 Lixiviant Chemistry

2.5.1 Proposed Lixiviant Chemistry

Section 2.2.8.1 of the Moore Ranch ER discusses the proposed lixiviant chemistry. The lixiviant is the recovery solution which is used to solubilize the uranium from the ore deposit. The composition of the lixiviant is designed to reverse the natural geochemical conditions which led the to original uranium deposition. The Moore Ranch project proposes a carbonate-bicarbonate recovery solution consisting of varying concentrations and combinations of sodium carbonate (Na_2CO_3), sodium bicarbonate ($NaHCO_3$), oxygen, and carbon dioxide (CO_2) added to the native groundwater to promote the dissolution of uranium as a uranyl carbonate complex. Table 2.2-1 of the ER presents the typical lixiviant concentrations of a number of water quality parameters.

2.5.2 NUREG-1910 Discussion

Section 2.4.1.1 of NUREG-1910 describes potential lixiviant chemistry including the use of acid-based and ammonia-based lixiviants. NRC noted that while these types of lixiviants could be proposed in the future, their use presents challenges for groundwater restoration. For the purposes of the analysis contained in NUREG-1910, NRC expected that ISL operations in the United States will use alkaline lixiviants that are based on sodium carbonate-bicarbonate as the complexing agent and gaseous oxygen or hydrogen peroxide as the oxidizing agents. Table 2.4-1 presents typical lixiviant chemistry, which is identical to the data provided in Table 2.2-1 of the ER with the exception of pH. NRC considered a lixiviant with a maximum pH of 10.5 S.U., while the Moore Ranch ER is based on a maximum pH of 8.0 S.U.

2.5.3 Conclusion

The proposed alkaline lixiviant chemistry for Moore Ranch is identical to the basis used for the analysis in NUREG-1910 with the exception of the maximum expected pH of the solution, which is less than the maximum pH considered by NRC.

Reference: NUREG-1910, Section 2.4.1.1 and Table 2.4-1.

2.6 Uranium Processing

2.6.1 Proposed Uranium Processing Method

Section 2.2.8 of the Moore Ranch ER provides a detailed description of the proposed uranium processing method. The recovery of uranium from the pregnant lixiviant will take place in the ion exchange (IX) columns. The uranium bearing recovery solution enters the pressurized downflow IX column and passes through the resin bed. The uranium complexes in solution are loaded onto the resin in the column. Once the resin in an IX column is loaded to capacity with uranium, the column will be taken out of service. The resin loaded with uranium will be transferred from the IX column to the elution circuit for stripping using a sodium chloride solution followed by a bicarbonate rinse. When a sufficient volume of pregnant eluant is held in storage, it is acidified with either sulfuric or hydrochloric acid to break the uranyl carbonate complex ion and liberate carbonate ions as carbon dioxide. Anhydrous ammonia or sodium hydroxide is then added to raise the pH to a level conducive for precipitating uranium crystals. Hydrogen peroxide is then added to the solution to precipitate the uranium. The precipitated uranyl peroxide slurry is pH adjusted, allowed to settle, and the clear solution decanted. The thickened uranyl peroxide "slurry" is further dewatered and washed. The solids discharge is either sent to the vacuum dryer for drying before shipping or is sent to storage for shipment as slurry to a licensed recovery or conversion facility.

Figure 2.2-5 provides the process flow diagram for the proposed project.

2.6.2 NUREG-1910 Discussion

Section 2.4.2 of NUREG-1910 describes the uranium processing method considered in the evaluation. In the ion exchange columns, the uranium is adsorbed onto resin beads that selectively remove uranium from solution. When the resin beads in the ion exchange columns become saturated with uranium, the columns are taken offline. After the resin is loaded with uranium, it enters the elution circuit. In the elution circuit, the uranium is eluted from the resin and the resin is made available for further cycles of uranium absorption. The resin may be eluted directly in the ion exchange column, or it may be transferred to a separate elution tank. In the elution process, the uranium is removed from the resin by flushing with a concentrated brine solution. A sodium carbonate or bicarbonate rinse is used during this phase. After enough pregnant eluant is obtained, it is moved to the precipitation, drying, and packaging circuit. In the precipitation and drying circuit, the pregnant eluant is typically acidified using hydrochloric or sulfuric acid to destroy the uranyl carbonate complex. Hydrogen peroxide is then added to precipitate the uranium as uranyl peroxide. Caustic soda or ammonia is also normally added at this stage to neutralize the acid remaining in the eluate. After the precipitation process, the resulting slurry is sent to a thickener where it is settled, washed, filtered, and dewatered. The thickened slurry may be transported offsite to a uranium processing plant to produce yellowcake or it may be filter pressed to remove additional water, dried and packaged onsite.

NUREG-1910 considers multihearth and vacuum dryers and notes that newer ISL facilities usually use vacuum yellowcake dryers. In a vacuum dryer, the heating system is isolated from the yellowcake so that no radioactive materials are entrained in the heating system or its exhaust. The drying chamber that contains the yellowcake slurry is under vacuum. Moisture in the yellowcake is the only source of vapor. Emissions from the drying chamber are normally treated through a bag filter to remove yellowcake particulates with an efficiency exceeding 99 percent. Any captured particulates are returned to the drying chamber. Then, any water vapor exiting the drying chamber is cooled and condensed. This process is designed to capture virtually all escaping particles. The dried yellowcake is removed from the bottom of the dryer and packaged in drums for eventual shipping offsite.

Figure 2.4-2 provides a typical flow diagram of an ISL uranium recovery process.

2.6.3 Conclusion

The proposed uranium processing method for Moore Ranch is identical to the basis used for the analysis in NUREG-1910 with the use of a vacuum dryer.

Reference: NUREG-1910, Section 2.4.2 and Figure 2.4-2

2.7 Central Plant Facilities

2.7.1 Proposed Central Plant Facilities

Section 2.3 of the Moore Ranch ER discusses the proposed central plant facilities. The central plant will not only serve production from Moore Ranch ISR operations, but is also planned to process resin from other potential satellite projects in the area, or potential tolling arrangements with other in situ operations licensed under a different operator. The central plant will be initially designed and constructed to produce 2 million pounds of U_3O_8 per year. Capacity is expected to be expanded to 4 million pounds per year as these other potential satellite projects are licensed and production increases. The initial central plant facilities will be housed in a building approximately 350 feet long by 100 feet wide. The building width (with the exception of the ion exchange area) will likely double to accommodate the future planned expansion. Section 2.3.1 of the ER provides flow and material balances for the ion exchange, elution, and precipitation systems.

2.7.2 NUREG-1910 Discussion

The process description in NUREG-1910 is restricted to the general description contained in Section 2.4.2.

2.7.3 Conclusion

The specific discussion of planned production capacity, plant design, and flow and material balances for the various circuits at the proposed Moore Ranch project are not included in NUREG-1910 and will require site-specific analysis. It should be noted that these systems include control measures for potential environmental impacts but analysis is primarily related to the safety evaluation conducted by NRC.

Reference: N/A

2.8 Chemical Storage Facilities

2.8.1 Proposed Chemical Storage Facilities

Section 2.3.3 of the Moore Ranch ER provides a detailed discussion of the proposed chemical storage facilities. Chemical storage facilities will include both hazardous and non-hazardous material storage areas. Bulk hazardous materials, which have the potential to impact radiological safety, will be stored outside and segregated from areas where licensed materials are processed and stored. The ER provides details for the planned storage of process related chemicals (i.e., carbon dioxide, oxygen, chemical reductants, anhydrous ammonia or sodium hydroxide, acid, and hydrogen peroxide) and non process related chemicals (e.g., diesel).

2.8.2 NUREG-1910 Discussion

The process description in NUREG-1910 is restricted to the general description contained in Section 2.4.2 and does not address chemical storage facility design.

2.8.3 Conclusion

The specific discussion of planned storage facilities for process related and non process related chemicals at the proposed project are not included in NUREG-1910 and will require site-specific analysis. It should be noted that these systems include control measures for potential environmental impacts but analysis is primarily related to the safety evaluation conducted by NRC.

Reference: N/A

2.9 Instrumentation and Control

2.9.1 Proposed Instrumentation and Control

Section 2.4 of the Moore Ranch ER discusses instrumentation and control for wellfield operations, ion exchange circuit, process areas, yellowcake drying systems, process wastewater disposal systems, and radiological monitoring instrumentation.

2.9.2 NUREG-1910 Discussion

NUREG-1910 does not address instrumentation and control design.

2.9.3 Conclusion

The specific discussion of planned instrumentation and control at the proposed Moore Ranch project are not included in NUREG-1910 and will require site-specific analysis. It should be noted that these systems include control measures for potential environmental impacts but analysis is primarily related to the safety evaluation conducted by NRC.

Reference: N/A

3 ENVIRONMENTAL IMPACTS

3.1 Land Use Impacts

3.1.1 Land Use Impacts of the Proposed Action

As discussed in Section 4.1 of the ER, rangeland is the primary land use within the proposed license area and the surrounding 2.0-mile review area. Oil and gas production (coal bed methane) facilities and infrastructure are located on rangeland throughout the review area. The review area also contains pastureland to the west. Land use within the proposed license area is illustrated on Figure 3.1-1 of the ER.

The total license area for the proposed project is approximately 7,110 acres. Construction of the Moore Ranch Central Plant and associated structures will encompass approximately 11 acres. Operation of the proposed project will ultimately encompass approximately 150 acres (i.e., disturbed land). Use of the land as rangeland will be excluded from this area during the life of the project. Oil and gas production facilities will not be affected.

There are currently no occupied housing units in the proposed license area. There is no recreational use of the license area or the surrounding 2.0-mile area, as all of the land is privately owned.

The impacts to land use are considered temporary and reversible by returning the land to its former grazing use through post-mining surface reclamation. There will be no long-term impacts or institutional controls following decommissioning of the site.

3.1.2 Land Use Impacts Assessed in NUREG-1910

Section 4.3.1 of NUREG-1910[4] assessed land use impacts from ISL operations. For the purposes of the impact assessment, the site area and land use of new ISL facilities to be licensed was bounded as follows:

- Total license area of a new ISL site: 1,000 to 7,000 ha [2,471 to 17,297 acres]

[4] Note that Section 4.3 assessed the Wyoming East Uranium Milling Region (in which the proposed project is located) and in many instances, due to similarities between the regions, references portions of the analysis contained in Section 4.2, which assessed impacts for the Wyoming West Uranium Milling Region. Some of the data used in this comparison (e.g., site area estimates) is contained in Section 4.2. Where data from Section 4.2 is considered in the comparison for a specific impact, the appropriate subsection is included in the NUREG-1910 references.

- Total (disturbed land) surface area of a new ISL site including multiple well fields, a central processing facility, and satellite plants within the overall license area: 40 to 1,000 ha [99 to 2,471 acres]

- License areas in the Wyoming East Uranium Milling Region consist of a mixture of private lands and lands managed by the BLM and USFS.

- ISL surface facilities are considered controlled areas that are fenced to limit access. Entire well fields or areas around pump houses and well heads may also be fenced for safety, security, and to prevent livestock grazing or other types of access.

NUREG-1910 noted that much of the total licensed area of ISL facilities is expected to remain undisturbed since surface operations (well fields and processing facilities) affect only a small portion of the licensed area.

3.1.2.1 Construction Impacts to Land Use

NUREG-1910 noted that construction activities would (1) change and disturb the land uses, (2) restrict access and establish right-of-way for access, (3) affect mineral rights, (4) restrict livestock grazing areas, (5) restrict recreational activities, and (6) alter ecological, cultural and historical resources. NUREG-1910 determined that potential impacts to most aspects of land use from the construction of an ISL facility would be SMALL[5]. This is because (1) the amount of area disturbed by the construction would be small in comparison to the available lands; (2) the majority of the site would not be fenced; (3) potential conflicts over mineral access would be expected to be negotiated and agreed upon; (4) only a small portion of the available land would be restricted from grazing; and (5) the open spaces for hunting and off-road vehicle access would be minimally impacted by the fencing associated with the ISL facility.

3.1.2.2 Operations Impacts to Land Use

NUREG-1910 determined that the type of land use impacts for operational activities is expected to be similar to construction impacts regarding access restrictions and that additional land disturbance would not be expected from conducting the operational activities. Because access restrictions and land disturbance impacts would be similar to,

[5] NUREG-1910 noted that potential impacts to historic and cultural resources would range from SMALL to LARGE, depending on site-specific conditions. All other land use impacts were deemed to be SMALL. Note that for the purposes of this comparison, impacts to ecological resources are discussed in Section 3.5 and impacts to cultural and historical resources are discussed in Section 3.8 as suggested in NRC guidance contained in NUREG-1748.

or less than, those expected for construction, the overall potential impacts to land use from operational activities was determined to be SMALL.

3.1.2.3 Aquifer Restoration Impacts to Land Use

NUREG-1910 determined that the type of land use impacts for aquifer restoration activities is expected to be similar to construction and operations impacts regarding access restrictions and that additional land disturbance would not be expected from conducting the operational activities. Land use impacts from aquifer restoration would decrease as fewer wells and pump houses are used and overall equipment traffic and use would diminish. The overall potential impacts to land use from aquifer restoration activities was determined to be SMALL.

3.1.2.4 Decommissioning Impacts to Land Use

NUREG-1910 determined that the type of land use impacts for decommissioning activities is expected to be similar to construction and operations impacts but the intensity of activities disturbing the land uses would temporarily increase due to increased use of earth and material-moving equipment and other heavy equipment. The overall potential impacts to land use from decommissioning activities was determined to be SMALL to MODERATE.

3.1.3 Conclusions on Land Use Impacts

The proposed license area and total disturbed land area for the project fall within the bounds analyzed in NUREG-1910. Current land use (i.e., grazing) is similar to that assumed in NUREG-1910. Land use and access will be limited during construction, operations, and decommissioning within the wellfield and central plant areas. Impacts to the current land use (primarily grazing) will be offset through leases and agreements with the private land owners. There are no recreational uses of the project area and oil and gas production facilities will not be affected.

Reference: NUREG 1910, Section 4.3.1
NUREG 1910, Section 4.2.1

3.2 Transportation Impacts

3.2.1 Transportation Impacts of the Proposed Action

Section 4.2 of the ER assessed impacts from the proposed action from access road construction, additional traffic on existing highways, and transportation accidents.

Section 4.2.1 of the ER notes that an existing gravel road accesses the general location selected for construction of the central plant and that this existing road may require minor improvements and completion of a short spur road to accommodate access by trucks and heavy equipment during construction and operation. Impacts from these road improvements are expected to be insignificant.

Section 4.2.2 estimates the impact of additional traffic on existing roadways due to the proposed project. The most heavily used public road segment would be State Highway 387 between I-25 to the west and State Highway 59 to the east. Although this is a primary route for the area, the existing traffic levels on the highway are low. The highest levels of project-related traffic would be from the operations workforce, and assuming there would be an average of one employee per vehicle, per one-way vehicle trip, there could be an increase of 5.4 percent in daily traffic along the highway. This 5.4 percent (10.8 percent for two trips per day) increase is well below the 25 percent threshold generally used for predicting significant effects to a transportation system.

Section 4.2.3 reviews accident risks involving potential transportation occurrences. Risks are reviewed for the following types of shipments:

- *Ion Exchange Resin Transport:* Shipments of uranium-laden resin and barren eluted resin are planned in 4,000 gallon tanker trucks. It is currently anticipated that up to four loads of uranium-laden resin may be transported for elution and up to four loads of barren eluted resin may be returned on a daily basis.
- *Yellowcake Transportation:* NUREG-0706[6] concluded that the probability of a truck accident involving shipments of yellowcake in any year is 11 percent for each uranium extraction facility. This calculation used average accident probabilities (4.0 x 10^{-7}/km for rural interstate, 1.4 x 10^{-6}/km for rural two-lane road, and 1.4 x 10^{-6}/km for urban interstate) that NUREG/CR-6733[7] reviewed and determined were conservative. As stated in Section 2.3 of the ER, the Moore Ranch project is planned for an annual production rate of 2 million pounds of yellowcake.

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[6] U.S. Nuclear Regulatory Commission, *Final Generic Environmental Impact Statement on Uranium Milling*, NUREG-0706, September 1980.

[7] U.S. Nuclear Regulatory Commission, *A Baseline Risk-Informed, Performance-Based Approach for In Situ Leach Uranium Extraction Licensees*, NUREG/CR-6733, September 2001.

- *Hazardous Chemical Transportation:* It is estimated that approximately 4 bulk chemical, fuel, and supply deliveries will be made per working day throughout the operational life of the project. Types of deliveries will include carbon dioxide, oxygen, salt, soda ash, hydrogen peroxide, anhydrous ammonia or sodium hydroxide, sulfuric or hydrochloric acid, and fuel.
- *Radioactive Waste Transportation:* 11e.(2) by-product material generated during operations will be transported to a licensed disposal site. Because of the low levels of radioactive concentration involved, these shipments are considered to have minimal potential environmental impact in the event of an accident. Shipments are generally made bulk in sealed roll off containers in accordance with the applicable Department of Transportation (DOT) hazardous materials shipping provisions.

3.2.2 Transportation Impacts Assessed in NUREG-1910

Section 4.3.2 of NUREG-1910 assesses potential environmental impacts from transportation activities associated with ISL operations. NRC notes that the estimated low magnitude of road transportation from all phases of the ISL lifecycle, when compared with local traffic volumes in the Wyoming East Uranium Milling Region, is not expected to significantly change the amount of traffic or accident rates. A possible exception to this conclusion is that commuting traffic for facility workers during periods of peak employment would have greater impacts when traveling roads with the lowest levels of current traffic. The magnitude of estimated construction related transportation is expected to vary depending on the size of the facility. However, when considered with the regional traffic counts, NRC determined that most of the roads that would be used for construction transportation in the Wyoming East Uranium Milling Region would not gain significant increases in daily traffic and therefore traffic related impacts would be SMALL. Roads with the lowest average annual daily traffic counts would have higher (MODERATE) traffic and potential infrastructure impacts, in particular, when facilities are experiencing peak employment. The limited duration of construction (12-18 months) activities suggest impacts would be of short duration in many areas where an ISL facility would be sited.

Overall, the estimated magnitude of operational truck transportation is generally low (a few trucks per day or less) and unlikely to generate any significant environmental impacts.

Section 4.2.2.2 of NUREG-1910 provided an analysis of the environmental impacts from potential accidents for the Wyoming West Uranium Milling Region and is referenced in Section 4.3.2 for the Wyoming East Region. For completeness, this comparison considers both sections.

- *Yellowcake Transportation*: The estimated and actual consequences of yellowcake accidents are small due to the appropriate use of safety controls and emergency response protocols. NUREG-1910 assumes yellowcake shipments to a conversion facility in Metropolis, IL, which is the only facility in the U.S for conversion to uranium hexafluoride (UF_6). NUREG-1910 relies on analysis prepared in NUREG-0708 for shipments from conventional mills and estimates 34 shipments per year based on an annual production rate of 1,300,000 pounds of yellowcake. The analysis results are 0.01 and 0.0008 cancer deaths per year from yellowcake accidents for a single ISL facility, based on complete and partial loss of package contents, respectively. NUREG-1910 notes that these risk results can be recalculated for facilities with higher production estimates, longer shipment distances, or increased accident rates by adjusting the computed accident probability term. For comparison, NUREG-1910 notes that the Smith Ranch-Highlands property in Converse County, Wyoming, is licensed at 5,500,000 pounds of yellowcake per year, which would translate to 145 yellowcake shipments at maximum permitted production level. This would increase the potential impact by a factor of 4.3 to 0.04 and 0.003 latent cancer fatalities. NUREG-1910 notes that historic spills from accidents have been contained and cleaned up quickly without significant health or safety impacts to workers or the public. Safety controls and compliance with existing NRC transportation regulations in 10 CFR Part 71 and DOT regulations add confidence that yellowcake can be shipped safely with a low potential of affecting the environment. NUREG-1910 concludes that the potential radiological impacts associated with yellowcake transportation are SMALL.

- *Ion Exchange Resin Transport*: NUREG-1910 assessed sites that include remote ion exchange processing and that transport loaded ion exchange resins from the remote ion exchange processing site(s) to a central processing facility. The analysis was based on one truck per day, seven days per week. The radiological impacts of these shipments are expected to be lower than estimated risks from the finished yellowcake product. NUREG-1910 concludes that the potential for environmental impacts from ion exchange resin transport would be SMALL.
- *Radioactive Waste Transportation*: Operational 11e.(2) by-product wastes will be shipped offsite by truck for disposal at a licensed disposal site. All radioactive waste shipments are shipped in accordance with the applicable NRC requirements in 10 CFR Part 71 and DOT regulations. Risks from transporting yellowcake shipments during operations bound the risks expected from waste shipments, owing to the concentrated nature of shipped yellowcake, the longer distance yellowcake is shipped relative to waste destined for a licensed disposal facility, and the relative number of shipments for each type of material. Therefore, impacts from transporting ISL facility byproduct wastes would be SMALL.
- *Hazardous Chemical Transportation*: The number of operational chemical supply shipments is discussed in Section 2.8 of NUREG-1910, which noted that one facility reported 272 bulk chemical shipments per year. These shipments must follow DOT hazardous materials shipping regulations and requirements. Spill responses would be similar to yellowcake transportation. NUREG-1910 concludes that, given the precautions taken with these materials, the likelihood of an incident in a populated area is considered low and therefore the overall risk of a high

consequence accident is considered small. As a result of the low frequency of shipments (estimated at less than 1 per day) and the low risk of high consequence accidents, the potential environmental impacts of chemical transportation to potential ISL facilities would be SMALL.

Aquifer restoration and decommissioning transportation impacts are expected to be less than impacts for construction and operations because transportation activities will be primarily limited to supplies, waste shipments, on site transportation, and employee commuting. Impacts would be SMALL to MODERATE considering the potential impacts of commuting during peak employment periods on low traffic roads in the Wyoming East Uranium Milling Region.

3.2.3 Conclusions on Transportation Impacts

The projected transportation impacts associated with the project fall within the bounds analyzed in NUREG-1910. Peak transportation is projected for commuting employees during the operational phase, with a maximum 10.8 percent increase based on one employee per vehicle, which is well below the 25 percent threshold generally used for predicting significant effects to a transportation system. The ER noted that it is likely that employees will car pool due to commuting distances, reducing this overall impact. NUREG-1910 projected SMALL impacts from transportation although roads with the lowest average annual daily traffic counts would have MODERATE traffic and potential infrastructure impacts. Moore Ranch is serviced by State Highway 387, which is a primary transport route in this part of the Powder River Basin and would not be considered having low average annual daily traffic counts, so impacts would be SMALL.

The accident analysis in Section 4.2.2.2 generally bounds the impacts from Moore Ranch. The planned yellowcake production level is 2,000,000 pounds, which falls well below the 5,500,000 pounds analyzed for the Smith Ranch/Highland Project. Ion exchange resin and hazardous chemical shipments for Moore Ranch were estimated at four trucks per day for each type of shipment, which exceeds the bounding analysis in NUREG-1910 of one shipment per day. Site specific analysis of this additional level of ion exchange resin and hazardous chemical shipments may be necessary.

Reference: NUREG 1910, Section 4.3.2
NUREG 1910, Section 4.2.2.2

3.3 Geology and Soils Impacts

3.3.1 Geology and Soils Impacts of the Proposed Action

3.3.1.1 Geology Impacts of the Proposed Action

Section 4.3 of the ER assessed impacts to geology and soils from the proposed project. Geological impacts from operations are expected to be minimal, if any. No significant matrix compression or ground subsidence is expected, as the net withdrawal of fluid from the target sandstone will be on the order of 1 percent or less.

3.3.1.2 Soils Impacts of the Proposed Action

Based on the soil mapping unit descriptions in Section 3.3 of the ER, the hazard for water erosion within the proposed project area varies from slight to severe and the hazard from wind erosion varies from moderate to severe. Given the fine-loamy and sandy texture of the surface horizons throughout the majority of the proposed project area and the semi-arid climate, the soils are more susceptible to erosion from wind than water. Table 4.3-1 provides a summary of wind and water erosion hazards within the proposed project.

The 11 acre fenced controlled area is underlain by soils with a slight potential for water erosion and a severe potential for wind erosion. The soils underlying the proposed wellfields are at a moderate to severe risk of erosion from both wind and water. Though no topsoil will be stripped from the wellfields, construction may result in an increase in the erosion hazard from both wind and water due to the removal of vegetation and the physical disturbance from heavy equipment.

Mitigation measures for soils impacts are discussed in Section 5.3.2 of the ER and include temporary diversion of surface runoff from undisturbed areas around the disturbed areas and the use of water velocity dissipation structures, retaining sediment through the use of best management practices such as silt fencing, retention ponds, or other effective means, salvage and stockpiling of topsoil from the central plant facility area and from secondary wellfield access roads in a manner to avoid wind and/or water erosion, reestablishment of temporary or permanent native vegetation as soon as possible after disturbance, and constructing roads to minimize erosion.

Mitigation measures for soils impacts caused by solution spills are discussed in Section 5.4.2.3.2 of the ER. All piping from the plant, to and within the wellfield will be buried for frost protection. Pipelines will be constructed of high density polyethylene (HDPE) with butt welded joints, or equivalent. All pipelines will be pressure tested at operating pressures prior to final burial and initiation of production flow and following maintenance activities that may affect the integrity of the system. Each Mine Unit will have a number of header houses where injection and production wells will be continuously monitored for pressure and flow. EMC will implement a program of continuous wellfield monitoring by roving wellfield operators and will require periodic inspections of each well that is in service.

3.3.2 Geology and Soils Impacts Assessed in NUREG-1910

Section 4.3.3 of NUREG-1910 assesses potential environmental impacts to geology and soils during construction, operation, aquifer restoration, and decommissioning of ISL facilities.

During construction (Section 4.3.3.1), the principal impacts on geology and soils would result from earth-moving activities associated with constructing surface facilities, wastewater evaporation ponds, access roads, well fields, and pipelines. The impact of construction activities on geology and soils will depend on local topography, surface bedrock geology, and soil characteristics. Generally, earth-moving activities would result in only SMALL (approx. 10 percent of site) and temporary (months) disturbance of soils. These are impacts that are commonly mitigated using accepted best management practices. NUREG-1910 notes that operators of ISL facilities typically adopt construction practices that prevent or substantially reduce erosion, such as stockpiling and stabilizing surface soils for later use during decommissioning and land reclamation. Stockpiles are typically located, shaped, and seeded with a cover crop by the operator to control erosion.

During operations (Section 4.3.3.2), the removal of uranium from the target sandstones will result in a permanent change to the composition of uranium-bearing rock formations. However, the mobilization and recovery process does not result in the removal of rock matrix or structure and, therefore, no significant matrix compression or ground subsidence is expected. In addition, the source formations for uranium in the Wyoming East Uranium Milling Region occur at depths of hundreds of feet and, therefore, impacts on geology from ground subsidence are expected to be SMALL, if any. A potential impact to soils during operations is pipe ruptures or failures, which can release lixiviant to pond on the surface, run off into surface water bodies, infiltrate and adsorb in overlying-soil and rock, or infiltrate and percolate to groundwater. Soil contamination could also occur from transportation accidents resulting in yellowcake or ion exchange resin spills. In the short term, impacts to soils from spills could range from SMALL to LARGE depending on the volume of soil affected by the spill. Because of the required immediate responses, spill recovery actions, and routine monitoring programs, impacts from spills are temporary, and the overall long-term impact to soils would be expected to be SMALL. Soil impacts could also result from the discharge of treated wastewater and/or from the use of evaporation ponds to manage liquid waste.

During aquifer restoration (Section 4.3.3.3), the groundwater sweep and recirculation processes do not result in the removal of rock matrix or structure and, therefore, no significant matrix compression or ground subsidence is expected. Therefore, the impacts to geology from aquifer restoration are expected to be SMALL. As with soil impacts during operations, a potential impact during aquifer restoration is the release of contaminated groundwater due to pipe ruptures or failures, resulting in SMALL to LARGE short term soil impacts. As with operations, the overall long-term impact to soils would be expected to be SMALL. Soil impacts could also result from the discharge of treated wastewater and/or from the use of evaporation ponds to manage liquid waste.

During decommissioning (Section 4.3.3.4), the primary impacts to geology and soils would be from activities associated with land reclamation and cleanup of contaminated soils. NUREG-1910 notes that the licensee is required to submit a decommissioning plan to NRC for review and approval. The licensee's spill documentation is used to identify potentially contaminated soils requiring offsite disposal at a licensed facility. Any areas potentially impacted by operations are included in surveys to ensure all areas of elevated soil concentrations are identified and properly cleaned up to comply with NRC regulations at 10 CER Part 40, Appendix A, Criterion 6-(6). Section 4.3.3.4 concludes that most of the impacts to geology and soils associated with decommissioning are temporary (short-term) and SMALL. Since the goal of decommissioning and reclamation is to restore the facility to preproduction conditions, to the extent practical, the overall long-term impacts to the geology and soils would be SMALL.

3.3.3 Conclusions on Geology and Soils Impacts

The projected geology and soils impacts associated with the project fall within the bounds analyzed in NUREG-1910. No significant matrix compression or ground subsidence is expected, so geology impacts will be SMALL. The hazard for water erosion within the proposed project area varies from slight to severe and the hazard from wind erosion varies from moderate to severe. The ER notes that the soils are more susceptible to erosion from wind than water. Mitigation measures for water and wind erosion are described in Section 5.3.2 of the ER and meet those considered in NUREG-1910, so soil impacts from erosion are expected to be SMALL. Mitigation measures for potential impacts from solution spills are described in Section 5.4.2.3.2 of the ER and meet those considered in NUREG-1910, so soil impacts from spills are expected to be temporary and SMALL.

Reference: NUREG 1910, Section 4.3.3

3.4 Water Resources Impacts

3.4.1 Surface Water Impacts

3.4.1.1 Surface Water and Wetlands Impacts of the Proposed Action

Section 4.4.1 of the ER analyzes impacts to surface water and wetlands from the proposed action, which includes two wellfields and a central plant facility. No wetlands will be impacted due to the construction of the central plant and the two wellfield sites. Wetlands or surface water channels may be impacted in the easternmost wellfield site but as noted in Section 3.5 of the ER, wetlands located within the project boundaries are recommended as non-jurisdictional.

No drainages or bodies of water will be significantly modified or altered within the project area during project construction or operations. The potential for erosion is present due to the construction of the wells near the Simmons Draw drainage. However, disturbance is short-term and disturbed areas will be reseeded soon after the wellfields are constructed.

Normal construction activities within the wellfields, process plant, and along the pipeline courses and roads have the potential to increase the sediment yield of the disturbed areas. However, the relative size of these disturbances is small when compared to the size of the overall areas and to the size of the watersheds, and also have a short term impact. Since wellfield decommissioning and reclamation activities will be on-going throughout the life of the project, the area to be reclaimed at the conclusion of operations will be reduced, although a slight increase in sediment yields and total runoff can still be expected. Since all natural flow within the project boundaries is ephemeral with no intermittent or perennial streams, potential impacts to surface water from construction and decommissioning activities are also limited to uncommon precipitation or runoff events. As noted in Section 5.4.1.1 of the ER, diversion ditches and culverts will be used to prevent excessive erosion and control runoff. In areas where runoff is concentrated, energy dissipaters are used to slow the flow of runoff to minimize erosion and sediment loading in the runoff. Construction and industrial stormwater National Pollutant Discharge Elimination System (NPDES) permits will be obtained in accordance with WDEQ - Water Quality Division regulations. Best management practices will be implemented to reduce erosion impacts according to storm water management plans developed for those permits.

3.4.1.2 Surface Water Impacts Assessed in NUREG-1910

Section 4.3.4.1 of NUREG-1910 assesses potential environmental impacts to surface water and references the causes and nature of impacts contained in Section 4.2.4.1 for the Wyoming West Uranium Milling Region. For completeness, this review considers both sections. Because average annual runoff in the Wyoming East Uranium Milling Region is greater than in the Wyoming West Uranium Milling Region, NRC determined that the potential for surface water impacts due to storm water runoff will be slightly greater. Except for the Shirley Basin area, there are fewer perennial streams in the Wyoming East Uranium Milling Region. For surface water impacts from construction, operations, aquifer restoration, and decommissioning, Section 4.3.4.1 notes that compliance with applicable federal and state regulations and permit conditions and use of best management practices and required mitigation measures would reduce impacts to surface waters, and overall impacts would be expected to be SMALL.

3.4.1.3 Conclusions on Surface Water Impacts

The projected surface water impacts associated with the proposed project fall within the bounds analyzed in NUREG-1910. There are no jurisdictional wetlands on the project site and no drainages or bodies of water will be significantly modified or altered during project construction or operations. Mitigation measures including construction and industrial stormwater discharge permits and best management practices plans are detailed in Section 5.4.1.1 of the ER and meet those considered in NUREG-1910.

Reference: NUREG 1910, Section 4.3.4.1
NUREG 1910, Section 4.2.4.1

3.4.2 Groundwater Impacts to Shallow Aquifers

3.4.2.1 Groundwater Impacts to Shallow Aquifers of the Proposed Action

Section 3.4.1.2 of the ER details the existing use of shallow groundwater in the proposed project area. Figure 3.4.1-1 shows the locations of all water wells in the License Area and the 2-mile radius review area. Within this area, there are three domestic water wells ranging from 180 to 440 feet in depth. Licensed yields for these wells vary between 15 and 20 gpm, and static water level ranges between 40 to 85 feet below ground surface. While these wells are licensed for domestic use, there are currently no occupied residences within the License Area and 2-mile radius. Therefore, these wells are not being primarily utilized for human consumption. There are no irrigation wells located within the surveyed 2-mile radius of the License Area boundary. There are four stock wells located within the License Area that are older and as a result are not licensed through the State Engineers Office. There is also a windmill and a shallow well located in the License Area. However, it is not functional.

Section 4.4.2.3.1 of the ER analyzes impacts to shallow groundwater as a result of excursions of lixiviant. Mechanical integrity testing methods are intended to minimize the potential for vertical excursions due to well casing failure and are discussed in Section 5.4.2.3.1. Further discussion is contained in the excursion discussion in Section 3.4.3.1 of this document.

Section 4.4.2.3.2 of the ER analyzes impacts to shallow groundwater as a result of an uncontrolled release of process liquids due to a wellfield leak. Should an uncontrolled wellfield release occur, there would be a potential for contamination of the shallow aquifer. With a slow leak that remains undiscovered or a catastrophic failure, a shallow excursion is one potential impact. Mitigation measures to prevent and correct wellfield spills are discussed in Section 5.4.2.3.2 of the ER and were previously described in the soil impact discussion (Section 3.3.1.2) of this analysis.

Evaporation ponds and land application are not planned for the proposed project and the potential impacts to shallow groundwater from these waste management techniques was not assessed in the ER.

3.4.2.2 Groundwater Impacts to Shallow Aquifers Assessed in NUREG-1910

Section 4.3.4.2.2.1 of NUREG-1910 assesses potential impacts to shallow (near surface) aquifers related to operations. The failure of pipeline fittings or valves, or failures of well mechanical integrity could result in leaks and spills of pregnant and barren lixiviant that could impact water quality in shallow (near-surface) aquifers. The potential environmental impacts of these failures could be MODERATE to LARGE, if the ground water table in shallow aquifers is close to the ground surface, if the shallow aquifers are important sources for local domestic or agricultural water supplies, and if the shallow aquifers are hydraulically connected to other locally or regionally important aquifers. Conversely, the potential environmental impacts could be SMALL, if shallow aquifers have poor water quality or yields not economically suitable for production and if they are hydraulically separated from other locally and regionally important aquifers. Section 4.3.4.2.2.1 notes that in some parts of the Wyoming East Uranium Milling Region, local shallow aquifers (alluvium-type) exist and they usually yield small quantities of water only for local uses. Therefore, potential environmental impacts due to spills and leaks in these shallow aquifers would be expected to be SMALL to MODERATE. NUREG-1910 notes that potential impacts would be reduced based on flow monitoring to detect pipeline leaks and spills early and implementation of required spill response and cleanup procedures. In addition, preventative measures such as well mechanical integrity testing would limit the likelihood of well integrity failure during operations.

The use of evaporation ponds or land application to manage process water generated during operations also could impact shallow aquifers.

3.4.2.3 Conclusions on Groundwater Impacts to Shallow Aquifers

The projected impacts to shallow aquifers associated with the project fall within the bounds analyzed in NUREG-1910. There are few livestock wells within the license area and no wells that are currently used for domestic or irrigation purposes. These wells are relatively deep. The mitigation measures described in the ER include flow monitoring to detect pipeline leaks and spills early and implementation of required spill response and cleanup procedures. Well mechanical integrity testing is included which would limit the likelihood of well integrity failure. The use of evaporation ponds or land application to manage process water generated during operations is not proposed for the Moore Ranch Project.

Reference: NUREG 1910, Section 4.3.4.2.2.1

3.4.3 Groundwater Impacts to Production and Surrounding Aquifers

3.4.3.1 Groundwater Impacts to Production and Surrounding Aquifers of the Proposed Action

Consumptive Use

Section 4.4.2.1 of the ER analyzes the impacts to groundwater in the production and surrounding aquifers due to consumptive use during operations and aquifer restoration. Based on a bleed of 0.5% to 1.5% of the total proposed flow of 3,000 gpm, the potential impact from consumptive use of groundwater is expected to be minimal. Based on assumptions stated in Section 4.4.2.1 and the results of hydrologic testing, drawdown after the proposed project at various distances from the centroid of pumping were estimated. These drawdown estimates were based on an average consumptive use of 105 gal/min over a 12.5 year operational and aquifer restoration period. Drawdown was estimated as follows:

- Nearest stock well (5,000 feet) Drawdown of 11.3 feet
- Nearest license boundary (6,500 feet) Drawdown of 9.8 feet
- Nearest water supply well (16,000 feet) Drawdown of 5.1 feet

This estimated drawdown is approximately 10 to 15 percent of the available drawdown in the 70 Sand.

Figure 3.4-1 of the ER shows that few water wells are present in the vicinity of the proposed project. The closest industrial well is approximately 2,900 feet, the closest stock well is approximately 5,000 feet, and the closest domestic well is approximately 16,000 feet from the centroid of pumping. The ER concludes that the limited drawdown that likely will be induced from mining, groundwater restoration and plant operations will have little if any impact on local water users.

In Section 5.4.2.1.2 of the ER, mitigation measures were proposed for excessive drawdown in nearby water supply wells. Although not expected, if significant impacts to these nearby wells are observed (e.g., water levels drop to a point that impairs the usefulness of the wells), the following mitigation measures would be considered:

- Lowering the pump level in the wells, if possible;
- Deepening the wells, if possible; or,
- Replacing the wells with new wells completed in deeper sands that are not impacted by ISR operations.

Excursions and Groundwater Quality

In Section 4.4.2.2 of the ER, an estimate of the post-mining water quality was based on the experience of COGEMA Mining, Inc. in Production Units 1 through 9 at the Irigaray ISR project located in the Powder River Basin near the proposed project. The Irigaray data was selected because of the proximity and similar geologic conditions to the proposed project.

In Section 5.4.2.2 of the ER, the proposed aquifer restoration process is described. Successful groundwater restoration has been demonstrated using the methods proposed. Therefore, long term impacts on groundwater quality are expected to be minimal. Approval of an aquifer exemption by the WDEQ and the EPA is required before mining operations can begin. The aquifer exemption removes the mining zone from protection under the Safe Drinking Water Act (SDWA). Approval is based on existing water quality, the ability to commercially produce minerals, and the lack of use as an underground source of drinking water (USDW).

The primary goal of the groundwater restoration efforts will be to return the groundwater quality of the production zone, on a wellfield average, to the preoperational (baseline) water quality conditions using Best Practicable Technology (BPT). Recognizing that restoration activities are not likely to return groundwater to the exact water quality that existed prior to ISL operations, a secondary restoration standard of WDEQ class of use will be applied. The secondary standard of class of use will be applied only after restoration using BPT no longer shows significant improvement in groundwater quality and continuing restoration activities would not provide a significant benefit.

In Section 4.4.2.3.1 of the ER, potential impacts from lixiviant excursions are considered. The historical experience at other ISR uranium operations indicates that the selected excursion indicator parameters and upper control limits (UCLs) allow detection of horizontal excursions early enough that corrective action can be taken before water quality outside the exempted aquifer boundary is significantly degraded. As noted in NUREG/CR-6733, significant risk from a horizontal excursion would occur only if it persisted for a long period without being detected. Section 5.4.2.3 of the ER discusses mitigation measures to minimize and control horizontal excursions. The lateral movement of lixiviant will be controlled at the proposed project by maintaining well field production flow at a rate slightly greater than the injection flow. Monitoring for lateral movement of lixiviant will be accomplished by using a horizontal excursion monitoring system. This system consists of a ring of monitor wells completed in the same aquifer and zone as the injection and production wells. Monitor wells will be installed as discussed in Section 6 of the ER. Monitor wells will be sampled biweekly for approved excursion indicators.

Section 4.4.2.3.1 notes that vertical excursions can be caused by improperly cemented well casings, well casing failures, improperly abandoned exploration wells, or leaky or discontinuous confining layers. Section 5.4.2.3 of the ER discusses mitigation measures to minimize and control vertical excursions. Vertical excursions will be prevented through aquifer testing programs and rigorous well construction, abandonment, and testing requirements. Well construction and integrity testing will be conducted in accordance with WDEQ regulations and methods approved by NRC and WDEQ. Well abandonment is conducted in accordance with methods approved and monitored by the WDEQ and discussed in detail in Section 5.1.1 of the ER.

As noted in Section 3.3.2 of the ER, the 68 sand is separated from the 60 sand by 0 to 25 feet of shale or mudstone. This shale appears to pinch out in the western edge of the proposed Wellfield 1 as shown in cross section B-B'. The 68 sand is the first sand below the 70 sand, which contains the economic ore deposits in the area, and is therefore referred to as the underlying 68 sand. Water level data discussed in Section 3.4.3.2 of the ER are consistent with isopach data that indicate the absence of the underlying shale between the 70 and 68 Sands in the eastern portion of Wellfield 2 and therefore possible hydraulic communication between those units. In Section 2.2.7 of the ER, EMC describes a numerical groundwater flow model that has been developed based on site-derived information that replicates the unconfined conditions observed at the site. The numerical model was used to simulate aquifer response across the License Area during typical and proposed production and restoration phases of all wellfields. The results of those simulations will be provided in an Appendix to the ER, "Numerical Modeling of Groundwater Conditions Related to In Situ Recovery at the Moore Ranch Uranium Project, Wyoming" (Petrotek 2008b) to be submitted in an updated ER in response to an expected Request for Additional Information (RAI) from NRC staff. Results of the model simulations indicated several feet of drawdown will occur across each wellfield during production at a one percent bleed. Particle tracking clearly shows an inward gradient toward the wellfield during wellfield production.

3.4.3.2 Groundwater Impacts to Production and Surrounding Aquifers Assessed in NUREG-1910

Consumptive Use

Section 4.3.4.2.2.2 of NUREG-1910 discusses potential impacts to the production and surrounding aquifers from operations. NRC-licensed flow rates for ISL facilities typically range from about 4,000 to 9,000 gal/min. Most of this water is returned to the production aquifer after being stripped of uranium. Consumptive use refers to water that is not returned to the production aquifer. During operations, consumptive use is due primarily to production bleed, which is typically between 1 and 3 percent of the total flow and includes other smaller losses. NRC used a hypothetical well field in the Wyoming East Uranium Milling Region pumped at a constant rate of 6,000 gal/min with 2 percent bleed, resulting in an annual total volume of production bleed of 63 million gallons (190 acre-ft). Based on this hypothetical flow and production bleed, NRC estimated the consumptive use of water in one year of operation is roughly equivalent to the water used to irrigate 44 acres in Wyoming for one year.

Consumptive water use during operations could impact local water users who use water from the production aquifer outside of the exempted zone by lowering water levels in local wells. In addition, if production aquifers are not completely hydraulically isolated from aquifers above and below, consumptive use may impact local users by causing a lowering of water levels in those aquifers.

To assess the potential drawdown that could be caused by consumptive use during operations, NRC calculated drawdowns for a hypothetical case in which the water withdrawn by an entire ISL facility operating at 4,000 gal/min with a 2 percent bleed was withdrawn from a single well (i.e., a production bleed of 80 gal/min). NRC noted that this scenario would significantly overestimate the drawdown because water withdrawal at a typical ISL facility is distributed among hundreds of wells located across tens to thousands of acres. In this extreme case, drawdowns at locations 1 m (3.3 ft), 10 m (33 ft), and 100 m (330 ft) away from the hypothetical would be 88 m (289 ft), 70 m (230 ft), and 52 m (171 ft) after 10 years of operation. In addition, the potential effect of natural recharge to the production aquifers on groundwater levels was not considered. NRC determined that based on the scenario described, the short-term impact of consumptive use near a wellfield could be MODERATE if there are local water users who use the production aquifer or if the production aquifer is not well-isolated from other aquifers that are used locally. Because localized drawdown near well fields would dissipate after pumping stops, NRC determined that these localized effects would be temporary. Long-term impacts would be expected to be SMALL in most cases, depending on site-specific conditions.

Excursions and Groundwater Quality

Section 4.3.4.2.2.2 of NUREG-1910 discusses potential impacts to groundwater quality in the production zone and impacts of excursions. Groundwater quality in the production aquifer is degraded as part of the ISL facility's operations. In order for ISL operations to occur, the uranium-bearing production aquifer must be exempted as an underground source of drinking water through the Wyoming UIC program. When uranium recovery is complete in a well field, the licensee is required to initiate aquifer restoration activities to restore the production aquifer to baseline or pre-operational class-of-use conditions, if possible. For these reasons, NUREG-1910 determined that the potential impacts to the water quality of the uranium-bearing production zone aquifer as a result of ISL operations would be expected to be SMALL and temporary.

To control horizontal excursions, inward hydraulic gradients are expected to be maintained by production bleed so that groundwater flow is towards the production zone from the edges of the well field. If this inward gradient is not maintained, horizontal excursions can occur and lead to the spread of leaching solutions in the ore-bearing aquifer. The impact of horizontal excursions could be MODERATE to LARGE if a large volume of contaminated water leaves the production zone, particularly if the production aquifer outside the mineralization zone is used for water production. To reduce the likelihood and consequences of potential excursions at ISL facilities, NRC requires licensees to take preventative measures including the installation of a ring of monitoring wells encircling the production zone to permit early detection of horizontal excursions. If excursions are detected, corrective actions are taken and the well is placed on a more frequent monitoring schedule until the well is found to no longer be in excursion.

The rate of vertical flow and the potential for vertical excursions between the production aquifer and an aquifer above or below is determined by groundwater level differences between the adjacent aquifers and the thickness and vertical hydraulic conductivity of an aquitard that hydraulically separates them. Vertical hydraulic head gradients between the production aquifer and the underlying and overlying aquifers could be altered by potential increases in pumpage from the overlying or underlying aquifers for water supply purposes in the vicinity of an ISL facility, which may enhance potential vertical excursions from the production aquifer. Discontinuities in the thickness and spatial heterogeneities in the vertical hydraulic conductivity of confining units could lead to vertical flow and excursions. In addition, potential well integrity failures could lead to vertical excursions. As a result of inadequate well construction, degradation, or accidental rupture, well casings above or below the uranium-bearing aquifer could allow lixiviant to travel from the well bore into the surrounding aquifer. Deep monitoring wells drilled through the production aquifer and confining units that penetrate aquitards could potentially create vertical pathways for excursions of lixiviant from the production aquifers to the adjacent aquifers. Relevant factors when considering the significance of potential impacts from a vertical excursion (such as local geology and hydrology and the proximity of injection wells to drinking water supply wells) are discussed in Section 2.4.1 of NUREG-1910.

To reduce the likelihood and consequences of potential excursions at ISL facilities, NRC requires licensees to take preventive measures prior to starting operations. For example, licensees must conduct MIT to ensure that lixiviant would remain in the well and not escape into surrounding aquifers. Licensees are required to conduct aquifer pump tests prior to starting operations in a well field to determine aquifer parameters and to ensure that confining layers above and below the production zone are expected to preclude the vertical movement of fluid from the production zone. The licensee must also develop and maintain monitoring programs to detect both vertical and horizontal excursions and must have operating procedures to analyze an excursion and determine how to remediate it.

3.4.3.3 Conclusions on Groundwater Impacts to Production and Surrounding Aquifers

Consumptive Use

Section 4.3.4.2.2.2 of NUREG-1910 reviewed potential impacts to the production and surrounding aquifers due to consumptive use. Drawdown was estimated for a hypothetical wellfield with a consumptive use of 80 gal/min over 10 years. NRC determined that the short-term impact of consumptive use near a wellfield could be MODERATE and that the long term impact would be SMALL, depending in site specific conditions. Estimates prepared for the proposed project resulted in less significant drawdown in an area with few nearby wells. The bounding analysis contained in NUREG-1910 and the lack of nearby wells indicates that the consumptive use for the proposed project was adequately considered in NUREG-1910.

Excursions and Groundwater Quality

The uranium-bearing production aquifer for the proposed project will be exempted as an USDW through the Wyoming UIC program. When uranium recovery is complete, aquifer restoration activities will be started to restore the production aquifer to baseline or pre-operational class-of-use conditions, if possible. The methods and expected results of aquifer restoration meet the conclusions of NUREG-1910.

To control horizontal excursions, inward hydraulic gradients are expected to be maintained by production bleed so that groundwater flow is towards the production zone from the edges of the well field. Installation of a ring of monitoring wells encircling the production zone will be completed to permit early detection of horizontal excursions.

Well MIT will be conducted to ensure that lixiviant would remain in the well and not escape into surrounding aquifers. Aquifer pump tests will be performed prior to starting operations to determine aquifer parameters and to ensure that confining layers above and below the production zone are expected to preclude the vertical movement of fluid from the production zone. Monitoring programs to detect both vertical and horizontal excursions are defined and operating procedures are discussed to analyze an excursion and determine how to remediate it.

The water level and isopach data indicate the absence of the underlying shale between the 70 and 68 Sands in the eastern portion of Wellfield 2 and therefore possible hydraulic communication between those units. Because of this, EMC has performed modeling to determine operating methods to control mining solutions and complete aquifer restoration. These are site-specific factors that are not considered in NUREG-1910 and that must be reviewed by NRC.

Reference: NUREG 1910, Section 4.3.4.2.2.2

3.4.4 Groundwater Impacts to Deep Aquifers

3.4.4.1 Groundwater Impacts to Deep Aquifers of the Proposed Action

Section 2.5.1.3 of the ER discusses the planned liquid waste management techniques for the proposed project. The use of deep waste disposal wells is considered to be the best alternative to dispose of liquid wastes generated by ISL operations and aquifer restoration. The proposed deep well(s) will isolate liquid wastes generated by the project from any USDW. These wells must be authorized by the State of Wyoming under a UIC Permit. EMC submitted the required application to the WDEQ in May 2008. Section 4.13.2.1 of the ER discusses the expected environmental impacts associated with disposal of liquid waste through the use of deep injection wells. The permitting process for these types of wells through the WDEQ and EPA programs minimize the impacts to deep aquifers.

3.4.4.2 Groundwater Impacts to Deep Aquifers Assessed in NUREG-1910

Section 4.3.4.2.2.3 of NUREG-1910 analyzes potential impacts to deep aquifers from ISL operations. Potential impacts to confined deep aquifers below the production aquifers could be due to deep well injection of processing wastes into deep aquifers. Underground injection of fluid requires a permit from the EPA or an authorized state-administered UIC program. The potential environmental impacts of injection of leaching solutions into deep aquifers would be expected to be SMALL, if water production from deep aquifers is not economically feasible or the groundwater quality from these aquifers is not suitable for domestic or agricultural uses.

3.4.4.3 Conclusions on Groundwater Impacts to Deep Aquifers

The use of deep waste disposal wells is considered to be the best alternative to dispose of liquid wastes generated by ISL operations and aquifer restoration. The proposed deep well(s) will isolate liquid wastes generated by the project from any USDW. The permitting process for these types of wells through the WDEQ and EPA programs minimize the impacts to deep aquifers and fall within the analysis contained in NUREG-1910.

Reference: NUREG 1910, Section 4.3.4.2.2.3

3.4.5 Aquifer Restoration Impacts to Groundwater

3.4.5.1 Aquifer Restoration Impacts to Groundwater of the Proposed Action

Section 5.4.2.2.2 of the ER discusses aquifer restoration for the proposed project. The restoration stage typically consists of three phases:

1) Groundwater transfer;
2) Groundwater sweep;
3) Groundwater treatment.

These phases are designed to optimize restoration equipment used in treating groundwater and to minimize the volume of groundwater consumed during the restoration stage. The ER notes that the sequence of the activities will be determined based on operating experience and waste water system capacity. Not all phases of the restoration stage will be used if deemed unnecessary. For instance, modeling recently completed for the proposed project suggests that groundwater sweep may not be an effective restoration technique, particularly in areas where unconfined conditions exist.

Consumptive use of groundwater was addressed in Section 4.4.2.1 of the ER and in the preceding discussion in Section 3.4.3.1 of this document. The consumptive use estimates prepared for the EA are based on the flow associated with concurrent recovery and restoration activities as shown in the ER on Figure 5.4-1, Proposed Moore Ranch Operations and Restoration Schedule. This estimate was based on an average flow of 105 gal/min.

3.4.5.2 Aquifer Restoration Impacts to Groundwater Assessed in NUREG-1910

Section 4.3.4.2.3 of NUREG-1910 analyzes potential impacts to groundwater from aquifer restoration. Impacts are related to groundwater consumptive use and waste management practices, including discharge of wastes to evaporation ponds, land application of treated waste water, and potential deep disposal of brine slurries resulting from reverse osmosis. In addition, aquifer restoration directly affects groundwater quality in the vicinity of the wellfield being restored.

Aquifer restoration typically involves a combination of the following methods: (1) groundwater transfer, (2) groundwater sweep, (3) reverse osmosis with permeate injection, and groundwater recirculation. These methods are discussed in more detail in Section 2.5 of NUREG-1910.

Groundwater consumptive use during aquifer restoration is generally reported to be greater than during ISL operations. One reason for increased consumptive use during restoration is that no water is re-injected during groundwater sweep. Water is not re-injected during groundwater sweep because the purpose of the sweep phase is to remove contaminated water from a wellfield and draw unaffected water into the well field.

Section 4.3.4.2.3 of NUREG-1910 notes that the actual rate of groundwater consumption at an ISL facility at any time depends on the various stages of operation and restoration of the individual wellfields. NRC postulates a hypothetical case in which three well fields at a site undergo groundwater sweep while three undergo reverse osmosis treatment with permeate re-injection and another three continue production. This hypothetical case results in 100 gal/min consumed during groundwater sweep, 30 gal/min consumed to perform reverse osmosis treatment, and another 10 gal/min consumed by production bleed in the remaining three well fields. The total water consumption rate while these processes continued would be 140 gal/min. At this rate, 74 million gal would be consumed in one year, which is equivalent to the water used to irrigate 53 acres in Wyoming for one year. NUREG-1910 notes that the potential environmental impacts are dependent on the restoration techniques chosen, the severity and extent of the contamination, and the current and future use of the production and surrounding aquifers in the vicinity of the ISL facility. The potential environmental impacts of groundwater consumptive use during restoration could be SMALL to MODERATE.

Aquifer restoration processes also affect groundwater quality directly by removing contaminated groundwater from wellfields, reinjecting treated water, and recirculating groundwater. In general, aquifer restoration is continued until NRC and applicable state requirements for groundwater quality are met.

3.4.5.3 Conclusions on Aquifer Restoration Impacts to Groundwater

The proposed restoration methods are similar to those analyzed in NUREG-1910. The estimated consumptive use during aquifer restoration is bounded by the analysis contained in NUREG-1910. Restoration will result in returning groundwater quality to requirements set by NRC and the WDEQ as discussed in NUREG-1910.

Reference: NUREG 1910, Section 4.3.4.2.3
NUREG 1910, Section 2.5

3.4.6 Decommissioning Impacts to Groundwater

3.4.6.1 Decommissioning Impacts to Groundwater of the Proposed Action

Section 4.4.2.1 of the ER analyzes impacts to groundwater due to consumptive use from the proposed project. The analysis is based on an average consumptive use of 105 gal/min for the period of the project. Water use during decommissioning will be limited to dust control and other routine water uses, which will be well below the average consumptive use considered.

Section 4.12.1.2.1 of the ER discusses the potential impacts from spills of chemicals and accident prevention and mitigation measures. The proposed prevention and mitigation measures represent best management practices for the hazardous materials that will be used at the proposed project.

Section 5.1.1 of the ER discusses well plugging and abandonment methods that will be employed during decommissioning. All production, injection and monitor wells and drill holes will be abandoned in accordance with WS-35-11-404 and Chapter VIII, Section 8 of the WDEQ-LQD Rules and Regulations to prevent adverse impacts to groundwater quality or quantity.

3.4.6.2 Decommissioning Impacts to Groundwater Assessed in NUREG-1910

Section 4.3.4.2.4 of NUREG-1910 analyzes the environmental impacts to groundwater during dismantling and decommissioning ISL facilities. Impacts are primarily associated with consumptive use of groundwater, potential spills of fuels and lubricants, and well abandonment.

- NUREG-1910 notes that the potential environmental impacts during the decommissioning phase are expected to be similar to potential impacts during the

Unless the workforce is distributed throughout the region, the impact of an ISL on the housing market would be MODERATE, depending upon location, due to the limited number of available units.

Assuming the majority of workforce is derived from outside the Wyoming East Uranium Milling Region, potential impacts to education from operation activities would be SMALL. Effects on other community services (health care, utilities, shopping, recreation, etc.) during operation are anticipated to be similar to construction (less in volume/quantity, but longer in duration). Therefore, the potential impacts would be SMALL.

The same ISL facility components and workforce would be involved in aquifer restoration as during operations use.

Decommissioning is, essentially, deconstruction, and is expected to require a similar work force (up to 200 personnel), with similar skills, as the construction phase. The decommissioning phase may last up to a year longer than the construction phase, depending upon the condition of the ISL at termination. However, the overall potential impacts are still expected to be SMALL to MODERATE.

3.10.3 Conclusions on Socioeconomic Impacts

The proposed project estimates a construction workforce of 50 for the initial construction period of one year, of which 25 (50 percent) would likely be from Campbell County. The operational period would employ 60 full-time workers for the first 10 years, with 40 full-time workers required for continuing plant operations over an additional 15 years. Approximately 30 (50 percent) of the operational workers would be located in Campbell County. Net quantifiable economic benefits of $28.8 million can be linked to the proposed project. These work force, schedule, and economic benefits estimates fall within the bounds analyzed in NUREG-1910.

Reference: NUREG 1910, Section 4.3.10

3.11 Environmental Justice

3.11.1 Environmental Justice of the Proposed Action

Section 4.11 of the ER discusses the environmental justice impacts of the proposed action. The data in Table 4.11-1 show that minority populations in the affected Tracts account for an overall smaller proportion of the population than the proportion of minority populations at the state level. No concentrations of minority populations were identified as residing near the proposed project facilities, as residents nearest to the area are rural populations, while most of the minority population lives in Gillette and communities along the I-25 corridor to the south. The ER concludes that there would be no disproportionate impact to minority population from the construction and operation of the proposed project.

3.11.2 Environmental Justice Assessed in NUREG-1910

Section 6.3 of NUREG-1910 discusses the environmental justice impacts of ISL mining in the Wyoming East Uranium Milling Region. No minority populations were identified in the Wyoming East Uranium Milling Region using 2000 Census data and the criteria from NRC. NRC concludes that for ISL facilities located in the Wyoming East Uranium Milling Region, no minority and low-income population will experience a disproportionately high and adverse impact. However, NRC will review environmental justice on a site-specific basis to confirm the conclusions in NUREG-1910 remain valid.

3.11.3 Conclusions on Environmental Justice

NRC has concluded in NUREG-1910 that for ISL facilities located in the Wyoming East Uranium Milling Region, no minority and low-income population will experience a disproportionately high and adverse impact. However, NRC will review environmental justice on a site-specific basis to confirm the conclusions in NUREG-1910 remain valid.

Reference: NUREG 1910, Section 6.3

3.12 Public and Occupational Health Impacts

3.12.1 Nonradiological Impacts

3.12.1.1 Nonradiological impacts of the Proposed Action

Section 4.12.1 of the ER assesses potential nonradiological impacts to occupational and public health and safety from the proposed action. Section 3.10 of the ER discussed the population distribution for the 80 km radius around the proposed project. Figure 3.10-1 provides the sectorial population for the 16 compass sectors in concentric rings of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70 and 80 km from the center of the proposed project. The population within 2 miles of the proposed License Area boundary was estimated. The nearest resident is approximately 4.5 km from the proposed central plant location. The nearest sensitive receptors (e.g., schools) are in the Town of Wright, located approximately 32.2 km from the central plant location.

NRC has previously evaluated the effects of accidents at conventional uranium milling facilities in NUREG–0706 and specifically at ISR uranium facilities in NUREG/CR-6733. These analyses demonstrate that, for most credible potential accidents, consequences are minor so long as effective emergency procedures and properly trained personnel are used. The proposed project facilities are consistent with the operating assumptions, site features, and designs examined in the NRC analyses in NUREG/CR-6733.

Section 4.12.1.2.1 of the ER specifically analyzes the risks from chemicals used at the proposed project based on the risk insights provided in NUREG/CR-6733. The section provides discussions of sulfuric acid, anhydrous ammonia, hydrogen peroxide, oxygen, carbon dioxide, sodium carbonate, sodium chloride, and sodium sulfide. For each chemical, this section of the ER discusses uses, physical storage facilities, relevant regulatory programs, specific accident prevention methods, and mitigation/accident response measures. Section 4.12.1.2.2 discusses potential sources of non-radiological fumes or gases that can result from use of process related chemicals.

3.12.1.2 Nonradiological Impacts Assessed in NUREG-1910

Section 4.3.11.2.3 of NUREG-1910 assesses the potential nonradiological impacts to public and occupational health and safety from ISL operations and notes that while hazardous chemicals are used at ISL facilities, SMALL risks would be expected in the use and handling of these chemicals during normal operations at ISL facilities. Releases of these hazardous chemicals could produce significant consequences and affect public and occupational health and safety.

Section 4.3.11.2.4 of NUREG-1910 assesses the potential nonradiological impacts to public and occupational health and safety from accidents and references the analysis performed for the Wyoming West Uranium Milling Region in Section 4.2.11.2.4. That section notes that ISL facilities use hazardous chemicals to extract uranium, process waste water, and restore groundwater quality including ammonia, sodium hydroxide, sulfuric acid, hydrochloric acid, oxygen, hydrogen peroxide, carbon dioxide, sodium carbonate, sodium chloride, hydrogen sulfide, and sodium sulfide. As with other industrial operations, releases of hazardous chemicals of sufficient magnitude to adversely impact public and occupational health and safety are possible, but are generally considered unlikely, given commonly applied safety practices and the history of safe use of these chemicals at NRC-regulated ISL facilities. An accident analysis for each of these chemicals is provided in Appendix E of NUREG-1910.

Specific quantities or uses of chemicals require certain controls, procedures, or safety measures defined in EPA and OSHA standards. Five applicable regulations considered are:

- 40 CFR Part 68, Chemical Accident Prevention Provisions
- 29 CFR 1910.119, Occupational Safety and Health Administration Standards-Process Safety Management of Highly Hazardous Chemicals
- 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response
- 40 CFR Part 355, Emergency Planning and Notification
- 40 CFR 302.4, Designation, Reportable Quantities, and Notification-Designation of Hazardous Substances

Requirements from these regulations for the chemicals in use at uranium ISL facilities are summarized in Table 4.2-3 of NUREG-1910. Comparing these requirements with typical onsite quantities shown in Table 2.10.3 indicates there is a potential that some of the chemicals may exceed the minimum reporting quantities in Table 4.2-3. This would trigger an increased level of regulatory oversight regarding possession, storage, use, and subsequent disposal of these chemicals. Compliance with the necessary requirements would reduce the likelihood of a release. Offsite impacts would be SMALL, while impacts to workers involved in response and cleanup could receive MODERATE impacts that would be mitigated by establishing procedures and training requirements.

3.12.1.3 Conclusions on Nonradiological Impacts

The proposed project is in a remote rural area with the nearest resident located approximately 4.5 km from the proposed central plant location. The process chemicals for the proposed project are included in those analyzed in NUREG-1910. The ER discusses applicable regulatory provisions, engineering controls, specific accident prevention methods, and mitigation/accident response measures previously assessed by NUREG/CR-6733.

Reference: NUREG 1910, Section 4.3.11.2.3
NUREG 1910, Section 4.2.11.2.3
NUREG 1910, Appendix E
NUREG 1910, Table 4.2-3

3.12.2 Radiological Impacts

3.12.2.1 Radiological Impacts of the Proposed Action

Section 4.12.2 of the ER assesses potential radiological impacts to occupational and public health and safety from the proposed action. MILDOS-AREA was used to model radiological impacts on human and environmental receptors (e.g. air and soil) using site specific radon-222 release estimates, meteorological and population data, and other parameters. Since the proposed project will employ a vacuum dryer, the only radiological releases will be radon gas. The results of the MILDOS-AREA model indicate the following:

1. The maximum TEDE of 0.8 mrem/year, located at the northwest property boundary, is 0.8 percent of the public dose limit of 100 mrem/year.

2) Receptor #17 is the closest resident to the proposed facility. The estimated TEDE at this location is 0.7 mrem/year, which is 0.7 percent of the regulatory limit.

3) The effect of the Moore Ranch operation on any potential resident is less that 1 mrem/year.

4) Since radon-222 is the only radionuclide emitted, public dose requirements in 40 CFR part 190 and the 10 mrem/year constraint rule in 10 CFR §20.1101 do not apply.

5) Even if 100% of the radon-222 contained in restoration and production fluids were released to the atmosphere (i.e. 100% released instead of 10%), the impacts to potential residents surrounding the facility would be less than the 100 mrem/year public dose limit.

Table 4.12-4 provides the MILDOS-AREA dose estimate for each receptor. Table 4.12-5 provides the annual Total Effective Dose Equivalent for the population for the proposed project.

Section 4.12.2.4 of the ER assesses the potential radiological impacts from accidents. The accident scenarios considered include tank failure, plant pipe failure, and wellfield spill. Mitigation measures are discussed in Section 5.12.2 of the ER.

3.12.2.2 Radiological Impacts Assessed in NUREG-1910

Section 4.3.11.2.1 of NUREG-1910 assesses the potential radiological impacts to public and occupational health and safety from ISL operations. NUREG-1910 notes that a potential ISL facility would be required by its NRC license to implement a radiation safety program that complies with the requirements of 10 CFR Part 20 as described in Section 2.9. Estimated doses to members of the public are discussed for a variety of commercial-scale and satellite facilities in Section 4.2.11.2.1 for the Wyoming West Uranium Milling Region. As shown, these doses are well below the public dose limit of 1 mSv/yr (100 mrem/yr). Dose assessment are performed using MILDOS-AREA, which considers a variety of environmental pathways including external, inhalation, and ingestion of soil, plants, meat, milk, aquatic foods, and water. Releases are assumed to be particles are uranium-238, thorium-230, radium-226, and lead-210. Because of the distance to offsite receptors, radiological doses from normal operations are expected to have a SMALL impact on the general public.

Section 4.2.11.2.2 of NUREG-1910 assesses the potential radiological impacts from accidents. The analysis in NUREG-1910 is based on the radiological hazards assessment performed in NUREG/CR-6733 that considered the various stages within the ISL process. Consequences from accident scenarios were conservatively modeled and if the analyses revealed sufficiently small consequences, no further assessment was needed.

The analysis in Section 4.2.11.2.2 concludes that in the unlikely event of an unmitigated accident, doses to the workers could have a MODERATE impact depending on the type of accident, but doses to the general public would have only a SMALL impact.

3.12.2.3 Conclusions on Radiological Impacts

MILDOS-AREA was used to model radiological impacts on human and environmental receptors for the proposed project. The maximum TEDE of 0.8 mrem/yr was located at the northwest property boundary and is 0.8 percent of the public dose limit. The TEDE to the nearest resident was 0.7 mrem/yr. Radiological impacts due to accidents fall with the assessment contained in NUREG-1910. Mitigation measures are based on the analysis previously performed by NRC in NUREG/CR-6733.

Reference: NUREG 1910, Section 4.3.11.2.1
NUREG 1910, Section 4.2.11.2.1
NUREG 1910, Section 4.2.11.2.2

3.13 Waste Management Impacts

3.13.1 Waste Management Impacts of the Proposed Action

Section 4.13 of the ER discusses waste management impacts associated with the proposed project. The impacts are organized by the types of waste and effluents produced during the ISL process.

3.13.1.1 Gaseous and Airborne Particulates

Section 4.13.1 of the ER discusses the gaseous and airborne particulates released as a result of the project. The primary radioactive airborne effluent at the proposed project will be radon-222 gas. Radiological impacts associated with this effluent were discussed in Section 3.12.2 of this document.

3.13.1.2 Liquid Waste

Section 4.13.2 of the ER discusses the liquid waste created as a result of the proposed project. The operation of the ion exchange process generates production bleed, the primary source of liquid waste as previously discussed in Section 2.0 of the ER. This bleed is routed to the deep disposal well(s) for disposal. Evaporation ponds are not proposed for the project. Other liquid waste streams from the central plant include plant wash down water and bleed stream from the elution and precipitation circuits. Table 4.13-1 of the ER provides a summary of the anticipated waste stream water quality.

Liquid wastes generated as a result of aquifer restoration are discussed. Only the groundwater sweep and groundwater treatment activities will generate wastewater.

It is anticipated that the maximum volume of liquid waste stream for disposal will be approximately 45 gpm during normal operations and approximately 100 gpm during restoration. The average net consumptive use during the operational and restoration phases of the proposed project was estimated at 105 gpm as discussed in Section 3.4 of this document.

3.13.1.3 Solid Waste

Waste which is not contaminated with radioactive material or which can be decontaminated and re-classified as uncontaminated waste includes solid waste, piping, valves, instrumentation, equipment and any other items that are not contaminated or which may be successfully decontaminated. It is estimated that the proposed project will produce approximately 2,000 cubic yards (yd^3) of uncontaminated solid waste per year. Uncontaminated solid waste will be collected on the site on a regular basis and disposed of in the nearest sanitary landfill.

All contaminated items that cannot be decontaminated to meet release criteria will be properly packaged, transported, and disposed at a disposal site licensed to accept 11e.(2) byproduct material. Radioactive solid waste that has a contamination level requiring controlled disposal will be isolated in drums or other suitable containers. It is estimated that the proposed project will produce approximately 100 yd^3 of 11e.(2) byproduct material per year. EMC does not have a disposal agreement in place at this time for byproduct material but has committed to obtaining one before operations begin.

The potential exists for any industrial facility to generate hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). In the State of Wyoming, hazardous waste is governed by WDEQ Hazardous Waste Rules and Regulations. Based on preliminary waste determinations conducted in consideration of the processes and materials that will be used on the project, the proposed facility will likely be classified as a Conditionally Exempt Small Quantity Generator (CESQG), defined as a generator that generates less than 100 kg of hazardous waste in a calendar month and that complies with all applicable hazardous waste program requirements. It is expected that only used waste oil and universal hazardous wastes such as spent batteries will be generated at the proposed project.

3.13.1.4 Decommissioning Wastes

Appendix E of the ER provides the estimated reclamation costs for final site decommissioning. This estimate was revised based on a final site design and feasibility study after the original application was submitted in October 2007 and will be submitted to NRC staff in the near future with the response to an expected request for additional information on the ER.

Based on the revised surety estimate, it is estimated that final site decommissioning including the two proposed wellfields will produce more byproduct material for disposal at a licensed facility and uncontaminated solid waste than the quantities assessed in NUREG-1910.

3.13.2 Waste Management Impacts Assessed in NUREG-1910

Section 4.3.12 of NUREG-1910 assesses the waste management impacts for the Wyoming East Uranium Milling Region. Due to the similarity of impacts with those assessed for the Wyoming West Uranium Milling Region, the analysis in Section 4.2.12

is referenced. Waste streams, and waste management practices applicable to ISL facilities are described in Section 2.7. All ISL facilities are required by NRC to have an agreement in place with a licensed disposal facility to accept radioactive byproduct wastes associated with all phases of the ISL facility lifecycle prior to start of operations. Transportation impacts associated with waste management are discussed in Section 4.3.2, which characterizes impacts as SMALL. Overall, NUREG-1910 concludes that waste management impacts would be SMALL.

3.13.2.1 Construction Impacts to Waste Management

The relatively small scale of construction activities (Section 2.3) and incremental development of well fields at ISL facilities generate low volumes of construction waste. As a result of the limited volumes of construction waste that would be generated during construction of a new ISL facility, waste management impacts from construction would be SMALL.

3.13.2.2 Operations Impacts to Waste Management

As discussed in Section 2.7, operational wastes are primarily liquid waste streams consisting of process bleed (1 to 3 percent of the process flow rate) and aquifer restoration water. Wastes would also be generated from well development, flushing of depleted eluant to limit impurities, resin transfer wash, filter washing, uranium precipitation process wastes (brine), and plant wash down water. The methods used for handling and processing these wastes include water treatment (with barium chloride, and reverse osmosis), followed by disposal methods involving evaporation ponds, land application, deep well injection, and surface water discharge. State permitting actions, NRC license conditions, and NRC inspections ensure the proper practices would be used to comply with safety requirements to protect workers and the public and overall impacts would be SMALL.

Deep well injection is a liquid waste water disposal method that requires special approval and permits designed to limit potential impacts to ground waters. Licensees must obtain a UIC permit from EPA or the appropriate state agency, and obtain NRC approval (Section 1.7.2). These permit approval processes provide confidence that potential environmental impacts would be limited. Therefore, NUREG-1910 concludes that impacts would be SMALL from deep well injection activities.

Solid wastes generated from operations classified as radioactive wastes are sent to a licensed facility for disposal. Contaminated equipment and buildings would be similarly disposed or decontaminated and released according to NRC requirements. Nonradioactive hazardous wastes would be segregated and disposed of at a hazardous waste disposal facility. Non-radiological uncontaminated wastes are disposed of as ordinary solid waste at a municipal solid waste facility. Disposal impacts would be SMALL for radioactive wastes as a result of required pre-operational disposal agreements. Impacts for hazardous and municipal waste would also be expected to be SMALL, assuming the amount of contaminated soil is small.

3.13.2.3 Aquifer Restoration Impacts to Waste Management

Waste management activities during aquifer restoration utilize the same treatment and disposal options implemented for operations. Therefore, NUREG-1910 impacts associated with aquifer restoration would be similar to the operational impacts discussed in Section 4.2.12.2.

3.13.2.4 Decommissioning Impacts to Waste Management

Section 4.2.12.4 of NUREG-1910 notes that waste disposal is an unavoidable, but SMALL, impact associated with decommissioning an ISL facility. Radioactive wastes from decommissioning ISL facilities (including contaminated excavated soil, evaporation pond bottoms, process equipment) are disposed of as byproduct material at a licensed facility. NRC regulations (10 CFR Part 40, Appendix A, Criterion 2) require that byproduct material be disposed of at existing disposal sites unless such offsite disposal is impractical or the benefits of onsite disposal clearly outweigh those of reducing the number of waste disposal sites. Licensees are required to have an agreement in place with a licensed disposal facility prior to starting operations. Requiring such an agreement ensures sufficient disposal capacity will be available for 11e.(2) byproduct wastes generated by decommissioning activities.

Ensuring safe handling, storage, and disposal of decommissioning wastes is addressed by requiring licensed facilities to submit a decommissioning plan for NRC review (Section 2.6) prior to starting decommissioning activities. Therefore, NUREG-1910 concludes that the potential waste management radiation safety impacts from ISL facility decommissioning would be SMALL.

The estimated volume of decommissioning wastes for a large ISL facility is provided in Table 2.6-1 of NUREG-1910. The total volume of estimated byproduct waste is approximately 4,593 cubic meters (6,008 cubic yards) or about 300 truckloads. This waste would be generated over an estimated period of 2 to 3 years for completion of decommissioning activities. The total volume of solid wastes estimated for a large ISL facility is approximately 715 cubic meters (935 cubic yards) or about 47 truckloads. The magnitude of uncontaminated solid wastes from decommissioning is larger than comparable operational waste volumes but would not present any unique problems regarding available disposal capacity. The required pre-operational agreement for disposal of byproduct material and the small volume of solid waste generated for offsite disposal suggest the waste management impacts would be SMALL. Related transportation impacts are discussed separately in Section 4.3.2 of NUREG-1910.

3.13.3 Conclusions on Waste Management Impacts

The waste management impacts associated with the proposed project fall within the analysis completed in NUREG-1910 with the exception of quantities of byproduct and solid waste produced during decommissioning.

Reference: NUREG 1910, Section 4.3.12
NUREG 1910, Section 4.2.12
NUREG-1910, Section 2.7
NUREG-1910, Table 2.6-1

3.14 Cumulative Impacts

The Moore Ranch Environmental Report identifies two past, present, or reasonably foreseeable future actions (RFFAs) that could involve incremental environmental impacts. These actions are site specific and are not covered in NUREG-1910. However, it appears that a Level 1 site-specific cumulative effects analysis would be appropriate. The proposed ISL facility is in compliance with applicable federal and state laws and policies (e.g., the Endangered Species Act) and the expected impacts to a specific resource area are small.

Following is a short description of the present and RFFAs identified for the proposed project.

3.14.1 Cumulative Impacts of Coal Bed Methane Development Projects

Section 4.14.1 of the ER discusses the potential cumulative impacts of present and planned coal bed methane development in the area of the proposed project. The analysis includes a discussion of CBM recovery methods and environmental impacts and is based on a Final Environmental Impact Statement (FEIS) prepared by the Bureau of Land Management (BLM) for the Powder River Basin. The proposed project area includes existing CBM recovery facilities.

Note that two decision documents are referenced in the ER that are not included in the lists of draft and final EISs prepared by federal agencies for the area. NUREG-1910 in Tables 5.2-3 and 5.2-4 identifies draft and final EISs and programmatic or large-scale EISs prepared for the 38 month period from January 7, 2005, through February 22, 2008. Although prepared before the time period selected by NRC in NUREG-1910, EMC relied heavily on the following documents in preparing the discussion of cumulative impacts from coal bed methane production:

U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office, Buffalo Field Office, Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project, WY-070-02-065, January 2003.

U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office, Buffalo Field Office, Record of Decision and Resource Management Plan Amendments for the Powder River Basin Oil and Gas Project, WY-070-02-065, April 2003.

These documents are listed in Section 9.4 of the ER and may provide valuable information to NRC in preparing their assessment of cumulative impacts from coal bed methane development in the proposed project area.

3.14.2 Cumulative Impacts of Other Uranium Development Projects

Section 4.14.2 of the ER discusses potential cumulative impacts from other uranium development projects in the vicinity of the proposed project. The Powder River Basin has been historically developed for the recovery of uranium using ISR and conventional mining. The only existing operational uranium projects currently located in the Powder River Basin are the Smith Ranch/Highland Uranium Project (operated by Power Resources, Inc.) and the Irigaray/Christensen Ranch Project (operated by Cogema Mining, Inc. and currently in standby status). These ISR projects are located approximately 59 km south southeast and 30 km north northwest of the proposed project, respectively. Considering the distance between the existing projects and the proposed project, cumulative environmental impacts are not expected.

EMC is aware that several companies are actively investigating the potential for ISR mining in areas near the proposed project. These projects are in various stages of development. Licensing and permitting applications had not been submitted to the regulatory agencies at the time of the EMC application. As such, it was not possible for EMC to accurately predict the cumulative environmental impacts should these uranium projects seek and ultimately gain regulatory approval and be developed.

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Addendum 1
Moore Ranch Environmental Report and NUREG-1910 Comparison
Summary Table

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table				
Aspect	**Moore Ranch Environmental Report References**	**NUREG-1910 References**	**Conclusions**	**Proposed Action Within Bounds Analyzed in NUREG-1910?**
2 ANALYSIS OF PROPOSED ACTION				
2.1 Site Location and Description	Section 2.1	Section 3.1.1 Figure 3.1.2 Figure 3.3.3	Moore Ranch Project location is included within the Wyoming East Region.	Yes
2.2 Orebody	Section 2.2.5	Section 2.1.2 Figure 2.1-1	Moore Ranch ore body is typical of those considered.	Yes
2.3 Well Construction and Integrity Testing	Section 2.2.6	Section 2.3.1.1 Figure 2.3-4	Well drilling, construction, development, and testing methods meet or exceed the methods considered.	Yes
2.4 Wellfield Design and Operation	Section 2.2.7 Figure 2.2-3 Figure 2.2-4	Section 2.3.1.1 Figure 2.3-1 Section 2.4.1.2 Figure 2.4-1	Wellfield pattern design, piping construction and installation are comparable to the methods reviewed. Wellfield control using production bleed is comparable.	Yes
2.5 Lixiviant Chemistry	Section 2.2.8.1 Table 2.2-1	Section 2.4.1.1 Table 2.4-1	The proposed alkaline lixiviant chemistry is the basis for the analysis in NUREG-1910 with the exception of the maximum expected pH of the solution, which is less than the maximum pH considered by NRC.	Yes
2.6 Uranium Processing	Section 2.2.8 Figure 2.2-5	Section 2.4.2 Figure 2.4-2	The proposed uranium processing method for Moore Ranch is identical to the basis used for the analysis in NUREG-1910 with the use of a vacuum dryer.	Yes
2.7 Central Plant Facilities	Section 2.3.1 Section 2.3.2	N/A	The specific discussion of planned production capacity, plant design, and flow and material balances will require site-specific analysis. Primarily related to safety evaluation.	No

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table

Aspect	Moore Ranch Environmental Report References	NUREG-1910 References	Conclusions	Proposed Action Within Bounds Analyzed in NUREG-1910?
2.8 Chemical Storage Facilities	Section 2.3.3	N/A	The specific discussion of planned storage facilities for process related and non process related chemicals will require site-specific analysis. Primarily related to safety evaluation.	No
2.9 Instrumentation and Control	Section 2.4	N/A	The specific discussion of planned instrumentation and control are not included in NUREG-1910 and will require site-specific analysis. Primarily related to safety evaluation.	No
3 ENVIRONMENTAL IMPACTS				
3.1 Land Use Impacts	Section 4.1 Figure 3.1-1	Section 4.3.1 Section 4.2.1	The proposed license area and total disturbed land area for the project fall within the bounds analyzed in NUREG-1910. Current land use (i.e., grazing) is similar. Land use and access will be limited during construction, operations, and decommissioning within the wellfield and central plant areas. Impacts to the current land use (primarily grazing) will be offset through leases and agreements with the private land owners. There are no recreational uses; oil and gas production facilities will not be affected.	Yes
3.2 Transportation Impacts	Section 4.2	Section 4.3.2	The projected transportation impacts associated with the project fall within the bounds analyzed in NUREG-1910.	Yes
3.2 Transportation Impacts (Transportation Accident Analysis)	Section 4.2.3	Section 4.2.2.2	Yellowcake shipments fall within the bounds analyzed in section 4.2.2.2. Ion exchange resin and hazardous chemical shipments exceed the bounds (i.e., one shipment of each per day) and will require site-specific analysis.	No

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table				
Aspect	**Moore Ranch Environmental Report References**	**NUREG-1910 References**	**Conclusions**	**Proposed Action Within Bounds Analyzed in NUREG-1910?**
3.3 Geology and Soils Impacts	Section 4.3 Section 5.3.2	Section 4.3.3	The projected geology and soils impacts associated with the project fall within the bounds analyzed in NUREG-1910. Mitigation measures for soil erosion and solution spills are in accordance with those discussed in NUREG-1910.	Yes
3.4 Water Resources Impacts (Surface Water)	Section 4.4.1 Section 5.4.1.1	Section 4.3.4.1 Section 4.2.4.1	The surface water impacts associated with the project fall within the bounds analyzed in NUREG-1910. Mitigation measures including permits and best management practices plans are in accordance with those discussed in NUREG-1910.	Yes
3.4 Water Resources Impacts (Groundwater Impacts to Shallow Aquifers)	Section 4.4.2.3.1 Section 4.4.2.3.2 Section 5.4.2.3.1 Section 5.4.2.3.2 Section 3.4.1.2 Figure 3.4.1-1	Section 4.3.4.2.2.1	The projected impacts to shallow aquifers associated with the project fall within the bounds analyzed in NUREG-1910. There are few livestock wells within the license area and no domestic or irrigation wells. These wells are relatively deep. The mitigation measures described in the ER include flow monitoring to detect pipeline leaks and spills and implementation of spill response procedures. Well mechanical integrity testing is included. The use of evaporation ponds or land application to manage process water generated during operations is not proposed for the Moore Ranch Project.	Yes
3.4 Water Resources Impacts (Groundwater Impacts to Production and Surrounding Aquifers – *Consumptive Use*)	Section 4.4.2.1 Figure 3.4-1 Section 5.4.2.1.2	Section 4.3.4.2.2.2	The bounding analysis contained in NUREG-1910 and the lack of nearby wells indicates that the consumptive use for the proposed project was adequately considered in NUREG-1910.	Yes

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table				
Aspect	**Moore Ranch Environmental Report References**	**NUREG-1910 References**	**Conclusions**	**Proposed Action Within Bounds Analyzed in NUREG-1910?**
3.4 Water Resources Impacts (Groundwater Impacts to Production and Surrounding Aquifers – *Excursions and Groundwater Quality*)	Section 4.4.2.2 Section 5.4.2.2 Section 4.4.2.3.1 Section 5.4.2.3 Section 3.3.2 Section 3.4.3.2 Section 2.2.7	Section 4.3.4.2.2.2 Section 2.4.1	When uranium recovery is complete, aquifer restoration activities will be started to restore the production aquifer to baseline or pre-operational class-of-use conditions, if possible. The methods and expected results of aquifer restoration meet the conclusions of NUREG-1910. Methods for controlling, monitoring, and correcting horizontal and vertical excursions meet those assessed in NUREG-1910. The unconfined nature of the 68 and 70 Sands in a portion of Wellfield 2 indicate the need for site specific operational and restoration methods and individual review by NRC.	No
3.4 Water Resources Impacts (Groundwater Impacts to Deep Aquifers)	Section 2.5.1.3 Section 4.13.2.1	Section 4.3.4.2.2.3	The use of deep waste disposal wells is considered to be the best alternative to dispose of liquid wastes generated by ISL operations and aquifer restoration. The proposed deep well(s) will isolate liquid wastes generated by the project from any USDW. The permitting process for these types of wells through the WDEQ and EPA programs minimize the impacts to deep aquifers and fall within the analysis contained in NUREG-1910.	Yes
3.4 Water Resources Impacts (Aquifer Restoration Impacts to Groundwater)	Section 5.4.2.2.2 Section 4.4.2.1 Figure 5.4-1	Section 4.3.4.2.3 Section 2.5	The proposed restoration methods are similar to those analyzed in NUREG-1910. The estimated consumptive use during aquifer restoration is bounded by the analysis contained in NUREG-1910. Restoration will result in returning groundwater quality to requirements set by NRC and the WDEQ as discussed in NUREG-1910.	Yes

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table				
Aspect	**Moore Ranch Environmental Report References**	**NUREG-1910 References**	**Conclusions**	**Proposed Action Within Bounds Analyzed in NUREG-1910?**
3.4 Water Resources Impacts (Decommissioning Impacts to Groundwater)	Section 4.4.2.1 Section 4.12.1.2.1 Section 5.1.1	Section 4.3.4.2.4	The potential impacts to groundwater during decommissioning are similar to those analyzed in NUREG-1910. The estimated consumptive use during aquifer restoration is bounded by the analysis contained in NUREG-1910. Best management practices will be employed to control potential spills of hazardous materials. Well plugging and abandonment will be in accordance with Wyoming requirements.	Yes
3.5 Ecological Resources Impacts (Vegetation)	Section 4.5.1 Section 5.5.1	Section 4.3.5 Section 4.2.5 Section 2.10.1	The proposed project would impact an estimated 150 acres of upland grassland which is at the low end of the bounds analyzed in NUREG-1910. Active revegetation measures approved by the WDEQ are planned. Weed control is planned to limit the spread of undesirable and invasive, non-native species on disturbed areas. There are no threatened or endangered vegetation species or areas of woody shrubs or trees within the proposed development area, so no impacts are expected to these species.	Yes
3.5 Ecological Resources Impacts (Wildlife)	Section 4.5.2 Section 4.5.3 Section 4.5.4 Section 4.5.5 Section 4.5.6 Section 4.5.7 Section 4.5.10	Section 4.3.5 Figures 3.3-8 through 3.3-14	With the exception of active raptor nests, the proposed project does not contain areas of concerns beyond those analyzed in NUREG-1910. Consultation with the Wyoming Game and Fish Department will be necessary to gain approval before disturbances within buffer zones around raptor nests can occur.	Yes

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Moore Ranch Environmental Report and NUREG-1910 Comparison
Summary Table

Aspect	Moore Ranch Environmental Report References	NUREG-1910 References	Conclusions	Proposed Action Within Bounds Analyzed in NUREG-1910?
3.5 Ecological Resources Impacts (Aquatic Resources)	Section 4.5.8	Section 4.3.5	Since no aquatic habitat exists within the proposed project area that will support fish or macroinvertebrates, this analysis is not applicable to the proposed project.	N/A
3.5 Ecological Resources Impacts (Threatened and Endangered Species)	Section 4.5.9 Section 5.5.5.1	Section 4.3.5 Section 3.2.5.3	Bald eagles have not been documented in the project area and impacts of the proposed action would be limited to occasional foraging individuals rather than a large segment of the population. No other species of concern have been identified during site surveys. Mitigation measures have been identified should bald eagles roost or nest in the area after construction begins.	Yes
3.6 Air Quality Impacts	Section 4.6 Section 3.6.4	Section 4.3.6 Section 4.2.6 Section 1.7.2 Section 2.7.1 Figure 3.3-15 Figure 3.3-16	The proposed project falls within the analysis in NUREG-1910 for SMALL impacts to air quality because emissions will be within regulatory requirements, all areas within an 80 km radius of the proposed project are in attainment of NAAQS, and the proposed project will not be a major source under the New Source Review or operating (Title V) permit programs.	Yes
3.7 Noise Impacts	Section 4.7	Section 4.3.7 Section 4.2.7	The remote location of the proposed project is similar to the basis used for noise impact analysis in NUREG-1910. There are no occupied housing units within the proposed license area and open rangeland is the primary land use within and in the surrounding 2.0-mile area. There are no residents within 1,000 ft of the noise sources.	Yes

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table

Aspect	Moore Ranch Environmental Report References	NUREG-1910 References	Conclusions	Proposed Action Within Bounds Analyzed in NUREG-1910?
3.8 Historic and Cultural Resources Impacts	Section 4.8 Section 3.8 Section 5.8	Section 4.3.8 Section 3.3.8 Table 3.3-8	Two sites were identified during site investigations for the proposed project that are considered potentially eligible for the NRHP. These sites are located well over a mile away from any planned development. Mitigation measures including avoidance and approved testing and recovery plans have been identified and meet those assessed in NUREG-1910.	Yes
3.9 Visual/Scenic Resources Impacts	Section 4.9 Section 3.9.2 Section 5.9	Section 4.3.9 Section 3.3.9	NUREG-1910 analysis based on VRM Class III through Class V/Rehabilitation areas determined that visual and scenic impacts will be SMALL. The BLM has determined that the proposed project is located within a VRM Class IV area, which falls within the bounds analyzed by NRC. The total score of the scenic quality inventory for the proposed project area is 4. Although not required, EMC has described mitigative measures that will be taken to minimize visual and scenic impacts.	Yes
3.10 Socioeconomic Impacts	Section 4.10 Section 7.2.2 Section 7.3.3	Section 4.3.10	The proposed project estimates a construction workforce of 50 for the initial construction period of one year. The operational period would employ 60 full-time workers for the first 10 years, with 40 full-time workers required for continuing plant operations over an additional 15 years. Approximately 30 (50 percent) of the operational workers would be located in Campbell County. Net quantifiable economic benefits of $28.8 million can be linked to the proposed project. These work force, schedule, and economic benefits estimates fall within the bounds analyzed in NUREG-1910.	Yes

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table				
Aspect	**Moore Ranch Environmental Report References**	**NUREG-1910 References**	**Conclusions**	**Proposed Action Within Bounds Analyzed in NUREG-1910?**
3.11 Environmental Justice	Section 4.11 Table 4.11-1	Section 6.3	NRC has concluded in NUREG-1910 that for ISL facilities located in the Wyoming East Uranium Milling Region, no minority and low-income population will experience a disproportionately high and adverse impact. However, NRC will review environmental justice on a site-specific basis to confirm the conclusions in NUREG-1910 remain valid.	No
3.12.1 Public and Occupational Health Impacts (Nonradiological Impacts)	Section 4.12.1 Section 3.10 Figure 3.10-1	Section 4.3.11.2.3 Section 4.2.11.2.3 Appendix E Table 4.2-3	The proposed project is in a remote rural area with the nearest resident located approximately 4.5 km from the proposed central plant location. The process chemicals for the proposed project are included in those analyzed in NUREG-1910. The ER discusses applicable regulatory provisions, engineering controls, specific accident prevention methods, and mitigation/accident response measures previously assessed by NUREG/CR-6733.	Yes
3.12.2 Public and Occupational Health Impacts (Radiological Impacts)	Section 4.12.2 Table 4.12-4 Table 4.12-5 Section 5.12.2	Section 4.3.11.2.1 Section 4.2.11.2.1 Section 4.2.11.2.2	MILDOS-AREA was used to model radiological impacts on human and environmental receptors for the proposed project. The maximum TEDE of 0.8 mrem/yr was located at the northwest property boundary and is 0.8 percent of the public dose limit The TEDE to the nearest resident was 0.7 mrem/yr. Radiological impacts due to accidents fall with the assessment contained in NUREG-1910. Mitigation measures are based on the analysis previously performed by NRC in NUREG/CR-6733.	Yes
3.13 Waste Management Impacts	Section 4.13	Section 4.3.12 Section 4.2.12 Section 2.7	The waste management impacts associated with the proposed project fall within the analysis completed in NUREG-1910 with the exception of quantities of byproduct and solid waste produced during decommissioning.	No

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Moore Ranch Environmental Report and NUREG-1910 Comparison Summary Table				
Aspect	**Moore Ranch Environmental Report References**	**NUREG-1910 References**	**Conclusions**	**Proposed Action Within Bounds Analyzed in NUREG-1910?**
3.14 Cumulative Impacts (Coal Bed Methane Development Projects)	Section 4.14.1	N/A	N/A	No
3.14 Cumulative Impacts (Other Uranium Development Projects)	Section 4.14.2	N/A	N/A	No

construction phase. Groundwater consumptive use during the decommissioning activities would be less than groundwater consumptive use during ISL operation and groundwater restoration activities.

- Spills of fuels and lubricants during decommissioning activities could impact shallow aquifers. Implementation of best management practices during decommissioning is expected to reduce the likelihood and magnitude of such spills. Based on consideration of best management practices to minimize water use and spills, impacts to the groundwater resources in shallow aquifers from decommissioning would be SMALL.
- After ISL operations are completed, improperly abandoned wells could impact aquifers above the production aquifer by providing hydrologic connections between aquifers. As part of the restoration and reclamation activities, all monitor, injection, and recovery wells will be plugged and abandoned in accordance with the Wyoming UIC program requirements. If this process is properly implemented, the potential environmental impacts would be SMALL.

3.4.6.3 Conclusions on Decommissioning Impacts to Groundwater

The potential impacts to groundwater during decommissioning of the proposed project are similar to those analyzed in NUREG-1910. The estimated consumptive use during aquifer restoration is bounded by the analysis contained in NUREG-1910. Best management practices will be employed to control potential spills of hazardous materials. Well plugging and abandonment will be in accordance with Wyoming requirements.

Reference: NUREG 1910, Section 4.3.4.2.4

3.5 Ecological Resources Impacts

3.5.1 Impacts to Vegetation

3.5.1.1 Impacts to Vegetation of the Proposed Action

Section 4.5.1 of the ER assesses potential impacts to vegetation from the proposed action. Wellfield and production facilities will be constructed within upland grassland vegetation communities. Direct impacts include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types). Indirect impacts would include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition or changes in vegetative density; reduction of wildlife habitat; reduction in livestock forage; and changes in visual aesthetics. An estimated 150 acres of upland grassland would be affected by construction disturbance under current development plans. Section 5.5.1 of the ER discusses mitigation measures including temporary and permanent surface revegetation of disturbed areas. Revegetation practices will be conducted in accordance with WDEQ-LQD regulations and the mine permit. A temporary seed mix may be used in wellfield and other areas where the vegetation will be disturbed again prior to final decommissioning and final revegetation. The long term seed mix typically consists of one or more of the native wheat grasses. Seeding is accomplished with a seed mix approved by the WDEQ-LQD.

Construction activities, increased soil disturbance, and higher traffic volumes could stimulate the introduction and spread of undesirable and invasive, non-native species within the project area. The presence of two State-designated weeds, Canada thistle and field bindweed, was observed in the proposed project area during the baseline surveys along with other undesired annual grass species such as cheat grass brome. Section 5.5.1 of the ER discusses mitigation measures including weed control as needed to limit the spread of undesirable and invasive, non-native species on disturbed areas.

No threatened or endangered vegetation species were observed within the proposed project area; therefore, no impacts are anticipated.

There are no areas of woody shrubs or trees within the proposed development area, so no impacts are expected to this community.

3.5.1.2 Impacts to Vegetation Assessed in NUREG-1910

Section 4.3.5 of NUREG-1910 analyzes impacts to vegetation and notes that since vegetation in the Wyoming East Uranium Milling Region is similar to the vegetation found in the Wyoming West Uranium Milling Region, the potential impacts to terrestrial vegetation would also be similar (SMALL to MODERATE) and references in Section 4.2.5. For completeness, this review considers both sections. Section 4.2.5 notes that ISL uranium recovery facility construction primarily affects terrestrial vegetation through:

1. The removal of vegetation from the milling site during construction (and associated reduction in wildlife habitat and forage productivity and an increased risk of soil erosion and weed invasion);
2. The modification of existing vegetative communities as a result of maintenance;
3. The loss of sensitive plants and habitats as a result of construction clearing and grading; and
4. The potential spread of invasive species and noxious weed populations as a result of construction.

Section 4.2.5 of NUREG-1910 notes that ISL facilities are typically located in large remote areas of the region. Permit areas of past facilities have ranged from 2,552 acres to

16,000 acres of land as discussed in Section 2.10.1 of NUREG-1910. Typically the impact within these permit areas have been from 120 acres to 1,200 acres. The percent of vegetation removed or land disturbance has been from below 1 to 20 percent, which would be a SMALL impact in relation to the total permit area and surrounding plant communities.

Clearing herbaceous vegetation during construction in an open grassland or shrub steppe community is anticipated to have a short-term impact. If active re-vegetation measures were used with seed mixtures approved by the WDEQ, Land Quality Division, rapid colonization by annual and perennial herbaceous species in the disturbed staging areas and rights-of-ways would restore most vegetative cover within the first growing season. Impacts from clearing in this community would be SMALL.

Clearing woody shrubs and trees would have a primary long-term impact on vegetation if the project is located in a wooded area. Impacts from clearing this community would be SMALL to MODERATE depending of the amount of surrounding wooded area.

Noxious weeds that may invade areas disturbed by construction would be expected to be controlled on a regular basis. The applicant would be expected to employ minimal use of herbicides to control noxious weeds, so as not to affect native species on the site. Using applicable control techniques, impacts from noxious weeds would be SMALL.

3.5.1.3 Conclusions on Impacts to Vegetation

The proposed project would impact an estimated 150 acres of upland grassland which is at the low end of the bounds analyzed in NUREG-1910. Active revegetation measures approved by the WDEQ are planned. Weed control is planned to limit the spread of undesirable and invasive, non-native species on disturbed areas. There are no threatened or endangered vegetation species or areas of woody shrubs or trees within the proposed development area, so no impacts are expected to these species.

Reference: NUREG 1910, Section 4.3.5
NUREG 1910, Section 4.2.5
NUREG 1910, Section 2.10.1

3.5.2 Impacts to Wildlife

3.5.2.1 Impacts to Wildlife of the Proposed Action

The Moore Ranch ER assesses impacts to wildlife in the following sections:

- Section 4.5.2 assesses impacts to wildlife and fisheries. ISL uranium mining can have direct and indirect impacts on local wildlife populations. These impacts are both short-term (lasting until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). However, long term impacts are not expected to be substantial due to the relatively limited habitat disturbance associated with this mining method. Surface disturbance associated with the proposed project is expected to consist of approximately 150 acres of disturbed area including an 11-acre central plant facility, approximately 1.0 mile of new access road, and a permanent working staff of approximately 60 individuals. Most indirect impacts would relate to the displacement of wildlife due to increased noise, traffic, or other disturbances associated with the development and operation of the proposed project, as well as from small reductions in existing or potential cover and forage due to habitat alteration, fragmentation, or loss. Repeated surveys over multiple, consecutive years in the project area have documented that three wildlife species of particular concern do not occur in the proposed project area: the bald eagle, greater sage-grouse, and mountain plover. Other wildlife species of concern, such as ferruginous hawks, that do occur in the area may experience indirect impacts from increased travel and noise in the area during construction and operation.

- Section 4.5.3 assesses impacts to medium-sized and small mammals. Medium-sized mammals (such as lagomorphs, coyotes, and foxes) may be temporarily displaced during the initial uranium mining activities. Direct losses of some small mammal species (e.g., voles, ground squirrels, mice) may be higher than for other wildlife due to their more limited mobility and likelihood that they would retreat into burrows when disturbed. Given the limited area expected to be disturbed, such impacts would not be expected to result in major changes or reductions in mammalian populations for small or medium-sized animals. The species known to be, or potentially, present in the project area have shown an ability to adapt to human disturbance in varying degrees, as evidenced by their presence in CBM developments and residential areas of similar, or greater, disturbance.

- Section 4.5.4 assesses the impacts to big game mammals. Big game could be displaced from portions of the project area to adjacent areas, particularly during construction of the wellfield and facilities, when disturbance activities would be greatest. Disturbance levels would decrease during actual production and restoration operations. Similar disturbance is already present in the area due to existing CBM operations. Pronghorn would be most affected, as they are more prevalent in the area. However, no areas classified as crucial pronghorn habitat occur on or within several miles of the project area. Mule deer would not be substantially impacted given their infrequent use of these lands, the paucity of winter forage and security cover, and the availability of suitable habitat in adjacent areas. The WGFD does not consider the general area to be within the "use range" of any other big game species.

- Section 4.5.5 assesses impacts to upland game birds. The proposed project would affect approximately 150 non-contiguous acres of potential foraging and nesting habitat for mourning doves, though such disturbance is not expected to have any marked impacts on doves. Annual monitoring studies conducted by private and agency biologists in the project area since at least 2003 have repeatedly demonstrated that sage-grouse do not inhabit that locale.

- Section 4.5.6 assesses impacts to other birds. The proposed project could impact 14 avian species of concern known to occur or potentially present as seasonal or year-round residents. Direct impacts could include injury or mortality due to encounters with vehicles or heavy equipment during construction or maintenance operations. Indirect impacts could include habitat loss or fragmentation and increased noise and activity that may deter use of the area by some species. Surface disturbance would be relatively minimal (total of approximately 150 non-contiguous acres) and would be greatest during construction.

- Section 4.5.7 assesses the impacts to raptors. The proposed project would not impact regional raptor populations, though individual birds or pairs may be affected. Mining activity could cause raptors to abandon nests proximate to disturbance, particularly if mining encroaches on active nests during a given breeding season. Thirteen intact ferruginous hawk nests were known to be present within the portions of the project area monitored during 2007. Three documented great horned owl nest sites are located within the project area. One intact red-tailed hawk nest site occurred within that boundary in 2007. Typically, approval of a mitigation plan and appropriate permit will be acquired from the Wyoming Game and Fish Department before disturbance activities can occur within buffer zones for active raptor nests. All three species represented on the proposed project area have successfully nested near active surface coal mining and other energy development areas including CBM throughout the Powder River Basin for many years as documented in Annual Reports submitted to the WDEQ/LQD.

- Section 4.5.10 assesses impacts to waterfowl and shorebirds. Construction and operation of the proposed project would have a negligible effect on migrating and breeding waterfowl and shorebirds. Little existing habitat is present in the area, so it does not currently support large groups or populations of these species.

3.5.2.2 Impacts to Wildlife Assessed in NUREG-1910

Section 4.3.5 of NUREG-1910 analyzes impacts to wildlife and notes that impacts in the Wyoming East Uranium Milling Region would be similar to those in the Wyoming West Uranium Milling Region and would be SMALL to MODERATE, depending on site specific conditions. For completeness, this review considers both sections. Section 4.3.5 notes that crucial wintering and year-long ranges vital for survival of local populations of big game and sage grouse leks or breeding ranges are located within the region as shown in Figures 3.3-8 through 3.3-14. Consultation with the Wyoming Game and Fish Department would be conducted, as well as a site-specific analysis to determine potential impacts from the facility to these species.

3.5.2.3 Conclusions on Impacts to Wildlife

With the exception of active raptor nests, the proposed project does not contain areas of concerns beyond those analyzed in NUREG-1910. Consultation with the Wyoming Game and Fish Department will be necessary to gain approval before disturbances within buffer zones around raptor nests can occur.

Reference: NUREG 1910, Section 4.3.5
NUREG 1910, Figures 3.3-8 through 3.3-14

3.5.3 Impacts to Aquatic Resources

3.5.3.1 Impacts to Aquatic Resources of the Proposed Action

Section 4.5.8 of the ER notes that no aquatic habitat exists within the proposed project area that will support fish or macroinvertebrates. Therefore, no impacts from construction or operations to aquatic resources can occur.

3.5.3.2 Impacts to Aquatic Resources Assessed in NUREG-1910

Section 4.3.5 of NUREG-1910 analyzes impacts to aquatic resources. This analysis is not applicable to the proposed project since these resources do not exist in the project area.

3.5.3.3 Conclusions on Impacts to Aquatic Resources

Since no aquatic habitat exists within the proposed project area that will support fish or macroinvertebrates, this analysis is not applicable to the proposed project.

Reference: NUREG 1910, Section 4.3.5

3.5.4 Impacts to Threatened and Endangered Species

3.5.4.1 Impacts to Threatened and Endangered Species of the Proposed Action

Section 4.5.9 of the ER discusses potential impacts to threatened or endangered species. The proposed project may affect, but is not likely to adversely affect, bald eagles. The bald eagle was delisted from its Threatened status on June 28, 2007 in the lower 48 states. Its primary legal protection was transferred from the Endangered Species Act to the Bald and Golden Eagle Protection Act (BGEPA). As bald eagle nests and winter roost sites are absent in the project area, potential hazards for this species would be limited to foraging individuals during winter. Due to this lack of potential nesting or roosting sites and the lack of concentrated sources of prey, both the direct and indirect effects of the proposed action to bald eagles are expected to be minimal. Section 5.5.5.1 of the ER notes that if necessary, the majority of direct impacts could be mitigated if construction activities were conducted outside the winter and early spring months, or outside the daily roosting period, should eagles be present during construction. Any bald eagles that might roost or nest in the area once the mine is operational would be doing so in spite of continuous and on-going human disturbance, indicating a tolerance for such activities.

3.5.4.2 Impacts to Threatened and Endangered Species Assessed in NUREG-1910

Section 4.3.5 of NUREG-1910 notes that numerous threatened and endangered species and State Species of Concern are located within the region. These species with habitat descriptions are provided in Section 3.2.5.3. After a site has been selected, the habitats and impacts would be evaluated for federal and state species of concern that may inhabit the area. For site-specific environmental reviews, licensees and NRC staff consult with the U.S. Fish and Wildlife Service and Wyoming Game and Fish Department for potential survey requirements and explore ways to protect these resources. If any of the species are identified in the project site during surveys, impacts could range from SMALL to LARGE, depending on site-specific conditions. Mitigation plans to avoid and reduce impacts to the potentially affected species would be developed.

3.5.4.3 Conclusions on Impacts to Threatened and Endangered Species

Bald eagles have not been documented in the project area and impacts of the proposed action would be limited to occasional foraging individuals rather than a large segment of the population. No other species of concern have been identified during site surveys. Mitigation measures have been identified should bald eagles roost or nest in the area after construction begins.

Reference: NUREG 1910, Section 4.3.5
NUREG 1910, Section 3.2.5.3

3.6 Air Quality Impacts

3.6.1 Air Quality Impacts of the Proposed Action

Section 4.6 of the ER discusses air quality impacts of the proposed action. Construction activities will cause minimal short term effects on local air quality due to fugitive dust from vehicular traffic on unpaved roads and wind erosion of areas cleared of vegetation and diesel emissions from construction equipment. Diesel emissions from construction equipment are expected to be short term only, ceasing once the operational phase begins. EMC estimated fugitive dust emissions from operation of the proposed project based on projected activity levels and emission factors supplied by the WDEQ. The projected total PM_{10} emissions are 15.5 tons per year. This level of emissions is small relative to surface mines and other industrial operations in the area. The larger surface mines in the Powder River Basin show PM_{10} emissions inventories in the thousands of tons per year. Atmospheric dispersion modeling generally shows that fugitive PM_{10} emissions on the order of 15 tons per year result in insignificant impacts to ambient air beyond a distance of a few hundred yards from the sources. It is important to note that no control factors were assumed for the emission calculations. Periodic watering or chemical treatment of the unpaved roads as discussed in Section 5.6 of the ER will reduce emission factors by half or more.

As discussed in Section 3.6.4 of the ER, all areas within the 80 km radius of the proposed project are in attainment of NAAQS.

Although not specifically discussed in the ER, the proposed project will not be a major source under the New Source Review or operating (Title V) permit programs under EPA regulations at 40 CFR Part 70 and 71.

3.6.2 Air Quality Impacts Assessed in NUREG-1910

Section 4.3.6 of NUREG-1910 analyzes non-radiological impacts to air quality and notes that impacts in the Wyoming East Uranium Milling Region would be similar to those found in the Wyoming West Uranium Milling Region (discussed in Section 4.2.6). For completeness, this review considers both sections. The potential impacts to air quality are expected to be SMALL if the following conditions are met:

- Gaseous emissions are within regulatory limits and requirements;
- Air quality in the region of influence is in compliance with National Ambient Air Quality Standards (NAAQS); and
- The facility is not classified as a major source under the New Source Review or operating (Title V) permit programs (described in Section 1.7.2 of NUREG-1910).

The analysis in NUREG-1910 is based on the conclusion that these conditions apply to activities conducted as part of all four phases of the ISL facility lifecycle. Actions where the region of influence includes NAAQS nonattainment or maintenance areas typically would generate more scrutiny in the permitting process. Because of the existing air quality condition in these areas, any activity generating gaseous emissions could potentially create impacts to air quality that could be classified as MODERATE or LARGE. Classification as a major source under any permit program indicate facility emission levels warrant analyses to determine if, impacts would be at the MODERATE or LARGE level.

The Wyoming East Uranium Milling Region is classified as attainment for NAAQS (Figure 3.3-15). This also includes the counties immediately surrounding this region. The Wyoming East Uranium Milling Region does not include any Prevention of Significant Deterioration Class I areas (Figure 3.3-16). Therefore, the less stringent Class II area allowable increments apply.

Non-radiological gaseous emissions in all four phases include fugitive dust and combustion emissions as described in Section 2.7.1. Most of the combustion emissions are diesel emissions and are expected to be limited in duration and result in small, short-term effects. Therefore, air quality impacts from these sources would be SMALL.

Operating ISL facilities are not major point source emitters and are not expected to be classified as major sources under the operation (Title V) permitting program. Therefore, air quality impacts would be SMALL.

3.6.3 Conclusions on Air Quality Impacts

The proposed project falls within the analysis in NUREG-1910 for SMALL impacts to air quality because emissions will be within regulatory requirements, all areas within an 80 km radius of the proposed project are in attainment of NAAQS, and the proposed project will not be a major source under the New Source Review or operating (Title V) permit programs.

Reference: NUREG 1910, Section 4.3.6
NUREG 1910, Section 4.2.6
NUREG 1910, Section 1.7.2
NUREG 1910, Section 2.7.1
NUREG 1910, Figure 3.3-15
NUREG 1910, Figure 3.3-16

3.7 Noise Impacts

3.7.1 Noise Impacts of the Proposed Action

Section 4.7 of the ER discusses the noise impacts of the proposed action. There are no occupied housing units in the vicinity of the proposed project. Open rangeland is the primary land use within and in the surrounding 2.0-mile area. As a result of the remote location of the project and the low population density of the surrounding area, impact to noise or congestion within the project area or in the surrounding 2.0-mile area are not anticipated. Additionally, given the maximum increase in population due to migrant workers is insignificant, noise and congestion impacts are not anticipated in Campbell or other neighboring counties.

3.7.2 Noise Impacts Assessed in NUREG-1910

Section 4.3.7 of NUREG-1910 analyzes noise impacts and notes that impacts in the Wyoming East Uranium Milling Region would be similar to those found in the Wyoming West Uranium Milling Region (discussed in Section 4.2.7). For completeness, this review considers both sections.

Sections 4.2.7.1 and 4.3.7.1 assesses noise impacts from the construction phase. NRC anticipates that because of the use of heavy equipment, potential noise impacts would be greatest when an ISL facility is being built, especially in rural, previously undeveloped areas because the baseline noise levels are likely to be lower for these areas. Based on this, NUREG-1910 analyzes noise impacts compared to typical background noise in rural, undeveloped areas. Initial construction of larger surface facilities such as a central processing facility would be completed early in the project, but because of the staged nature of uranium ISL facilities, construction activities would be expected to continue throughout the life of the project as well fields are developed and brought into production. Sections 4.2.7.1 notes that the U.S. Department of Energy (DOE) calculated that in an arid environment similar to that in the Wyoming West Uranium Milling Region, 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 mi and that noise resulting from construction activities could occasionally be annoying to residents within 1,000 ft of the noise sources, particularly during the night. These conditions should also exist in the Wyoming East Uranium Milling Region. NUREG-1910 concludes that since the three uranium districts in the Wyoming East Uranium Milling Region are located in undeveloped rural areas at least 10 miles from the closest communities and considering decreasing noise levels with distance, construction activities and associated traffic would have only SMALL and temporary noise impacts for residences, communities, or sensitive areas that are located more than about 1,000 ft from specific noise generating activities. During construction, wildlife would be anticipated to avoid areas where noise-generating activities were ongoing. Therefore, overall noise impacts during construction would be SMALL to MODERATE.

Section 4.2.7.2 assesses noise impacts from the operations phase. NRC concludes that except for heavy truck traffic associated with the operation, operations at ISL uranium recovery facilities generally do not create important sources of noise for offsite receptors. Noise would be also be generated by trucks, pumps, generators, and other heavy equipment used around the mill site. Because most activities will be conducted inside buildings, NUREG-1910 concludes that potential noise impacts during ISL operations will be less than those during construction and noise impacts would be SMALL. Some country roads with the lowest average annual daily traffic counts would be expected to have higher relative increases in traffic and noise impacts, especially when facilities are experiencing peak employment. These impacts would be MODERATE.

Section 4.2.7.3 assesses noise impacts from the aquifer restoration phase. NRC anticipates that general noise levels during aquifer restoration would be expected to be similar to or less than those during the operational period and noise impacts would be SMALL. During construction, wildlife would be anticipated to avoid areas where noise-generating activities were ongoing. Therefore, overall noise impacts during aquifer restoration would be SMALL to MODERATE.

Section 4.2.7.4 assesses noise impacts from the decommissioning phase. NRC anticipates that general noise levels during decommissioning and reclamation would be expected to be similar to or less than those during the construction period and noise impacts would be SMALL.

3.7.3 Conclusions on Noise Impacts

The remote location of the proposed project is similar to the basis used for noise impact analysis in NUREG-1910. There are no occupied housing units within the proposed license area and open rangeland is the primary land use within and in the surrounding 2.0-mile area. There are no residents within 1,000 ft of the noise sources.

Reference: NUREG 1910, Section 4.3.7
NUREG 1910, Section 4.2.7

3.8 Historic and Cultural Resources Impacts

3.8.1 Historic and Cultural Resources Impacts of the Proposed Action

Section 4.8 of the ER discusses potential impacts to historic and cultural resources. As discussed in Section 3.8 of the ER, the Class II Inventory investigations found seven sites and 25 Isolate Resources/Artifacts. Two sites are considered eligible for nomination to the National Register of Historic Places (NRHP). All sites and artifacts are described in detail in the Class III Inventory Report in Appendix A of the ER. Only two sites that are listed as not eligible for nomination to the NRHP are at or near any current development areas (i.e., near the monitor well ring). No sites are located within planned wellfield areas as discussed in the report contained in Appendix B of the ER. The sites eligible for nomination to the NRHP are located well over a mile away from any planned development. The Class III Inventory Report in Appendix B concludes that the proposed action will not affect any known significant cultural resources and additional archaeological work is not considered necessary.

Section 5.8 provides proposed mitigation measures that will be implemented if future development expands near these eligible sites. If exploration and development plans are subsequently expanded near those areas, then all associated ground-disturbing activities will avoid impacting the two sites eligible for nomination to the NRHP. If avoidance is not feasible, then a testing/data recovery plan would be implemented and completed prior to commencement of any ground disturbing activities.

3.8.2 Historic and Cultural Resources Impacts Assessed in NUREG-1910

Section 4.3.8 of NUREG-1910 analyzes the potential impacts to historic and cultural resources from ISL construction, operation, aquifer restoration, and decommissioning activities. Construction involving land disturbing activities, such as grading roads, installing wells and constructing surface facilities and well fields during both the construction and operation phases would be the most likely activities that could affect cultural and NRHP-eligible, or potentially NRHP-eligible historical resources. Because of the localized nature of land disturbing activities related to construction, impacts to cultural and historical resources would be expected to be SMALL, but could be MODERATE or LARGE, if the facility is located on a known resource. Wyoming historical sites listed in the Wyoming State and/or NRHP and traditional cultural properties are provided in Section 3.3.8 and Table 3.3-8 of NUREG-1910. Proposed facilities or expansions adjacent to these properties would be likely to have the greatest potential impacts and mitigation measures such as avoidance, recording and archiving samples and additional consultations with the Wyoming SHPO and affected Native American tribes would be needed to assist in reducing the impacts.

3.8.3 Conclusions on Historic and Cultural Resources Impacts

Two sites were identified during site investigations for the proposed project that are considered potentially eligible for the NRHP. These sites are located well over a mile away from any planned development. Mitigation measures including avoidance and approved testing and recovery plans have been identified and meet those assessed in NUREG-1910.

Reference: NUREG 1910, Section 4.3.8
NUREG 1910, Section 3.3.8
NUREG 1910, Table 3.3-8

3.9 Visual and Scenic Resources Impacts

3.9.1 Visual and Scenic Resources Impacts of the Proposed Action

Section 4.9 discusses the visual and scenic resource impact of the proposed project. As discussed in Section 3.9.2 of the ER, the BLM has inventoried the landscape within the proposed project area and the surrounding 2-mile area and rated the areas as VRM Class IV. The management objective of VRM Class IV is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

As noted in Section 3.9.2, the total score of the scenic quality inventory for the proposed project is 4. According to NUREG-1569, if the visual resource evaluation rating is 19 or less, no further evaluation is required. Despite the low scenic quality inventory for the proposed project area, the ER describes mitigative measures to lessen the visual impact of the project in Section 5.9. One method to minimize these contrasts is the selection of paint colors for structures that harmonize with the surrounding landscape. To the extent possible, topographic features may be used to screen wellheads, plant facilities, and roads. Roads may be aligned with the contours of the topography, although this measure may result in a greater area of disturbance. Construction debris will be removed from new construction areas as soon as possible.

3.9.2 Visual and Scenic Resources Impacts Assessed in NUREG-1910

Section 4.3.9 of NUREG-1910 assesses the potential impacts to visual and scenic resources from ISL project development. Section 3.3.9 of NUREG-1910 notes that there are no VRM Class I areas identified in the Wyoming East Uranium Milling Region and that most of the areas are identified as VRM Class II through Class IV according to the BLM classification system. All of the existing and potential ISL facilities identified in the three uranium districts of the Wyoming East Uranium Milling Region are located more than 20 mi from Class II areas, within Class III through Class V/Rehabilitation VRM areas. Visual and scenic impacts introduced by ISL construction, operation, aquifer restoration, and decommissioning in these areas would be SMALL.

3.9.3 Conclusions on Visual and Scenic Resources Impacts

NUREG-1910 analysis based on VRM Class III through Class V/Rehabilitation areas determined that visual and scenic impacts will be SMALL. The BLM has determined that the proposed project is located within a VRM Class IV area, which falls within the bounds analyzed by NRC. The total score of the scenic quality inventory for the proposed project area is 4. Although not required, EMC has described mitigative measures that will be taken to minimize visual and scenic impacts.

Reference: NUREG 1910, Section 4.3.9
NUREG 1910, Section 3.3.9

3.10 Socioeconomic Impacts

3.10.1 Socioeconomic Impacts of the Proposed Action

Section 4.10 of the ER discusses the socioeconomic impacts of the proposed action. Socioeconomic impacts would be felt primarily in Campbell and Natrona Counties in northeastern Wyoming, with at least 50 percent of the work force located in Gillette. The proposed project is located in Campbell County, which would be most likely to experience effects to housing, public and other community services, recreation, county and municipal finances, crime, and the local transportation network. It is anticipated that the overall effect of the proposed facility operations on the local and regional economy would be beneficial.

3.10.1.1 Socioeconomic Impacts from Construction

The construction phase would cause a moderate impact to the local economy, resulting from the purchases of goods and services directly related to construction activities. An estimated 50 percent (25 workers) of the construction work force would be based in Campbell County, which contains the project site. Contractors for projects located throughout northeastern Wyoming typically hire the local construction labor pool. The actual number of construction workers available for the proposed project would potentially draw from the entire construction labor pool of 6,268 (2005 estimate; the construction labor pool as of 2007 is likely to be larger).

In the event that workers from other states are hired for construction of the project, temporary housing such as motel/hotel rooms and RV sites located within commuting distance would be required, as no on-site housing (man camp) is planned. The available stock of motel/hotel rooms would accommodate relocating workers. It is recognized, however, that the coal bed methane gas and mineral industries are presently a dominating factor for temporary housing availability in the area, and the workforce employed in these industries occupy much of the temporary housing that becomes available.

Most non-local workers would utilize temporary housing. Because existing mobile home and RV parks will be used for a majority of the temporary housing, the project will not require new water, sewer, electrical lines, or other infrastructure.

3.10.1.2 Socioeconomic Impacts from Operations

An estimated 40 to 60 people would be required for the operation of the proposed project. In the event that the entire operations workforce and their families relocated to the counties, the population increase would be a maximum of 150, based on the 2005 average household size of 2.52 in Wyoming. This increase would account for 0.1 percent of the population of Campbell and Natrona Counties, and is smaller than the projected annual growth rate.

The proposed project area lies within commuting distance of Gillette and Wright, in Campbell County, and Casper in Natrona County, so that operational workers from these counties would likely commute from their homes. There would be no impact to temporary housing located within commuting distance (an estimated 1 to 2 hours).

Household projections estimate an increase in households from 2000 to 2030 as 140 percent in Campbell County and 73 percent in Natrona County. The existing housing stock would not accommodate the projected households. Local communities in general are aware of the pressing need for the new residential development.

Families moving into the Natrona and Campbell County school districts as a result of the proposed project operations would not stress the current school system because it is presently under capacity.

Section 7 of the ER provides the benefit-cost analysis of the proposed project and assesses the economic impacts on the local economy. Section 7.2.2 provides key assumptions including the following:

The total effective life of the Project is assumed to be 27 years. Within this time frame, there are three distinct phases of operation with a distinct suite of costs and benefits:

- 2 years of site development and facility construction (1 year for initial construction and 1 year for construction related to plant expansion during operations some time in the future)

- 10 years of wellfields and central plant operation

- 15 years of the central plant continuing operation after decommissioning the wellfields.

The total estimated number of construction workers employed directly is 50 per year, of which 25 (50 percent) would likely be from Campbell County. Construction capital expenditures are estimated at $50 million (including initial construction and future plant expansion), or $25 million per year for the duration of the initial construction period.

Following one year of facility construction, the wellfields and central plant would be fully-operational, employing 60 full-time workers per year for the first 10 years. After completion of mining and restoration activities, 40 full-time workers will be required for continuing plant operations, accepting loaded ion exchange resin from satellite facilities for processing. Approximately 30 (50 percent) of the operational workers would be located in Campbell County.

Section 7.3.3 of the ER assesses the State and local tax revenue benefits. The IMPLAN analysis shows that the construction and operation of the proposed project is expected to generate a net present value of approximately $8.0 million in total enterprise and business tax revenues over the life of the project. Additionally, the current uranium severance tax is 4% of taxable market value coming from mining operations. Current resource estimates for the proposed project are 5.8 million lbs (43-101 compliant). This does not include reserve estimates as these projections are not yet complete. Assuming that the identified 5.8 million lbs were sold at current market prices of approximately $90 per pound, the severance tax would yield approximately $20,800,000 in net economic benefits over the life of the operation. In sum, the results show that $28.8 million net quantifiable economic benefits can be linked to the proposed project.

3.10.2 Socioeconomic Impacts Assessed in NUREG-1910

Section 4.3.10 of NUREG-1910 assesses the potential impacts to socioeconomics and notes that although a proposed facility size and production level can vary, the peak annual employment at an ISL facility can range up to about 200 people, including construction (Freeman and Stover, 1999; NRC, 1997; Energy Metals Corporation, U.S., 2007). Depending on the composition and size of the local workforce, NUREG-1910 estimates that the overall socioeconomic impacts from ISL milling facilities for the Wyoming East Uranium Milling Region would range from SMALL to MODERATE.

Assuming the number of persons per household in Wyoming is about 2.5 (U.S. Census Bureau, 2008), the number of people associated with an ISL facility workforce could be as many as 500 (i.e., 200 workers times 2.5 persons/household). The demand for public services (schools, police, fire, emergency services) would be expected to increase with the construction and operation of an ISL facility.

3.10.2.1 Construction Impacts to Socioeconomics Assessed in NUREG-1910

Section 4.3.10.1 of NUREG-1910 assesses the potential impacts to socioeconomics from construction activities. The majority of construction requirements would likely be filled by a skilled workforce from outside of the Wyoming East Uranium Milling Region. Assuming a peak workforce of 200, this influx of workers is expected to result in SMALL to MODERATE impact in the Wyoming East Uranium Milling Region. However, due to the short duration of construction (12-18 months), workers would have only a limited effect on public services and community infrastructure. Further, construction workers are less likely to relocate their entire family to the region, thus minimizing impacts from an outside workforce. In addition, if the majority of the construction workforce is filled from within the region, impacts to population and demographics would be SMALL.

NUREG-1910 notes that construction impacts to regional income and the labor force for a single ISL facility in the Wyoming West Uranium Milling Region would likely be SMALL. In addition, even if multiple facilities be developed concurrently, the potential for impact upon the labor force would still be SMALL.

Impacts to housing from construction activities would be expected to be SMALL and short-term even if the workforce is primarily filled from outside the region. It is likely that the majority of construction workers would use temporary housing such as apartments, hotels, or trailer camps. However, the impact upon specific facilities (apartment complexes, hotels, or campgrounds) could potentially be MODERATE, if construction workers concentrated in one general area.

Assuming the majority of employment requirements for construction are filled by outside workers (a peak of 200), there would be SMALL to MODERATE impacts to employment structure. If the majority of construction activities rely on the use of a local workforce, impacts would be anticipated to be SMALL to MODERATE depending upon the size of the local workforce. Counties such as Campbell and Albany would experience MODERATE impacts, due to their high unemployment rate and potential increase in employment opportunities.

NUREG-1910 notes that local finance would be affected by ISL construction through additional taxation and the purchase of goods and services. Though Wyoming does not have an income tax, it does have a state sales tax (4 percent), a lodging tax (2-5 percent), and a use tax (5 percent). Construction workers are anticipated to contribute to these as they purchase goods and services within the region and within the state while working on an ISL facility. In addition, and more significant, is the 'ad valorem tax' the state imposes on mineral extraction. In 2007 for uranium, alone, the state collected $ 17 million from this tax (WY Dept. of Revenue). It is anticipated that ISL facility development could have a MODERATE impact on local finances within the region.

Even if the majority of workforce is filled from outside, impacts to education from construction activities would be SMALL. This is because construction workers are less likely to re-locate their entire family for a relatively short duration (12-18 months).

3.10.2.2 Operation Impacts to Socioeconomics Assessed in NUREG-1910

Section 4.3.10.2 of NUREG-1910 assesses the potential impacts to socioeconomics from operations activities. Operational requirements use specialized workers. Activities would be longer term (20-40 years) than construction (12-18 months), and use a workforce of 50 to 80 personnel instead of up to 200 workers for the construction phase. The potential impact to the local population and public services resulting from the influx of workers and their families would range from SMALL to MODERATE, depending upon the location.

NUREG-1910 assumes that because of the highly technical nature of ISL operation the majority (approximately 70 percent) of the work force (35 to 56 personnel) would be staffed from outside the region for, at least, the initial ISL facility. Subsequent ISL facilities may draw personnel from established or decommissioned facilities. This is expected to have a SMALL impact upon the regional labor force.

If it is assumed that as many as 56 families (80 workers x 0.7 economic multiplier) are required to relocate into the Wyoming East Uranium Milling Region, the most likely available housing markets would be located in the larger communities, such as Casper and Douglas (within the region), and Gillette and Sheridan (located outside 'the region).