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Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities

Chapters 1 through 4

Final Report

Office of Federal and State Materials and
Environmental Management Programs

Wyoming Department of Environmental Quality
Land Quality Division

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U.S. Nuclear Regulatory Commission
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ABSTRACT

The Atomic Energy Act of 1954 and the Uranium Mill Tailings Radiation Control Act of 1978 authorize the U.S. Nuclear Regulatory Commission (NRC) to issue licenses for the possession and use of source material and byproduct material. These statutes require NRC to license facilities that meet NRC regulatory requirements that were developed to protect public health and safety from radiological hazards. *In-situ* leach (ISL) uranium recovery facilities must meet NRC regulatory requirements in order to obtain a source material license to operate.

Under NRC's environmental protection regulations in the Code of Federal Regulations, Title 10, Part 51, which implement the National Environmental Policy Act (NEPA), issuance of a license to possess and use source material for uranium milling requires an environmental impact statement (EIS) or a supplement to an EIS. NRC has prepared a generic environmental impact statement (GEIS) to help fulfill this requirement. The GEIS assesses the potential environmental impacts associated with the construction, operation, aquifer restoration, and decommissioning of an ISL uranium recovery facility in four specified regions in the western United States. The intent of the GEIS is to determine which impacts would be essentially the same for all ISL facilities and which ones would result in varying levels of impacts for different facilities, thus requiring further site-specific information to determine the potential impacts. As such, the GEIS provides a starting point for NRC's NEPA analyses for site-specific license applications for new ISL facilities, as well as for applications to amend or renew existing ISL licenses.

NRC developed this GEIS using (1) knowledge gained during the past 30 years licensing and regulating ISL facilities, (2) the active participation of the State of Wyoming Department of Environmental Quality as a cooperating agency, and (3) public comments received during the preparation of the GEIS. NRC's licensing experience indicates that the technology used for ISL uranium recovery is relatively standardized throughout the industry and therefore appropriate for a programmatic evaluation in a GEIS.

Based on discussions between uranium recovery companies and the NRC staff, future ISL facilities could be located in portions of Wyoming, Nebraska, South Dakota, and New Mexico. NRC is the licensing authority for ISL facilities in these states.

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EXECUTIVE SUMMARY

BACKGROUND

The Atomic Energy Act of 1954 and the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) authorize the U.S. Nuclear Regulatory Commission (NRC) to issue licenses for the possession and use of source material and byproduct material. The statutes require NRC to license facilities that meet NRC regulatory requirements that were developed to protect public health and safety from radiological hazards. *In-situ* leach (ISL) uranium recovery facilities must m3eet NRC regulatory requirements in order to obtain this license to operate.

NRC designed the licensing process to assure the safe operation of ISL facilities. In addition to information for a safety evaluation review, license applicants must submit an environmental report as part of their license application. Under the NRC's environmental protection regulations in the Code of Federal Regulations, Title 10, Part 51 (10 CFR Part 51), which implement the National Environmental Policy Act (NEPA), issuance of a license to possess and use source material for uranium milling requires an environmental impact statement (EIS) or a supplement to an EIS.

> **<u>Generic Environmental Impact Statement (GEIS)</u>**
>
> A GEIS is an environmental impact statement that assesses the scope of the environmental effects that would be associated with an action (such as issuing a license for an ISL facility) at numerous sites. The Commission directed the NRC staff to prepare the GEIS to cover as many of the potential uranium recovery sites as possible.
>
> **<u>Supplemental Environmental Impact Statement (SEIS)</u>**
>
> A supplemental EIS updates or supplements an existing EIS (such as the GEIS). The Commission directed the NRC staff to issue site-specific supplements to the GEIS for each new license application.

NRC prepared the Generic Environmental Impact Statement for *In-Situ* Leach Uranium Milling Facilities (GEIS) to help fulfill this requirement. The GEIS was prepared to assess the potential environmental impacts associated with the construction, operation, aquifer restoration, and decommissioning of an ISL facility in four specified geographic areas. The intent of the GEIS is to determine which impacts would be essentially the same for all ISL facilities and which ones would result in varying levels of impacts for different facilities, thus requiring further site-specific information to determine the potential impacts. As such, the GEIS provides a starting point for NRC's NEPA analyses on site-specific license applications for new ISL facilities, as well as for applications to amend or renew existing ISL licenses.

PURPOSE AND NEED

Commercial uranium recovery companies have approached NRC with plans to submit a number of license applications for new uranium recovery facilities and for the restart or expansion of existing facilities in the next several years. The large majority of these potential applications would involve use of the ISL process. The companies have indicated that these new, restarted, and expanded ISL facilities would be located in Wyoming, South Dakota, Nebraska, and New Mexico.

NRC is the regulatory authority responsible for issuing a source material license for an ISL facility in those four states. 10 CFR Part 51 regulations require evaluating the environmental impacts of the ISL facility as part of the licensing process. Recognizing that the technology for ISL uranium milling is relatively standardized, that the applications may be submitted over a relatively short period of time, and that the potential ISL facilities would be located in relatively discrete regions in the western United States, NRC decided to prepare a GEIS to avoid unnecessary duplicative efforts and to identify environmental issues of concern to focus on in site-specific environmental reviews. In this way, NRC could increase the efficiency and consistency in its site-specific environmental review of license applications for ISL facilities and so provide an option for applicants to use and licensees to continue to use the ISL process for uranium recovery.

THE PROPOSED FEDERAL ACTION AND ALTERNATIVES

In states where NRC is the regulatory authority over the licensing of uranium milling (including the ISL process), NRC has a statutory obligation to assess each site-specific license application to ensure it complies with NRC regulations before issuing a license. The proposed federal action is to grant an application to obtain, renew, or amend a source material license for an ISL facility.

Under NRC's environmental protection regulations at 10 CFR 51.20(b)(8), issuing a license to possess and use source material to a uranium milling facility is identified as a major federal action that requires the preparation of an EIS or a supplement to an EIS. NRC will prepare a SEIS for new ISL facility license applications. NRC will prepare an EA, SEIS or EIS for applications to amend or renew an existing ISL facility license.

The Proposed Federal Action

To grant applications to obtain, renew, or amend source material licenses for an ISL facility.

Purpose for the Proposed Federal Action

To provide an option for an applicant to use or a licensee to continue to use ISL technology for uranium recovery

The environmental review requirements for a material license are in 10 CFR Part 51. NRC's public health and safety requirements for ISL facilities are found in 10 CFR Parts 20 and 40. Parts 20, 40, and 51 require applicants to provide NRC with sufficient information to evaluate the impacts to public health and safety and the environment during the life-cycle of the ISL facility. NRC then prepares safety and environmental reviews that are used by NRC officials to decide whether to grant the source material license.

In reviewing an ISL license application, NRC will use the GEIS as starting point for its site-specific environmental reviews. NRC will evaluate site-specific data and information to determine whether the applicant's proposed activities and the site characteristics are consistent with those evaluated in the GEIS. NRC will then determine which sections of the GEIS can be incorporated by reference and which impact conclusions can be adopted in the site-specific environmental review, and whether additional data or analysis is needed to determine the environmental impacts to a specific resource area. Additionally, the GEIS provides guidance in the evaluation for certain impact analyses (e.g., cumulative impacts, environmental justice) for which the GEIS did not make impact conclusions. No decision on whether to license an ISL facility will be made based on the GEIS alone. The licensing decision will be based, in part, on a site-specific environmental analysis that makes use of the GEIS.

Uranium milling techniques are designed to recover the uranium from uranium-bearing ores. Various physical and chemical processes may be used, and selection of the uranium milling technique depends on the physical and chemical characteristics of the ore deposit and the attendant cost considerations. Generally, the ISL process is used to recover uranium from low-grade ores or deeper deposits that are not economically recoverable by conventional mining and milling techniques. In the ISL process, a leaching agent, such as oxygen with sodium carbonate, is added to native groundwater and injected through wells into the subsurface ore body to mobilize the uranium. The leach solution containing the mobilized uranium is pumped from there to the surface processing plant, and then ion exchange separates the uranium from the solution. After additional purification and drying, the resultant product, a mixture of uranium oxides also known as "yellowcake," is placed in 55-gallon drums prior to shipment offsite for further processing.

A range of alternatives was evaluated for inclusion in the GEIS. As defined in the GEIS, the proposed federal action is NRC's determination to grant an application to obtain, renew, or amend a source material license for an ISL facility. Under the no-action alternative, NRC would deny the applicant's or licensee's request. As a result, the new license applicant may choose to resubmit the application to use an alternate uranium recovery method or decide to obtain the yellowcake from other sources. A licensee whose renewal application is denied would have to commence shutting down operations in a timely manner. Denials of license amendments would require the licensee to continue operating under its previously approved license conditions.

Alternative methods for milling uranium were considered as possible alternatives to the ISL process. As stated previously, not all uranium deposits are suitable for ISL extraction. For example, if the uranium mineralization is above the saturated zone (i.e., all of the pore spaces in the ore-bearing rock are not filled with water), ISL techniques may not be appropriate. Likewise, if the ore is not located in a porous and permeable rock unit, it will not be accessible to the leach solution used in the ISL process. Because ISL techniques may not be appropriate in these circumstances, conventional mining (underground or open-pit/surface mining) and milling techniques (conventional milling and heap leaching) are viable alternative technologies.

Inasmuch as the suitability and practicality of using alternative milling methodologies depends on site-specific conditions, a generic discussion of alternative milling methodologies is not appropriate. Accordingly, this GEIS does not contain a detailed analysis of alternative milling methodologies. A detailed analysis of alternative milling methodologies that can be applied at a specific site will be addressed in NRC's site-specific environmental review for individual ISL license applications.

ANALYTICAL APPROACH

The GEIS serves to increase efficiency and eliminate repetitive discussions in NRC's environmental review process by identifying and evaluating environmental impacts that are generic and common to ISL uranium recovery facilities. Information from the GEIS can be summarized and incorporated by reference into the subsequent site-specific environmental review documents. The GEIS also identifies resource areas that need site-specific information to more fully determine the environmental impact to particular resource areas. The site-specific environmental impact analysis also will include any new or significant information necessary to evaluate the ISL facility license application.

For the GEIS, NRC identified the potential environmental impacts associated with the ISL process and the resource areas that could be affected. The general methodology for doing so was to (1) describe the ISL process activity or activities that could affect the resource, (2) identify the resource(s) that can be affected, (3) evaluate past licensing actions and associated environmental review documents and other available information, (4) assess the nature and magnitude of the potential environmental impacts to the resource(s), (5) characterize the significance of the potential impacts, and (6) identify site conditions and mitigation measures that may affect the significance. For some types of impacts analyses (e.g., cumulative impacts, environmental justice evaluations), NRC recognized the difficulty in making determinations in the GEIS, given the location-specific nature of these analyses. For these categories, NRC collected information and conducted initial evaluations, which are documented in the GEIS. The purpose of this information gathering and initial evaluation is intended to provide background data and guidance for the site-specific analyses for these types of impact evaluations.

NRC developed this GEIS based on its experience in licensing and regulating ISL facilities gained during the past 30 years. In the GEIS, NRC does not consider specific facilities, but rather provides an assessment of potential environmental impacts associated with ISL facilities that might be located in four regions of the western United States. These regions are used as a framework for discussions in this GEIS and were identified based on several considerations, including

- Past and existing uranium milling sites are located within States where NRC has regulatory authority over uranium recovery;
- Potential new sites are identified based on NRC's understanding of where the uranium recovery industry has plans to develop uranium deposits using ISL technology; and
- Locations of previously identified uranium deposits within portions of Wyoming, Nebraska, South Dakota, and New Mexico.

Using these criteria, four geographic regions were identified (Figure ES–1). For the purpose of this GEIS, these regions are

- Wyoming West Uranium Milling Region
- Wyoming East Uranium Milling Region
- Nebraska-South Dakota-Wyoming Uranium Milling Region
- Northwestern New Mexico Uranium Milling Region

The foundation of the environmental impact assessment in the GEIS is based on (1) the historical operations of NRC-licensed ISL facilities and (2) the affected environment in each of the four regions. The structure of the GEIS is presented in Figure ES–2.

Chapter 2 of the GEIS provides a description of the ISL process, addressing construction, operation, aquifer restoration, and decommissioning of an ISL facility. This section also discusses financial assurance, whereby the licensee or applicant establishes a bond or other financial mechanism prior to operations to ensure that sufficient funds are available to complete aquifer restoration, decommissioning, and reclamation activities.

Chapter 3 of the GEIS describes the affected environment in each uranium milling region using the environmental resource areas and topics identified through public scoping comments on the GEIS and from NRC guidance to its staff in NUREG–1748, "Environmental Review Guidance for Licensing Actions Associated With NMSS Programs," issued in 2003.

Chapter 4 of the GEIS provides an evaluation of the potential environmental impacts of constructing, operating, aquifer restoration, and decommissioning at an ISL facility in each of the four uranium milling regions. In essence, this involves placing an ISL facility with the characteristics described in Chapter 2 of the GEIS within each of the four regional areas described in Chapter 3 and describing and evaluating the potential impacts in each region separately. The potential environmental impacts are evaluated for the different stages in the ISL process: construction, operation, aquifer restoration, and decommissioning. Impacts are examined for the resource areas identified in the description of the affected environment. These resource areas are

- Land use
- Transportation
- Geology and soils
- Water resources
- Ecology
- Air quality
- Noise
- Historical and cultural resources
- Visual and scenic resources
- Socioeconomic
- Public and occupational health

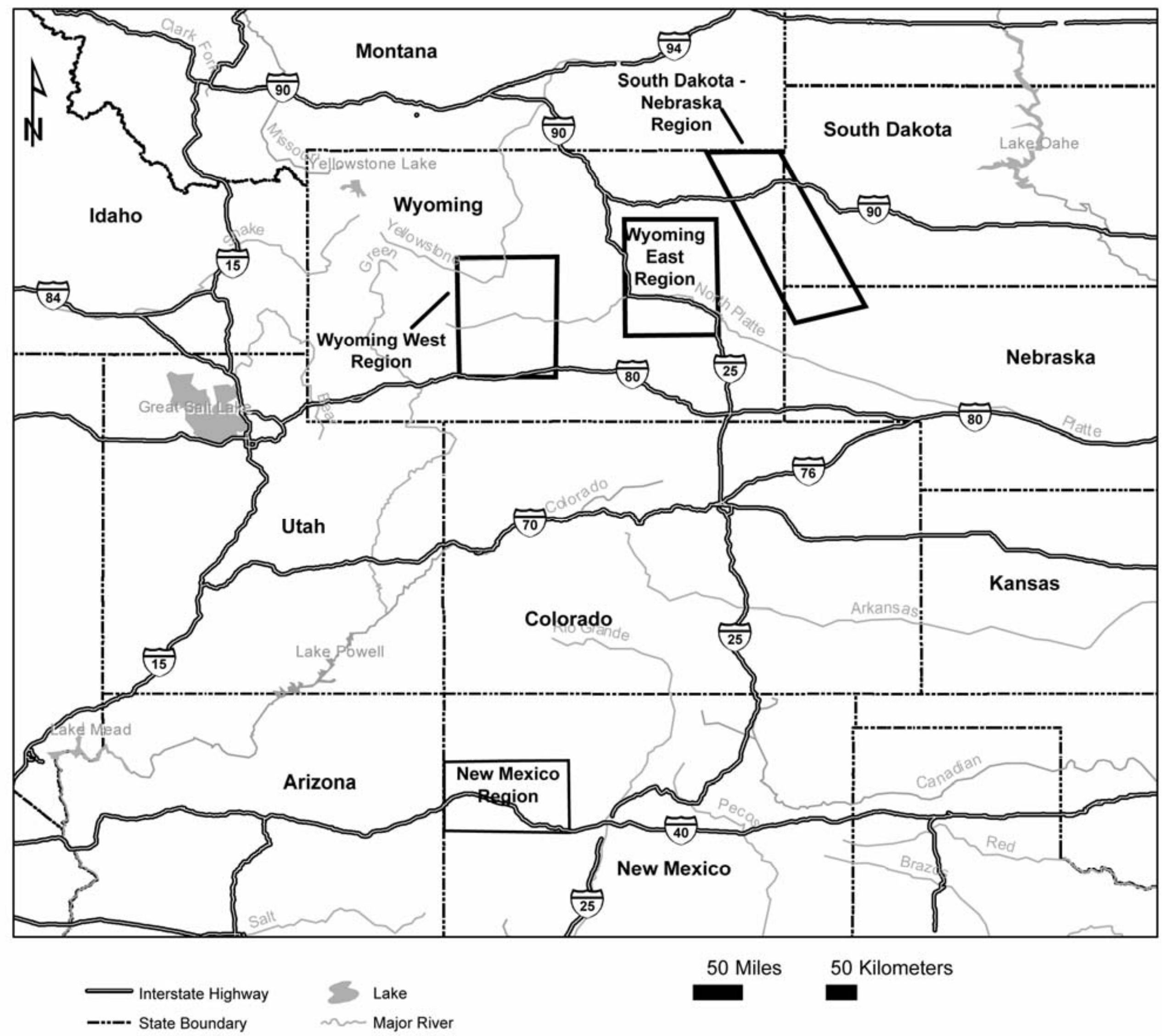

Figure ES–1. Location of Four Geographic Regions Used as a Framework for the Analyses Presented in This GEIS

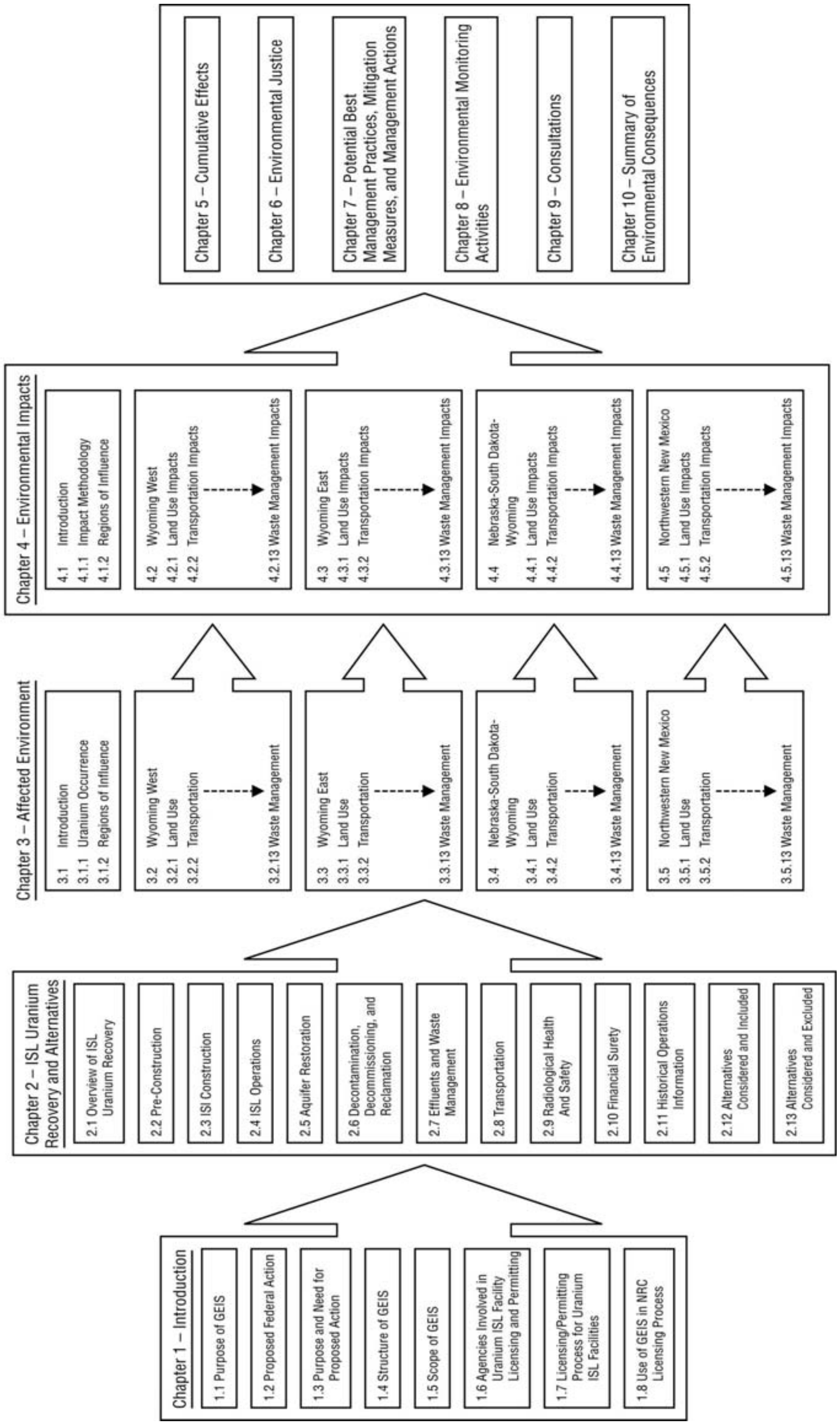

Figure ES–2. Structure of This GEIS

NRC identified a number of other issues that helped in the evaluation of the potential environmental impacts of an ISL facility. These issues include

- **Applicable Statutes, Regulations, and Agencies**. Various statutes, regulations, and implementing agencies at the federal, state, tribal, and local levels that have a role in regulating ISL facilities are identified and discussed.

- **Waste Management**. Potential impacts from the generation, handling, treatment, and final disposal of chemical, radiological, and municipal wastes are addressed.

- **Accidents**. Potential accident conditions are assessed in the GEIS. These include consideration of a range of possible accidents and estimation of their consequences, including well field leaks and spills, excursions, processing chemical spills, and ion-exchange resin and yellowcake transportation accidents.

- **Environmental Justice**. Although not required for a GEIS, to facilitate subsequent site-specific analyses, this GEIS provides a first order definition of minority and low income populations. Early consultations will be initiated with some of these populations, and the potential for disproportionately high and adverse impacts from future ISL licensing in the uranium milling regions will be evaluated in the event ISL license applications are submitted.

- **Cumulative Impacts**. The GEIS addresses cumulative impacts from proposed ISL facility construction, operation, groundwater restoration, and decommissioning on all aspects of the affected environment, by identifying past, present, and reasonably foreseeable future actions in the uranium milling regions.

- **Monitoring**. The GEIS discusses various monitoring methodologies and techniques used to detect and mitigate the spread of radiological and nonradiological contaminants beyond ISL facility boundaries.

SIGNIFICANCE LEVELS

In the GEIS, NRC has categorized the potential environmental impacts using significance levels. According to the Council on Environmental Quality, the significance of impacts is determined by examining both context and intensity (40 CFR 1508.27). Context is related to the affected region, the affected interests, and the locality, while intensity refers to the severity of the impact, which is based on a number of considerations. In this GEIS, the NRC used the significance levels identified in NUREG–1748:

- 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.

SUMMARY OF IMPACTS

Chapter 4 of the GEIS provides NRC's evaluation of the potential environmental impacts of the construction, operation, aquifer restoration, and decommissioning at an ISL facility in each of the four uranium milling regions. A summary of this evaluation by environmental resource area and phase of the ISL facility lifecycle is provided next.

Land Use Impacts

CONSTRUCTION—Land use impacts could occur from land disturbances (including alterations of ecological cultural or historic resources) and access restrictions (including limitations on other mineral extraction activities, grazing activities, or recreational activities). The potential for land use conflicts could increase in areas with higher percentages of private land ownership and Native American land ownership or in areas with a complex patchwork of land ownership. Land disturbances during construction would be temporary and limited to small areas within permitted boundaries. Well sites, staging areas, and trenches would be reseeded and restored. Unpaved access roads would remain in use until decommissioning. Competing access to mineral rights could be either delayed for the duration of the ISL project or be intermixed with ISL operations (e.g., oil and gas exploration). Changes to land use access including grazing restrictions and impacts on recreational activities would be limited due to the small size of restricted areas, temporary nature of restrictions, and availability of other land for these activities. Ecological, historical, and cultural resources could be affected, but would be protected by careful planning and surveying to help identify resources and avoid or mitigate impacts. For all land use aspects except ecological, historical, and cultural resources, the potential impacts would be SMALL. Due to the potential for unidentified resources to be altered or destroyed during excavation, drilling, and grading, the potential impacts to ecological, historical, or cultural resources would be SMALL to LARGE, depending on local conditions.

OPERATION—The types of land use impacts for operational activities would be similar to construction impacts regarding access restrictions because the infrastructure would be in place. Additional land disturbances would not occur from conducting operational activities. Because access restriction and land disturbance related impacts would be similar to, or less than, those for construction, the overall potential impacts to land use from operational activities would be SMALL.

AQUIFER RESTORATION—Due to the use of the same infrastructure, land use impacts would be similar to operations during aquifer restoration, although some operational activities would diminish—SMALL.

DECOMMISSIONING—Land use impacts would be similar to those described for construction with a temporary increase in land-disturbing activities for dismantling, removing, and disposing of facilities, equipment, and excavated contaminated soils. Reclamation of land to preexisting conditions and uses would help mitigate potential impacts—SMALL to MODERATE during decommissioning, and SMALL once decommissioning is completed.

Transportation Impacts

CONSTRUCTION—Low magnitude traffic generated by ISL construction relative to local traffic counts would not significantly increase traffic or accidents on many of the roads in the region. Existing low traffic roads could be moderately impacted by the additional worker commuting traffic during periods of peak employment. This impact would be expected to be more pronounced in areas with relatively lower traffic counts. Moderate dust, noise, and incidental wildlife or livestock kill impacts would be possible on, or near, site access roads (dust in particular for unpaved access roads)—SMALL to MODERATE.

OPERATION—Low magnitude traffic relative to local traffic counts on most roads would not significantly increase traffic or accidents. Existing low traffic roads could be moderately impacted by commuting traffic during periods of peak employment including dust, noise, and possible incidental wildlife or livestock kill impacts on or near site access roads. High consequences would be possible for a severe accident involving transportation of hazardous chemicals in a populated area. However, the probability of such accidents occurring would be low owing to the small number of shipments, comprehensive regulatory controls, and use of best management practices. For radioactive material shipments (yellowcake product, ion-exchange resins, waste materials), compliance with transportation regulations would limit radiological risk for normal operations. Low radiological risk is estimated for accident conditions. Emergency response protocols would help mitigate long-term consequences of severe accidents involving release of uranium—SMALL to MODERATE.

AQUIFER RESTORATION—The magnitude of transportation activities would be lower than for construction and operations, with the exception of workforce commuting, which could have moderate impacts on, or in the vicinity of, existing low traffic roads—SMALL to MODERATE.

DECOMMISSIONING—The types of transportation activities, and therefore the types of impacts, would be similar to those discussed for construction and operations, except the magnitude of transportation activities (e.g., number and types of waste and supply shipments, no yellowcake shipments) from decommissioning could be lower than for operations. Accident risks would be bounded by the operations yellowcake transportation risk estimates—SMALL.

Geology and Soils Impacts

CONSTRUCTION—Disturbance to soil would occur from construction (clearing, excavation, drilling, trenching, road construction); however, such disturbances would be expected to be temporary, disturbed areas would be small (approximately 15 percent of the total site area), and potential impacts would be mitigated by using best management practices. A large portion of the well fields, trenches, and access roads would be restored and reseeded after construction. Excavated soils would be stockpiled, seeded, and stored onsite until needed for reclamation fill. No impacts to subsurface geological strata would be likely—SMALL.

OPERATION—Temporary contamination or alteration of soils would be likely from operational leaks and spills and possible from transportation, use of evaporation ponds, or land application of treated waste water. However, detection and response to leaks and spills (e.g., soil cleanup), monitoring of treated waste water, and eventual survey and decommissioning of all potentially impacted soils would limit the magnitude of overall impacts to soils—SMALL.

AQUIFER RESTORATION—Impacts to geology and soils from aquifer restoration activities would be similar to impacts from operations due to use of the same infrastructure and similar activities conducted (e.g., well field operation, transfer activities, liquid effluent treatment and disposal)—SMALL.

DECOMMISSIONING—Impacts to geology and soils from decommissioning would be similar to impacts from construction. Activities to clean up, recontour, and reclaim disturbed lands during decommissioning would mitigate long-term impacts to soils—SMALL.

Surface Water Impacts

CONSTRUCTION—Impacts to surface waters and related habitats from construction (road crossings, filling, erosion, runoff, spills or leaks of fuels and lubricants for construction equipment) would be mitigated through proper planning, design, construction methods, and best management practices. Some impacts directly related to the construction activities would be temporary and limited to the duration of the construction period. U.S. Army Corps of Engineers permits may be required when filling and crossing of wetlands. Temporary changes to spring and stream flow from grading and changes in topography and natural drainage patterns could be mitigated or restored after the construction phase. Impacts from incidental spills of drilling fluids into local streams could occur, but would be temporary due to the use of mitigation measures. Impacts from roads, parking areas, and buildings on recharge to shallow aquifers would be SMALL, owing to the limited area of impervious surfaces proposed. Impacts from infiltration of drilling fluids into the local aquifer would be localized, small, and temporary—SMALL to MODERATE depending on site-specific characteristics.

OPERATION—Through permitting processes, federal and state agencies regulate the discharge of storm water runoff and the discharge of process water. Impacts from these discharges would be mitigated as licensees would operate within the conditions of their permits. Expansion of facilities or pipelines during operations would generate impacts similar to construction—SMALL to MODERATE depending on site-specific characteristics.

AQUIFER RESTORATION—Impacts from aquifer restoration would be similar to impacts from operations due to use of the same (in-place) infrastructure and similar activities conducted (e.g., well field operation, transfer of fluids, water treatment, storm water runoff)—SMALL to MODERATE depending on site-specific characteristics.

DECOMMISSIONING—Impacts from decommissioning would be similar to impacts from construction. Activities to clean up, recontour, and reclaim disturbed lands during decommissioning would mitigate long-term impacts to surface waters—SMALL to MODERATE depending on site-specific characteristics.

Groundwater Impacts

CONSTRUCTION—Water use impacts would be limited by the small volumes of groundwater used for routine activities such as dust suppression, mixing cements, and drilling support over short and intermittent periods. Contamination of groundwater from construction activities would be mitigated by best management practices—SMALL.

OPERATION—Potential impacts to shallow aquifers can occur from leaks or spills from surface facilities and equipment. Shallow aquifers are important sources of drinking water in some areas of the four uranium milling regions. Potential impacts to the ore-bearing and surrounding aquifers include consumptive water use and degradation of water quality (from normal production activities, off-normal excursion events, and deep well injection disposal practices). Consumptive use impacts from withdrawal of groundwater would occur because approximately 1 to 3 percent of pumped groundwater is not returned to the aquifer (e.g., process bleed). That amount of water lost could be reduced substantially by available treatment methods (e.g., reverse osmosis, brine concentration). Effects of water withdrawal on groundwater would be expected to be SMALL as the ore zone normally occurs in a confined aquifer. Estimated drawdown effects vary depending on site conditions and water treatment technology applied. Excursions of lixiviant and mobilized chemical constituents could occur from failure of well seals or other operational conditions that result in incomplete recovery of lixiviant. Well-seal-related excursions would be detected by the groundwater monitoring system, and periodic well mechanical integrity testing, and impacts would be expected to be mitigated during operation or aquifer restoration. Other excursions could result in plumes of mobilized uranium and heavy metals extending beyond the mineralization zone. The magnitude of potential impacts from vertical excursions would vary depending on site-specific conditions. To reduce the likelihood and consequences of potential excursions at ISL facilities, NRC requires licensees to take preventative measures prior to starting operations, including well tests, monitoring, and development of procedures that include excursion response measures and reporting requirements. Impacts from the alterations of ore body aquifer chemistry would be SMALL, because the aquifer would (1) be confined, (2) not be a potential drinking water source, and (3) be expected to be restored during the restoration period. Potential environmental impacts to confined deep aquifers below the production aquifers from deep well injection of processing wastes would be addressed by the underground injection permitting process regulated by the states and NRC's approval process—SMALL to LARGE, depending on site-specific conditions.

AQUIFER RESTORATION—Potential impacts would be from consumptive use and potential deep disposal of brine slurries after reverse osmosis, if applicable. The volume of water removed from the aquifer and related impacts would be dependent on site-specific conditions and the type of water treatment technology the facility uses. In some cases, groundwater consumptive use for the aquifer restoration has been reported to be less than groundwater use during the ISL operation, and drawdowns due to aquifer restorations have been smaller than drawdown caused by ISL operations. Potential environmental impacts associated with water consumption during aquifer restorations are determined by (1) the restoration techniques chosen, (2) the volume of water to be used, (3) the severity and extent of the contamination, and (4) the current and future use of the production and surrounding aquifers near the ISL facility or at the regional scale—SMALL to MODERATE, depending on site-specific conditions.

DECOMMISSIONING—Potential impacts from decommissioning would be similar to construction (water use, spills) with an additional potential to mobilize contaminants during demolition and cleanup activities. Contamination of groundwater from decommissioning activities would be mitigated by implementation of an NRC-approved decommissioning plan and use of best management practices—SMALL.

Terrestrial Ecology Impacts

CONSTRUCTION—Potential terrestrial ecology impacts would include the removal of vegetation from the well fields and the milling site, the modification of existing vegetative communities, the loss of sensitive plants and habitats from clearing and grading, and the potential spread of invasive species and noxious weed populations. These impacts would be expected to be temporary because restoration and reseeding occur rapidly after the end of construction. Introduction of invasive species and noxious weeds would be mitigated by restoration and reseeding after construction. Shrub and tree removal and loss would take longer to restore. Construction noise could affect reproductive success of sage-grouse leks by interfering with mating calls. Temporary displacement of some animal species would also occur. Critical wintering and year-long ranges are important to survival of both big game and sage-grouse. Raptors breeding onsite may be impacted by construction activities or milling operations, depending on the time of year construction occurs. Wildlife habitat fragmentation, temporary displacement of animal species, and direct or indirect mortalities would be possible. Implementation of wildlife surveys and mitigation measures following established guidelines would limit impacts. The magnitude of impacts depends on whether a new facility is being licensed or an existing facility is being extended—SMALL to MODERATE, depending on site-specific habitat conditions.

OPERATION—Habitats could be altered by operations (fencing, traffic, noise), and individual takes could occur due to conflicts between species habitat and operations. Access to crucial wintering habitat and water could be limited by fencing. However, the State of Wyoming Game and Fish Department specifies fencing construction techniques to minimize impediments to big game movement. Migratory birds could be affected by exposure to constituents in evaporation ponds, but perimeter fencing and netting would limit impacts. Temporary contamination or alteration of soils would be likely from operational leaks and spills and possible from transportation or land application of treated waste water. However, detection and response to leaks and spills (e.g., soil cleanup) and eventual survey and decommissioning of all potentially impacted soil limit the magnitude of overall impacts to terrestrial ecology. Mitigation measures such as perimeter fencing, netting, alternative sites, and periodic wildlife surveys would reduce overall impacts—SMALL.

AQUIFER RESTORATION—Impacts include habitat disruption, but existing (in-place) infrastructure would be used during aquifer restoration, with little additional ground disturbance. Migratory birds could be affected by exposure to constituents in evaporation ponds, but perimeter fencing and netting would limit impacts. Contamination of soils could result from leaks and spills and land application of treated waste water. However, detection and response techniques, and eventual survey and decommissioning of all potentially impacted soils, would limit the magnitude of overall impacts to terrestrial ecology. Mitigation measures such as perimeter fencing, netting, and alternative sites would reduce overall impacts—SMALL.

DECOMMISSIONING—During decommissioning and reclamation, there would be a temporary disturbance to land (e.g., excavated soils, buried piping, removal of structures). However, revegetation and recontouring would restore habitat altered during construction and operations. Wildlife would be temporarily displaced, but are expected to return after decommissioning and reclamation are completed and vegetation and habitat are reestablished—SMALL to MODERATE, depending on site-specific conditions.

Aquatic Ecology Impacts

CONSTRUCTION—Clearing and grading activities associated with construction could result in a temporary increase in sediment load in local streams, but aquatic species would recover quickly as sediment load decreases. Clearing of riparian vegetation could affect light and thus the temperature of water. Construction impacts to wetlands would be identified and managed through U.S. Army Corps of Engineers permits, as appropriate. Construction impacts to surface waters and aquatic species would be temporary and mitigated by best management practices—SMALL.

OPERATION—Impacts could result from spills or releases into surface water. Impacts would be minimized by spill prevention, identification, and response programs, and National Pollutant Discharge Elimination System (NPDES) permit requirements—SMALL.

AQUIFER RESTORATION—Activities would use existing (in-place) infrastructure, and impacts could result from spills or releases of untreated groundwater. Impacts would be minimized by spill prevention, identification, and response programs, and NPDES permit requirements—SMALL.

DECOMMISSIONING—Decommissioning and reclamation activities could result in temporary increases in sediment load in local streams, but aquatic species would recover quickly as sediment load decreases. With completion of decommissioning, revegetation, and recontouring, habitat would be reestablished and impacts would, therefore, be limited—SMALL.

Threatened and Endangered Species Impacts

CONSTRUCTION—Numerous threatened and endangered species and state species of concern are located in the four uranium milling regions. Small fragmentation of habitats would occur, but most species readapt quickly. The magnitude of impact would depend on the size of a new facility or extension to an existing facility and the amount of land disturbance. Inventory of threatened or endangered species would be developed during site-specific reviews to identify unique or special habitats, and Endangered Species Act consultations conducted with the U.S. Fish and Wildlife Service would assist in reducing impacts—SMALL to LARGE—depending on site-specific habitat and presence of threatened or endangered species.

OPERATION—Impacts could result from individual takes due to conflicts with operations. Small fragmentation of habitats would occur, but most species readapt quickly. The magnitude of impact would depend on the size of a new facility or extension to an existing facility and the amount of land disturbance. Impacts could potentially result from spills or permitted effluents, but would be minimized through the use of spill prevention measures, identification and response programs, and NPDES permit requirements. Inventory of threatened or endangered species developed during site-specific reviews would identify unique or special habitats, and Endangered Species Act consultations conducted with the U.S. Fish and Wildlife Service would assist in reducing impacts—SMALL to LARGE—depending on site-specific habitat and presence of threatened or endangered species.

AQUIFER RESTORATION—Impacts could result from individual takes due to conflicts with aquifer restoration activities (equipment, traffic). Existing (in-place) infrastructure would be used during aquifer restoration, so additional land-disturbing activities and habitat fragmentation would not be anticipated. Impacts may result from spills or releases of treated or untreated groundwater, but impacts would be minimized through the use of spill prevention measures, identification and response programs, and NPDES permit requirements. Inventory of threatened or endangered species would be developed during site-specific reviews to identify unique or special habitats, and Endangered Species Act consultations with the U.S. Fish and Wildlife Service would assist in reducing impacts—SMALL.

DECOMMISSIONING—Impacts resulting from individual takes would occur due to conflicts with decommissioning activities (equipment, traffic). Temporary land disturbance would occur as structures are demolished and removed and the ground surface is recontoured. Inventory of threatened or endangered species developed during site-specific environmental review of the decommissioning plan would identify unique or special habitats, and Endangered Species Act consultations with the U.S. Fish and Wildlife Service would assist in reducing impacts. With completion of decommissioning, re-vegetation, and re-contouring, habitat would be reestablished and impacts would, therefore, be limited—SMALL to LARGE.

Air Quality Impacts

CONSTRUCTION—Fugitive dust and combustion (vehicle and diesel equipment) emissions during land-disturbing activities associated with construction would be small, short-term, and reduced through best management practices (e.g., dust suppression). For example, estimated fugitive dust emissions during ISL construction are less than 2 percent of the National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$ and less than 1 percent for PM_{10}. For NAAQS attainment areas, nonradiological air quality impacts would be SMALL. A Prevention of

Significant Deterioration Class I area exists in only one of the four regions (Wind Cave National Park in the Nebraska-South Dakota-Wyoming Region). More stringent air quality standards would apply to a facility that impacts the air quality of that area. If impacts were initially assessed at a higher significance level, permit requirements would impose conditions or mitigation measures to reduce impacts—SMALL.

OPERATION—Radiological impacts can result from dust releases from drying of lixiviant pipeline spills, radon releases from well system relief valves, resin transfer or elution, and gaseous/particulate emissions from yellowcake dryers. Only small amounts of low dose materials would be expected to be released based on operational controls and rapid response to spills. Required spill prevention, control, and response procedures would be used to minimize impacts from spills. HEPA filters and vacuum dryer designs reduce particulate emissions from operations, and ventilation reduces radon buildup during operations. Compliance with the NRC-required radiation monitoring program would ensure releases are within regulatory limits. Other potential nonradiological emissions during operations include fugitive dust and fuel from equipment, maintenance, transport trucks, and other vehicles. For NAAQS attainment areas, nonradiological air quality impacts would be SMALL. A Prevention of Significant Deterioration Class I area is located in the Nebraska-South Dakota-Wyoming Region (Wind Cave National Park). More stringent air quality standards would apply to a facility that impacts the air quality of that area. If impacts were initially assessed at a higher significance level, permit requirements would impose conditions or mitigation measures to reduce impacts—SMALL.

AQUIFER RESTORATION—Because the same infrastructure is used, air quality impacts are expected to be similar to, or less than, those during operations. For NAAQS attainment areas, nonradiological air quality impacts would be SMALL. Where a Prevention of Significant Deterioration Class I area exists, such as the Wind Cave National Park in the Nebraska-South Dakota-Wyoming Region, more stringent air quality standards would apply to a facility that impacts the air quality. If impacts were initially assessed at a higher significance level, permit requirements would impose conditions or mitigation measures to reduce impacts—SMALL.

DECOMMISSIONING—Fugitive dust, vehicle, and diesel emissions during land-disturbing activities associated with decommissioning would be similar to, or less than, those associated with construction, would be short-term, and would be reduced through best management practices (e.g., dust suppression). Potential impacts would decrease as decommissioning and reclamation of disturbed areas are completed. For NAAQS attainment areas, nonradiological air quality impacts would be SMALL. However, where a Prevention of Significant Deterioration Class I area exists (Wind Cave National Park in the Nebraska-South Dakota-Wyoming Region), more stringent air quality standards would apply to a facility that impacts the air quality of that area. If impacts were initially assessed at a higher significance level, permit requirements would impose conditions or mitigation measures to reduce impacts—SMALL.

Noise Impacts

CONSTRUCTION—Noise generated during construction would be noticeable in proximity to operating equipment, but would be temporary (typically daytime only). Administrative and engineering controls would be used to maintain noise levels in work areas below Occupational Health and Safety Administration (OSHA) regulatory limits and mitigated by use of personal hearing protection. Traffic noise during construction (commuting workers, truck shipments to and from the facility, and construction equipment such as trucks, bulldozers, and compressors) would be localized, and limited to highways in the vicinity of the site, access roads within the site, and roads in the well fields. Relative increases in traffic levels would be SMALL for the larger roads, but may be MODERATE for lightly traveled rural roads through smaller communities. Noise may also adversely affect wildlife habitat and reproductive success in the immediate vicinity of construction activities. Noise levels decrease with distance, and at distances more than about 300 m [1,000 ft], ambient noise levels would return to background. Wildlife avoid construction areas because of noise and human activity. Generally, the uranium districts are located more than 300 m [1,000 ft] from the closest community. As a result, noise impacts would be SMALL to MODERATE.

OPERATION—Noise-generating activities in the central uranium processing facility would be indoors, reducing offsite sound levels. Well field equipment (e.g., pumps, compressors) would be contained within structures (e.g., header houses, satellite facilities), also reducing sound levels to offsite receptors. Administrative and engineering controls would be used to maintain noise levels in work areas below OSHA regulatory limits and mitigated by use of personal hearing protection. Traffic noise from commuting workers, truck shipments to and from the facility, and facility equipment would be expected to be localized, limited to highways in the vicinity of the site, access roads within the site, and roads in well fields. Relative increases in traffic levels would be SMALL for the larger roads, but may be MODERATE for lightly traveled rural roads through smaller communities. Most noise would be generated indoors and mitigated by regulatory compliance and best management practices. Noise from trucks and other vehicles is typically of short duration. Also, noise usually is not discernable to offsite receptors at distances of more than 300 m [1,000 ft.] Generally, the uranium districts are located more than 300 m [1,000 ft] from the closest community—SMALL to MODERATE.

AQUIFER RESTORATION—Noise generation is expected to be less than during construction and operations. Pumps and other well field equipment contained in buildings reduce sound levels to offsite receptors. Existing operational infrastructure would be used, and traffic levels would be expected to be less than those during construction and operations. There are additional sensitive areas that should be considered within some of the regions, but because of decreasing noise levels with distance, aquifer restoration activities would have only SMALL and temporary noise impacts for residences, communities, or sensitive areas, especially those located more than about 300 m [1,000 ft] from specific noise-generating activities. Noise usually is not discernable to offsite receptors at distances more than 300 m [1,000 ft]. Generally, the uranium districts are located more than 300 m [1,000 ft] from the closest community—SMALL to MODERATE.

DECOMMISSIONING—Noise generated during decommissioning would be noticeable only in proximity to equipment and temporary (typically daytime only). Administrative and engineering controls would be used to maintain noise levels in work areas below OSHA regulatory limits and mitigated by use of personal hearing protection. Noise levels during decommissioning would be less than during construction and would diminish as less and less equipment is used and truck traffic is reduced. Noise usually is not discernable to offsite receptors at distances more than 300 m [1,000 ft]. Generally, the uranium districts are located more than 300 m [1,000 ft] from the closest community—SMALL to MODERATE.

Historical and Cultural Resources Impacts

CONSTRUCTION—Potential impacts during ISL facility construction could include loss of, or damage and temporary restrictions on access to, historical, cultural, and archaeological resources. The eligibility evaluation of cultural resources for listing in the National Register of Historic Places (NRHP) under criteria in 36 CFR 60.4(a)–(d) and/or as Traditional Cultural Properties (TCP) would be conducted as part of the site-specific review and NRC licensing procedures undertaken during the NEPA review process. The evaluation of impacts to any historic properties designated as TCPs and tribal consultations regarding cultural resources and TCPs also occurs during the site-specific licensing application and review process. To determine whether significant cultural resources would be avoided or mitigated, consultations with State Historic Preservation Offices (SHPO), other government agencies (e.g., U.S. Fish and Wildlife Service and State Environmental Departments), and Native American Tribes (the THPO) occur as part of the site-specific review. Additionally, as needed, the NRC license applicant would be required, under conditions in its NRC license, to adhere to procedures regarding the discovery of previously undocumented cultural resources during initial construction. These procedures typically require the licensee to stop work and to notify the appropriate federal, tribal, and state agencies with regard to mitigation measures—SMALL or MODERATE to LARGE depending on site-specific conditions.

OPERATION—Because less land disturbance occurs during the operations phase, potential impacts to historical, cultural, and archaeological resources would be less than during construction. Conditions in the NRC license requiring adherence to procedures regarding the discovery of previously undocumented cultural resources would apply during operation. These procedures typically require the licensee to stop work and to notify the appropriate federal, tribal, and state agencies with regard to mitigation measures—SMALL, depending on site-specific conditions.

AQUIFER RESTORATION—Because less land disturbance occurs during the aquifer restoration phase, potential impacts to historical, cultural, and archaeological resources would be less than those during construction. Conditions in the NRC license requiring adherence to procedures regarding the discovery of previously undocumented cultural resources would apply during aquifer restoration. These procedures typically require the licensee to stop work and to notify the appropriate federal, tribal, and state agencies with regard to mitigation measures—SMALL, depending on site-specific conditions.

DECOMMISSIONING—Because less land disturbance occurs during the decommissioning phase and because decommissioning and reclamation activities would be focused on previously disturbed areas, potential impacts to historical, cultural, and archaeological resources would be less than during construction. Conditions in the NRC license requiring adherence to procedures regarding the discovery of previously undocumented cultural resources would apply during decommissioning and reclamation. These procedures typically require the licensee to stop work and to notify the appropriate federal, tribal, and state agencies with regard to mitigation measures—SMALL, depending on site-specific conditions.

Visual and Scenic Impacts

CONSTRUCTION—Visual impacts result from equipment (drill rig masts, cranes), dust/diesel emissions from construction equipment, and hillside and roadside cuts. Most of the four uranium milling regions are classified as Visual Resource Management (VRM) Class II through IV by the U.S. Bureau of Land Management. A number of VRM Class II areas surround national monuments (El Morro and El Malpais), the Chaco Culture National Historic Park, and sensitive areas managed within the Mount Taylor district in the Northwestern New Mexico Uranium Milling District and would have the greatest potential for impacts to visual resources. Most of these areas, however, are located away from potential ISL facilities at distances greater than 16 km [10 mi]. Most potential facilities are located in VRM Class III and IV areas. The general visual and scenic impacts associated with ISL facility construction would be temporary and SMALL, but from a Native American perspective, any construction activities would likely result in adverse impacts to the landscape, particularly for facilities located in areas within view of tribal lands and areas of special significance such as Mount Taylor. As previously discussed, a Prevention of Significant Deterioration Class I area (Wind Cave National Park) is located in the Nebraska-South Dakota-Wyoming Uranium Milling Region. Prevention of Significant Deterioration Class I areas require more stringent air quality standards that can affect visual impacts. Nevertheless, most potential visual impacts during construction would be temporary as equipment is moved and would be mitigated by best management practices (e.g., dust suppression). Because these sites are in sparsely populated areas and there is generally rolling topography of the region, most visual impacts during construction would not be visible from more than about 1 km [0.6 mi]. The visual impacts associated with ISL construction would be consistent with the predominant VRM Class III and IV—SMALL.

OPERATION—Visual impacts during operations would be less than those associated with construction. Most of the well field surface infrastructure has a low profile, and most piping and cables would be buried. The tallest structures include the central uranium processing facility {10 m [30 ft]} and power lines {6 m [20 ft]}. Because these sites are in sparsely populated areas and there is generally rolling topography of the regions, most visual impacts during operations would not be visible from more than about 1 km [0.6 mi]. Irregular layout of well field surface structures such as wellhead protection and header houses would further reduce visual contrast. Best management practices, and design (e.g., painting buildings) and landscaping techniques would be used to mitigate potential visual impact. The uranium districts in the four regions are all located more than 16 km [10 mi] from the closest VRM Class II region, and the visual impacts associated with ISL construction would be consistent with the predominant VRM Class III and IV—SMALL.

AQUIFER RESTORATION—Aquifer restoration activities would use in-place infrastructure. As a result, potential visual impacts would be the same as, or less than, those during operations—SMALL.

DECOMMISSIONING—Because similar equipment would be used and activities conducted, potential visual impacts during decommissioning would be the same as, or less than, those during construction. Most potential visual impacts during decommissioning would be temporary as equipment is moved and would be mitigated by best management practices (e.g., dust suppression). Visual impacts would be low, because these sites are in sparsely populated areas, and impacts would diminish as decommissioning activities decrease. An approved site reclamation plan is required prior to license termination, with the goal of returning the landscape to preconstruction conditions (predominantly VRM Class III and IV). Some roadside cuts and hill slope modifications, however, may persist beyond decommissioning and reclamation—SMALL.

Socioeconomic Impacts

CONSTRUCTION—Potential impacts to socioeconomics would result predominantly from employment at an ISL facility and demands on the existing public and social services, tourism/recreation, housing, infrastructure (schools, utilities), and the local work force. Total peak employment would be about 200 people, including company employees and local contractors, depending on timing of construction with other stages of the ISL lifecycle. During construction of surface facilities and well fields, the general practice would be to use local contractors (drillers, construction), as available. A local multiplier of 0.7 (U.S. Bureau of the Census) is used to indicate how many ancillary jobs could be created (in this case about 140). For example, local building materials and building supplies would be used to the extent practical. Most employees would live in larger communities with access to more services. Some construction employees, however, would commute from outside the county to the ISL facility, and skilled employees (e.g., engineers, accountants, managers) would come from outside the local work force. Some of these employees would temporarily relocate to the project area and contribute to the local economy through purchasing goods and services and taxes. Because of the small relative size of the ISL workforce, net impacts would be SMALL to MODERATE.

OPERATION—Employment levels for ISL facility operations would be less than those for construction, with total peak employment depending on timing and overlap with other stages of the ISL lifecycle. Use of local contract workers and local building materials would diminish, because drilling and facility construction would diminish. Revenues would be generated from federal, state, and local taxes on the facility and the uranium produced. Employment types would be similar to construction, but the socioeconomic impacts would be less due to fewer employees—SMALL to MODERATE.

AQUIFER RESTORATION—In-place infrastructure would be used for aquifer restoration, and employment levels would be similar to those for operations—SMALL to MODERATE.

DECOMMISSIONING—A skill set similar to the construction workforce would be involved in dismantling surface structures, removing pumps, plugging and abandoning wells, and reclaiming/recontouring the ground surface. Employment levels and use of local contractor support during decommissioning would be similar to those required for construction. Employment would be temporary, however, as decommissioning activities are short in duration. Because of similar employment levels, other socioeconomic impacts would be similar to construction—SMALL to MODERATE.

Public and Occupational Health and Safety Impacts

CONSTRUCTION—Worker safety would be addressed by standard construction safety practices. Fugitive dust would result from construction activities and vehicle traffic, but would likely be of short duration and would not result in a radiological dose. Diesel emissions would also be of short duration and readily dispersed into the atmosphere—SMALL to MODERATE.

OPERATION—Potential occupational radiological impacts from normal operations would result from (1) exposure to radon gas from the well field, (2) ion-exchange resin transfer operations, and (3) venting during processing activities. Workers would also be exposed to airborne uranium particulates from dryer operations and maintenance activities. Potential public exposures to radiation could occur from the same radon releases and uranium particulate releases (i.e., from facilities without vacuum dryer technology). Both worker and public radiological exposures are addressed in NRC regulations at 10 CFR Part 20, which require licensees to implement an NRC-approved radiation protection program. (Measured and calculated doses for workers and the public are commonly only a fraction of regulated limits.) Nonradiological worker safety matters are addressed through commonly applied occupational health and safety regulations and practices. Radiological accident risks could involve processing equipment failures leading to yellowcake slurry spills, or radon gas or uranium particulate releases. Consequences of accidents to workers and the public are generally low, with the exception of a dryer explosion which could result in worker dose above NRC limits. The likelihood of such an accident would be low, and therefore the risk would also be low. Potential nonradiological accidents impacts include high consequence chemical release events (e.g., ammonia) for both workers and nearby populations. The likelihood, however, of such release events would be low based on historical operating experience at NRC-licensed facilities, primarily due to operators following commonly applied chemical safety and handling protocols—SMALL to MODERATE.

AQUIFER RESTORATION—Activities during aquifer restoration overlap with similar activities during operations (e.g., operation of well fields, waste water treatment and disposal). The resultant impacts on public and occupational health and safety would be bound by operational impacts. The reduction of some operational activities (e.g., yellowcake production and drying, remote ion exchange) will limit the relative magnitude of potential worker and public health and safety hazards—SMALL.

DECOMMISSIONING—Worker and public health and safety would be addressed in a NRC-required decommissioning plan. This plan details how a 10 CFR Part 20 compliant radiation safety program would be implemented during decommissioning, how ensuring the safety of workers and the public would be maintained, and how applicable safety regulations would be complied with—SMALL.

Waste Management Impacts

CONSTRUCTION—Relatively small-scale construction activities (Section 2.3) and incremental well field development at ISL facilities would generate low volumes of construction waste—SMALL.

OPERATION—Operational wastes primarily result from liquid waste streams including process bleed, flushing of depleted eluant to limit impurities, resin transfer wash, filter washing, uranium precipitation process wastes (brine), and plant wash down water. State permit 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. Waste treatments such as reverse osmosis and radium settling would be used to segregate wastes and minimize disposal volumes. Potential impacts from surface discharge and deep well injection would be limited by the conditions specified in the applicable state permit. NRC regulations address constructing, operating, and monitoring for leakage of evaporation ponds used to store and reduce volumes of liquid wastes. Potential impacts from land application of treated wastewater would be addressed by NRC review of site-specific conditions prior to approval and routine monitoring in decommissioning surveys. Offsite waste disposal impacts would be SMALL for radioactive wastes as a result of required preoperational disposal agreements. Impacts for hazardous and municipal waste would also be SMALL due to the volume of wastes generated. For remote areas with limited available disposal capacity, such wastes may need to be shipped greater distances to facilities that have capacity; however, the volume of wastes generated and magnitude of such shipments are estimated to be low—SMALL.

AQUIFER RESTORATION—Waste management activities during aquifer restoration would use the same treatment and disposal options implemented for operations. Therefore, impacts associated with aquifer restoration would be similar to operational impacts. While the amount of wastewater generated during aquifer restoration would be dependent on site-specific conditions, the potential exists for additional wastewater volume and associated treatment wastes during the restoration period. However, this would be offset to some degree by the reduction in production capacity from the removal of a well field. NRC review of future ISL facility applications would verify that sufficient water treatment and disposal capacity (and the associated agreement for disposal of byproduct material) are addressed. As a result, waste management impacts from aquifer restoration would be SMALL.

DECOMMISSIONING—Radioactive wastes from decommissioning ISL facilities (including contaminated excavated soil, evaporation pond bottoms, process equipment) would be disposed of as byproduct material at an NRC-licensed facility. A preoperational agreement with a licensed disposal facility to accept radioactive wastes ensures sufficient disposal capacity would be available for byproduct wastes generated by decommissioning activities. Safe handling, storage, and disposal of decommissioning wastes would be addressed in a required decommissioning plan for NRC review prior to starting decommissioning activities. Such a plan would detail how a 10 CFR Part 20 compliant radiation safety program would be implemented during decommissioning to ensure the safety of workers and the public and compliance with applicable safety regulations. Overall, volumes of decommissioning radioactive, chemical, and solid wastes would be SMALL.

ABBREVIATIONS/ACRONYMS

BLM	U.S. Bureau of Land Management
CBSA	Core-Based Statistical Area
CEA	Cumulative Effects Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CEQ	Council on Environmental Quality
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FONSI	Finding of No Significant Impact
GEIS	Generic Environmental Impact Statement
ISL	*In-situ* Leach
MIT	Mechanical Integrity Testing
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NDEQ	Nebraska Department of Environmental Quality
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PVC	Polyvinyl Chloride
RFFA	Reasonably Foreseeable Future Action
SHPO	State Historic Preservation Officer
TDS	Total Dissolved Solids
THPO	Tribal Historic Preservation Officer
UCL	Upper Control Limit
UIC	Underground Injection Control
UMTRCA	Uranium Mill Tailings Radiation Control Act
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
VRM	Visual Resource Management
WDEQ	Wyoming Department of Environmental Quality

SI* (MODERN METRIC) CONVERSION FACTORS

Approximate Conversions From SI Units				
Symbol	**When You Know**	**Multiply By**	**To Find**	**Symbol**
Length				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
Area				
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
Volume				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
m^3	cubic meters	0.0008107	acre-feet	acre-feet
Mass				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
Temperature (Exact Degrees)				
°C	Celsius	1.8 °C + 32	Fahrenheit	°F

*SI is the symbol for the International System of Units. Appropriate rounding should be performed to comply with Section 4 of ASTM E380 (ASTM International. "Standard for Metric Practice Guide." West Conshohocken, Pennsylvania: ASTM International. Revised 2003.).

1 INTRODUCTION

The Atomic Energy Act and the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) authorize the U.S. Nuclear Regulatory Commission (NRC) to issue licenses for the possession and use of source material and byproduct material. The statutes require NRC to license facilities that meet NRC regulatory requirements that were developed to protect public health and safety from radiological hazards. *In-situ* leach (ISL) uranium milling facilities must meet NRC regulatory requirements in order to obtain this license to operate.

NRC licensing process is designed to assure the safe operation of ISL facilities. In addition to information for a safety evaluation review, license applicants must submit an environmental report as part of their license application. Under the NRC's environmental protection regulations in Title 10, Part 51 of the Code of Federal Regulations (10 CFR Part 51), which implement the National Environmental Policy Act (NEPA), issuance of a new license to possess and use source material for uranium milling requires an environmental impact statement (EIS) or a supplement to an EIS (SEIS). NRC will prepare an EA, SEIS or EIS for applications to amend or renew an existing ISL facility license in accordance to regulatory requirements in 10 CFR Part 51.

Generic Environmental Impact Statement (GEIS)

A GEIS is an environmental impact statement that assesses the scope of the environmental effects that would be associated with an action (such as issuing a license for an ISL facility) at numerous sites. The Commission directed the NRC staff to prepare the GEIS to cover as many of the potential uranium recovery sites as possible.

Supplemental EIS (SEIS)

A supplemental EIS updates or supplements an existing EIS (such as the GEIS). The Commission directed the NRC staff to issue site-specific supplements to the GEIS for each new license application.

NRC prepared this Generic Environmental Impact Statement for *In-Situ* Leach Uranium Milling Facilities to help fulfill this requirement. The GEIS was prepared to assess the potential environmental impacts associated with the construction, operation, aquifer restoration, and decommissioning of an ISL facility in four specified geographic areas. The intent of the GEIS is to determine which impacts would be essentially the same for all ISL facilities and which ones would result in varying levels of impacts for different facilities, thus requiring further site-specific information to determine the potential impacts. As such, the GEIS provides a starting point for NRC's NEPA analyses for site-specific license applications for new ISL facilities, as well as for applications to amend or renew existing ISL licenses.

1.1 Rationale of the GEIS

In the GEIS, NRC assesses the environmental impacts that could be associated with an ISL facility in four geographic areas of the western United States. The rationale for developing the GEIS is that ISL facilities use the same or very similar technology such that the potential environmental impacts associated with technology could be assessed on a generic (programmatic) basis. In this way, repetitive reviews of certain of these impacts could be avoided, thus focusing NRC's evaluation on unique issues of concern for each site.

NRC developed this GEIS using (1) knowledge gained during the past 30 years of licensing and regulating these facilities, (2) the active participation of the State of Wyoming as a cooperating agency, and (3) public comments received during the preparation of the GEIS.

NRC structured the GEIS by identifying four geographic regions (Figure 1.1-1) to use for the environmental impact analysis. These regions were identified based on several considerations, including

- Past and existing uranium milling sites are located within states where NRC has regulatory authority over uranium milling.
- Potential new sites are identified based on NRC understanding of where the uranium recovery industry has plans to develop uranium deposits using ISL technology (NRC, 2009).
- Locations of previously identified uranium deposits within portions of Wyoming, Nebraska, South Dakota, and New Mexico (EPA, 2006, 2007) (Figure 1.1-2).

In this GEIS, NRC documents the potential environmental impacts that would be associated with the construction, operation, aquifer restoration, and decommissioning of an ISL facility in

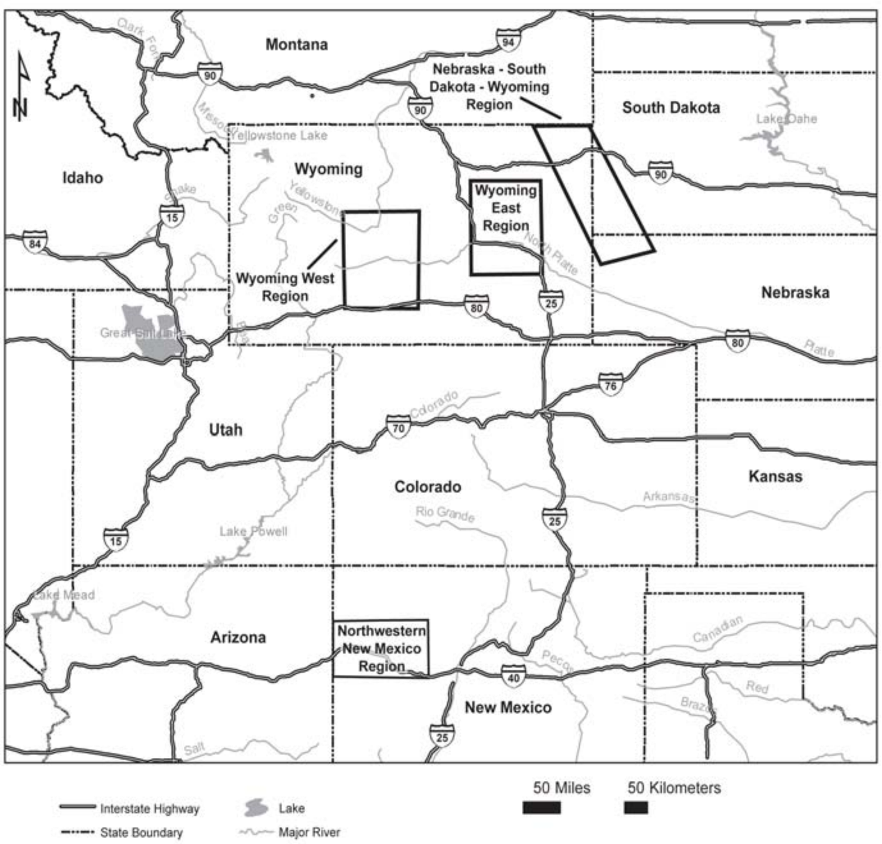

Figure 1.1-1. Four Geographic Regions Used as a Framework for the Analyses Presented in This GEIS

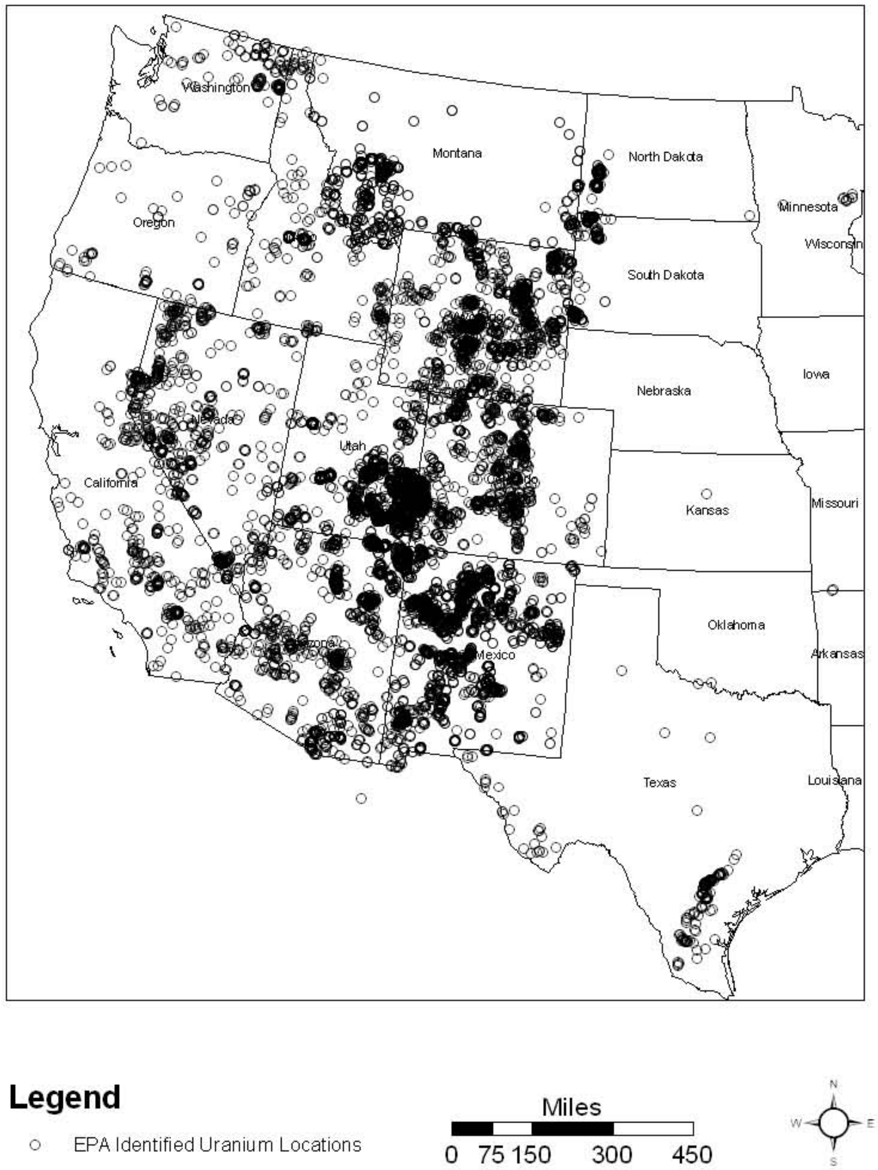

Figure 1.1-2. Major Uranium Reserves Within the United States (From Energy Information Administration, 2004)

the four specified regions of the Western United States. NRC intends that the GEIS will improve the efficiency of the licensing process by (1) providing an evaluation of the types of environmental impacts that may occur from licensing an ISL facility; (2) identifying and assessing impacts that are expected to be generic (the same or very similar) at ISL facilities with specified plant or site characteristics; and (3) identifying the scope of environmental impacts that need to be addressed in site-specific environmental reviews. The GEIS also provides information that will aid in the preparation of the site-specific environmental reviews for

ISL facilities and to help NRC maintain consistency when evaluating license applications involving the ISL process.

The availability of the GEIS does not change the basic practices and guidance that the NRC staff uses to conduct environmental reviews. In particular, the GEIS does not change the need for a detailed review of the information submitted by the applicant, nor does it change the need for conclusions in site-specific environmental assessments (EAs), SEISs, or EISs to be supported by sufficient technical bases that are transparent and traceable to supporting information. The NRC staff conducting environmental reviews is responsible for ensuring the conclusions of its environmental reviews are adequately supported by sufficient technical bases, whether that information is tiered off the GEIS or based on unique site-specific analyses.

The GEIS in no way relieves license applicants from the responsibility to adequately characterize and describe the proposed facility and site conditions in license application submittals. Information, methods, or analyses included in the GEIS that are applicable to a particular proposal could be used or referenced by license applicants provided the applicability and suitability of such referenced information is clear and its use does not significantly affect the completeness of any application.

1.2 The Proposed Federal Action

In states where NRC is the regulatory authority over the licensing of uranium milling (including the ISL process), NRC has a statutory obligation to assess each site-specific license application to ensure it complies with NRC regulations before issuing a license. The proposed federal action is to grant an application to obtain, renew, or amend a source material license for an ISL facility.

<u>The Proposed Federal Action</u>

To grant applications to obtain, renew, or amend source material licenses for an ISL facility.

<u>Purpose for the Proposed Federal Action</u>

To provide an option for applicants to use or licensees to continue to use ISL technology for uranium recovery.

Under NRC's environmental protection regulations at 10 CFR 51.20(b)(8), issuing a license to possess and use source material to a uranium milling facility is identified as a major federal action that requires the preparation of an EIS or a supplement to a EIS (SEIS). NRC will prepare a SEIS for new ISL facility license applications. NRC will prepare an EA, SEIS or EIS for applications to amend or renew an existing ISL facility license. The environmental review requirements for a material license are in 10 CFR Part 51. NRC's public health and safety requirements for ISL facilities are found in 10 CFR Parts 20 and 40. Parts 20, 40, and 51 require applicants to provide NRC with sufficient information to evaluate the impacts to public health and safety and the environment during the life cycle of the ISL facility. NRC then prepares safety and environmental reviews that are used by NRC officials to decide whether to grant the source material license.

In reviewing an ISL license application, NRC will use the GEIS as starting point for its site-specific environmental reviews. NRC will evaluate site-specific data and information to determine whether the applicant's proposed activities and the site characteristics are consistent with those evaluated in the GEIS. NRC will then determine which sections of the GEIS can be incorporated by reference and which impacts conclusions can be adopted in the site-specific environmental review, and whether additional data or analysis is needed to determine the environmental impacts for a specific resource area. Additionally, the GEIS provides guidance in the evaluation for certain impact analyses (e.g., cumulative impacts, environmental justice) for which the GEIS did not make impact conclusions. No decision on whether to license an ISL facility will be made based on the GEIS alone. The licensing decision will be based, in part, on a site-specific environmental analysis that makes use of the GEIS.

1.3 Purpose and Need for the Proposed Federal Action

Commercial uranium recovery companies have approached NRC with plans to submit as many as 15 license applications for new uranium recovery facilities, as well as up to 9 applications for the restart or expansion of existing facilities in the next several years (NRC, 2009). The majority of these potential applications (perhaps 18 of the 24) would involve use of the ISL process. The companies have indicated that these new, restarted, and expanded ISL facilities would be located in Wyoming, South Dakota, Nebraska, and New Mexico.

NRC is the regulatory authority responsible for issuing a source material license for ISL facilities in those four states. 10 CFR Part 51 regulations require evaluating the environmental impacts of the ISL facility as part of the licensing process. Recognizing that the technology for ISL uranium milling is relatively standardized, that the applications may be submitted over a relatively short period of time, and that the potential ISL facilities would be located in relatively discrete regions in the western United States, NRC decided to prepare a GEIS to avoid unnecessary duplicative efforts and to identify environmental issues of concern to focus on in site-specific environmental reviews. In this way, NRC could increase the efficiency and consistency in its site-specific environmental review of license applications for ISL facilities (NRC, 2007b) and so provide an option for applicants to use and licensees to continue to use the ISL process for uranium recovery.

The purpose and need of the proposed federal action has no role in a company’s decision to submit a license application to NRC for ISL uranium recovery at a particular location. From the company’s perspective, the purpose of submitting an ISL license application for a new license, or renewal or amendment of an existing license, is to use or continue to use ISL technology to recover uranium at a specific site. The company could propose the use of different uranium recovery methods, including conventional milling. NRC has concluded that it is not appropriate to determine the purpose and need for a site-specific license application in the GEIS. The purpose and need for each ISL license application will be addressed in the site-specific environmental review in order to evaluate whether reasonable alternative uranium recovery methods are appropriate for the evaluation of potential environmental impacts.

1.4 Analytical Approach Used in the GEIS

1.4.1 Objectives

The GEIS serves to increase efficiency and eliminate repetitive discussions in NRC’s environmental review process by identifying and evaluating environmental impacts that are generic and common to ISL uranium recovery facilities. Information from the GEIS can be summarized and incorporated by reference into the subsequent site-specific environmental review documents.

The GEIS also identifies resource areas that need site-specific information to more fully assess the environmental impacts to particular resource areas. The site-specific environmental impact analysis also will include any new or significant information necessary to evaluate the ISL facility license application.

1.4.2 Methodology

For the GEIS, NRC identified the potential environmental impacts associated with the ISL process and the resource areas that could be affected. The general methodology for doing so was to (1) describe the ISL process activities that could affect the resource, (2) identify the resource(s) that can be affected, (3) evaluate past licensing actions and associated environmental review documents and other available information, (4) assess the nature and magnitude of the potential environmental impacts to the resource(s), (5) characterize the significance of the potential impacts, and (6) identify site conditions and mitigation measures that may affect the significance.

For some types of impacts analyses (e.g., cumulative impacts, environmental justice evaluations), NRC recognized the difficulty in making determinations in the GEIS, given the location-specific nature of these analyses. For these categories, NRC collected information and conducted initial evaluations, which are documented in the GEIS. The purpose of this information gathering and initial evaluation is intended to provide background data and guidance for the site-specific analyses for these types of impact evaluations.

1.4.3 Structure of the GEIS

In this GEIS, NRC systematically evaluated the potential environmental impacts of construction, operation, aquifer restoration, and decommissioning of an ISL uranium recovery facility in four separate geographic regions of the western United States:

- **The Wyoming West Uranium Milling Region** includes portions of four Wyoming counties (Carbon, Fremont, Natrona, and Sweetwater).

- **The Wyoming East Uranium Milling Region** includes portions of eight Wyoming counties (Albany, Campbell, Carbon, Converse, Johnson, Natrona, Platte, and Weston) east of the Bighorn Mountains.

- **The Nebraska-South Dakota-Wyoming Uranium Milling Region** includes the portions of northwestern Nebraska (Dawes and Sioux Counties), western South Dakota (Custer, Fall River, Lawrence, and Pennington Counties), and the extreme eastern portion of Wyoming (Crook, Niobrara, and Weston Counties).

- **The Northwestern New Mexico Uranium Milling Region** includes McKinley County and portions of Cibola and Sandoval Counties.

1.4.3.1 Describing the ISL Process

Chapter 2 of this GEIS describes the ISL process, addressing construction, operation, aquifer restoration, and decommissioning of an ISL facility. This description is based on historical operations information from ISL facilities NRC licenses and regulates. The construction stage includes well field development and the construction of surface facilities and supporting infrastructure. Operations includes injection and production of solutions from uranium mineralization in the subsurface, as well as the process to recover the uranium from these solutions. Aquifer restoration includes activities to restore the groundwater quality in the production zone after uranium recovery is completed within a well field. Decommissioning includes the final stages of removing surface and subsurface infrastructure and reclaiming the surface after uranium production activities at a site have been completed. Chapter 2 of the GEIS also includes a section on financial surety arrangements, where the licensee or applicant establishes a bond or other financial mechanism prior to operations to ensure that sufficient funds are available to complete aquifer restoration, decommissioning, and reclamation activities.

Site-specific license applications may not include all stages of the ISL process. For example, an applicant may propose to limit activities to well field construction, uranium mobilization, and ion exchange, and then ship the uranium-bearing resin to an existing processing plant for final processing. In this case, the applicant's license application would likely exclude the construction, operation, and decommissioning of a processing plant. NRC categorizes the ISL operations by various stages so relevant portions of the GEIS can be incorporated by reference into subsequent site-specific environmental reviews. For practical reasons, the GEIS emphasizes commonly used technologies (including some variants), but all possible variants of ISL technology are not addressed. Proposals to use technologies not addressed in the GEIS will be evaluated by NRC in a site-specific licensing review.

1.4.3.2 Describing the Affected Environment

GEIS Chapter 3 describes the affected environment for each of the four geographic regions using the environmental resource areas identified in NRC (2003b), which provides guidance to the NRC staff in conducting environmental reviews. These resource areas are

- Land use
- Transportation
- Geology and soils
- Water resources
- Ecology
- Air quality
- Noise
- Historical and cultural resource
- Visual and scenic resources
- Socioeconomic
- Public and occupational health
- Waste management

NRC staff will conduct independent, site-specific environmental reviews for each license application (see Section 1.8.3). GEIS Chapter 3 is divided into regional area discussions to facilitate using the GEIS in these site-specific reviews. Relevant sections of the regional discussions can be incorporated by reference in the site-specific environmental reviews.

1.4.3.3 Identifying Environmental Issues and Characterizing Significance

In Chapter 4, NRC evaluates the potential environmental impacts of construction, operation, aquifer restoration, and decommissioning of an ISL facility in each of the four regions. In essence, this involves conceptual placement of an ISL facility with the characteristics described in GEIS Chapter 2 within each of the four regional areas described in Chapter 3 and then describing and evaluating the significance of potential impacts in each region separately. The description for each identified potential environmental impact includes the type and magnitude of the ISL activity that would affect the environment and the attributes of the resource area that would be potentially affected.

Classifying Impact Significance (after NRC, 2003b)

- *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.

The assessment of impacts considers potential environmental consequences at each stage in an ISL facility lifecycle—construction, operation, aquifer restoration, and decommissioning/reclamation—and presents them for each of the resource areas identified in Chapter 3.

According to the Council on Environmental Quality (CEQ), the significance of impacts is determined by examining both context and intensity (40 CFR 1508.27). Context is related to the affected region, the affected interests, and the locality, while intensity refers to the severity of the impact, which is based on a number of considerations. In describing the significance of potential impacts in this GEIS, the NRC used the significance levels identified in NUREG–1748 (NRC, 2003b) (see text box).

Considerations related to potential cumulative impacts are described in Chapter 5, and environmental justice is discussed in Chapter 6. Mitigation measures and best management practices that may reduce potential environmental impacts are identified and discussed in Chapter 7. Required monitoring programs are described in Chapter 8 and are included in the determination of significance. Chapter 9 discusses the process for NRC consultation with federal, tribal, state, and local agencies. In Chapter 10, impacts are summarized in a table for each of the four geographic regions. The structure of this GEIS is shown graphically in Figure 1.4-1.

1.5 Scope of the GEIS

The scoping process occurs early in the development of an EIS in accordance with NEPA. Scoping provides an opportunity for the public and other stakeholders to identify key issues and concerns that they believe should be addressed in the document. The NRC requirements for scoping are found at 10 CFR 51.26–29, while the general NRC approach to scoping is described in NUREG–1748 (NRC, 2003b, Section 4.2.3).

1.5.1 The GEIS Scoping Process

On July 24, 2007, NRC published in the *Federal Register* a notice of intent to prepare a GEIS to examine the potential impacts associated with ISL uranium recovery facilities (NRC, 2007b). In that notice, NRC described the scoping process for the GEIS and established a public comment period from July 24, 2007, to September 4, 2007. NRC also announced dates and times for two public scoping meetings to be held—one in Albuquerque, New Mexico, and the other in Casper, Wyoming. NRC published a revised notice of intent in the *Federal Register* on August 31, 2007, announcing a third public scoping meeting in Gallup, New Mexico, and extended the public comment period to October 8, 2007 (NRC, 2007c). Following the Gallup public meeting, NRC subsequently extended the comment period further to October 31, 2007, and finally to November 30, 2007 (NRC, 2007c). At each of the three public scoping meetings, NRC described its role and mission and reviewed NRC procedures and responsibilities. Tribal, state, and local government agencies; concerned local citizens; and other stakeholders were then invited to identify scoping issues and concerns and ask questions. Transcripts (NRC, 2008b, 2007d,e) were prepared for all three meetings and are available online at the NRC Agencywide Documents Access and Management System (ADAMS), which is accessible at www.nrc.gov or through the NRC website for the GEIS at http://www.nrc.gov/materials/uranium-recovery/geis.html.

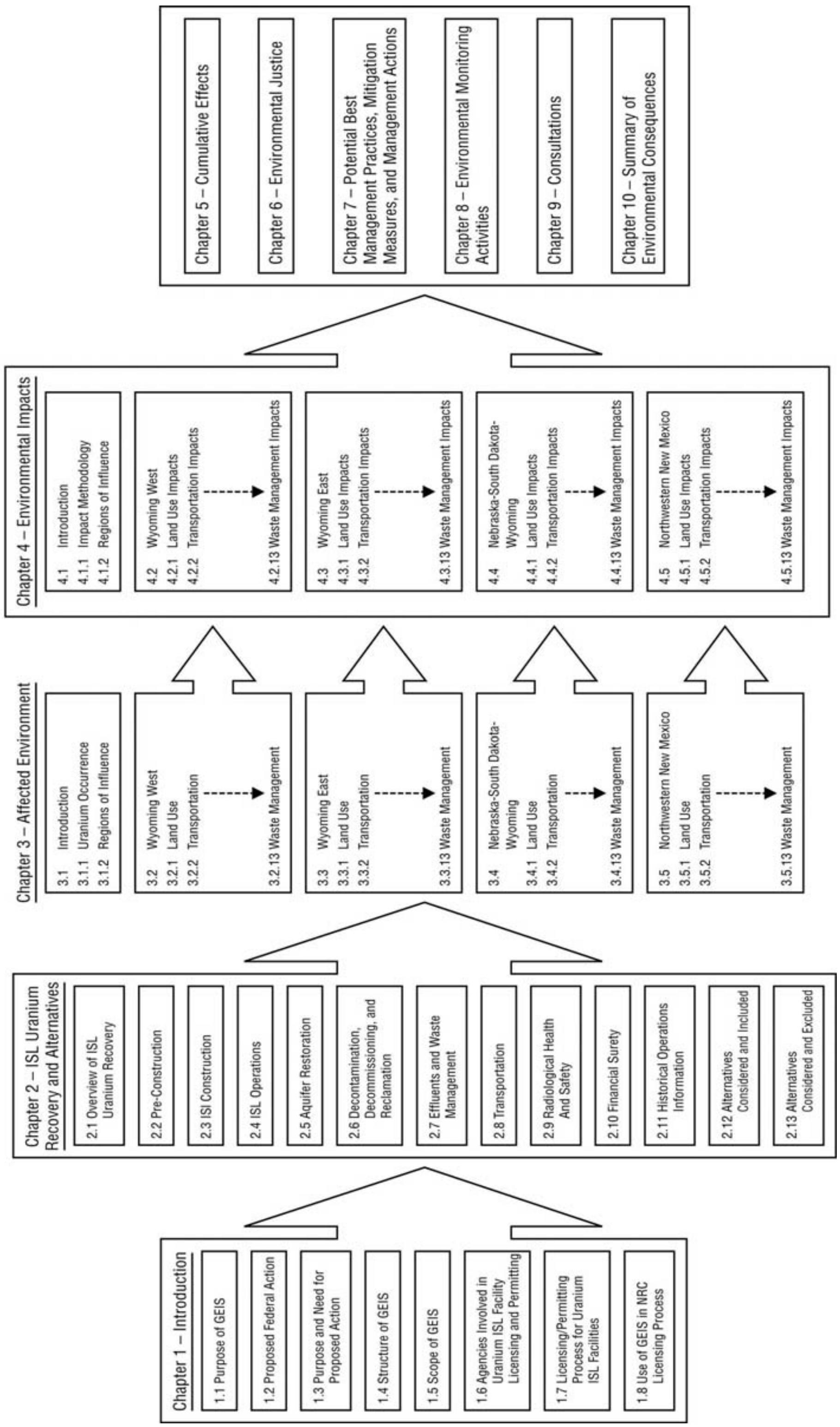

Figure 1.4-1. Structure of This GEIS

In addition to the comments received at the public meetings, NRC accepted written comments submitted either by regular mail or electronically. Using these varied methods, comments were received from approximately 1,600 entities (i.e., federal, state, and local agencies; industry organizations; public advocacy groups; and individual members of the public). A summary of comments NRC received during scoping is provided in a scoping summary report included as Appendix A to this GEIS.

1.5.2 Issues Studied in Detail

From the scoping process, NRC determined that the following issues identified by the public and other stakeholders would be addressed in the GEIS.

- **Proposed Action and Alternatives.** Scoping comments recommended clarifying the scope of the proposed action. Commenters also suggested a variety of alternatives for consideration. The proposed action is described in Section 1.2, and alternatives are described in Sections 2.12 and 2.13.

- **Applicable Statutes, Regulations, and Agencies.** Scoping comments expressed a need to clarify applicable regulations and the roles of government agencies in regulating ISL facilities. Various statutes, regulations, and implementing agencies at the federal, state, and local levels that have a role in regulating ISL facilities are identified and discussed in Section 1.6. The roles of these agencies are also described, as appropriate.

- **Purpose of the GEIS and Use in Site-Specific Licensing Reviews.** A number of scoping comments conveyed various interpretations of the purpose and intended use of the GEIS, suggesting the purpose and intended use needed to be clarified. For example, some thought the GEIS was going to be the only NEPA analysis conducted for all ISL facilities, while others thought the GEIS would eliminate or substantially degrade the rigor of NRC site-specific environmental reviews. A statement of purpose is included in Section 1.3, the NRC licensing process is described in Section 1.7.1, and the ways NRC intends to use the GEIS to evaluate environmental impacts in site-specific licensing reviews are provided in Section 1.8.

- **Opportunities for Public Involvement.** Many scoping comments reflected a perception that the GEIS would limit public involvement in ISL licensing. Some requested the opportunities for public involvement be described. Section 1.8.4 describes opportunities for public participation in the ISL licensing process.

- **Applicable Rulemaking Activities.** Some scoping comments recommended a discussion of ongoing rulemaking activities that are applicable to ISL licensing or the GEIS. The GEIS is based on the regulations in effect at the time of writing.

- **Land Use.** Concerns regarding potential land use impacts on ranching operations and livestock were raised during the scoping process. Potential impacts to existing land uses in the ISL milling regions including potential impacts to ranching, grazing, recreation, industrial, and cultural activities are discussed in Sections 4.2.1, 4.3.1, 4.4.1, and 4.5.1.

- **Transportation.** Scoping comments addressed general concerns with the safety of shipping yellowcake, road construction, fugitive dust generation, infrastructure damage, and incidental livestock kills. Potential radiological and nonradiological impacts from ISL transportation activities are discussed in Sections 4.2.2, 4.3.2, 4.4.2, and 4.5.2. Impacts from shipment of supplies, yellowcake product, and wastes associated with each phase of the ISL facility lifecycle are discussed. Normal transportation and accident conditions are considered. Potential nonradiological impacts evaluated include dust and noise generation, impacts on infrastructure such as roads, incidental livestock and wildlife kills, and changes to local traffic conditions. Potential radiological impacts considered include direct radiation and potential release of radioactive material from accidents during shipment.

- **Geology.** Scoping comments were received regarding the extent of soil disturbance and the utility of a generic analysis of geology. The GEIS describes the geology of the ISL milling regions in sufficient detail to support the evaluation of impacts to geology and soils (Sections 4.2.3, 4.3.3, 4.4.3, and 4.5.3) and groundwater (Sections 4.2.4.2, 4.3.4.2, 4.4.4.2, and 4.5.4.2) from ISL activities. GEIS Chapter 2 describes soil-disturbing activities (e.g., clearing, excavation, drilling, trenching, road construction, leaks, spills) and the magnitude of surface area disturbed at existing ISL facilities.

- **Water Resources.** A variety of water resource issues was raised in scoping comments including concerns about potential groundwater and surface water contamination, water availability and consumptive use, groundwater protection requirements, and aquifer restoration goals and techniques. The GEIS addresses potential impacts to surface waters, groundwater, and wetlands from each phase of the ISL facility lifecycle in Sections 4.2.4, 4.3.4, 4.4.4, and 4.5.4. Specific topics addressed include permitted surface water discharges, leaks and spills, groundwater excursions, consumptive water use, aquifer restoration, deep well injection, and applicable regulations. Hydrologic conditions in uranium milling regions are considered, as well as available restoration technologies and methods. The restoration of the aquifer water quality in the production zone following operations is addressed. Data from aquifer restoration efforts at ISL sites inform the analysis. Regulatory requirements and the roles of various federal, state, and local agencies regarding aquifer restoration are also discussed. Potential for groundwater impacts, in particular, is a key concern that has been historically an area of focus in NRC ISL licensing reviews.

- **Ecology.** Scoping comments on ecology raised topics regarding surface disturbance impacts on wildlife and vegetation, practices for isolating wildlife from exposure to uranium and other metals, recommended construction guidelines, habitat loss and fragmentation, and avoiding establishment of invasive species. The GEIS assesses the potential impacts to ecology in the uranium milling regions from all phases of the ISL facility lifecycle in Sections 4.2.5, 4.3.5, 4.4.5, and 4.5.5. This assessment includes consideration of potential impacts to terrestrial, aquatic, and threatened and endangered species. Specific topics addressed include evaluating ecoregions and habitat for a variety of listed species and assessing potential impacts from surface disturbances, habitat loss and fragmentation, and incidental kills. Applicable regulations and various management practices designed to protect species or mitigate potential impacts are discussed.

- **Meteorology, Climatology, and Air Quality.** Scoping comments included general environmental and safety concerns about the potential for airborne contamination, the magnitude of facility airborne releases, and applicable regulations. GEIS Sections 4.2.6, 4.3.6, 4.4.6, and 4.5.6 consider the potential impacts of all phases of the ISL facility lifecycle on local and regional air quality from both radiological and nonradiological emissions. The radiological air emissions addressed in the GEIS include radon from well fields, processing, and waste treatment operations and the potential for uranium particulate emissions from yellowcake drying operations. Nonradiological emissions addressed in the GEIS include combustion engine exhausts from trucking and well drilling operations and fugitive dusts from a variety of activities.

- **Noise.** Scoping comments on noise were limited to a statement regarding the low levels of noise ISL facilities generate. NRC recognizes that some activities in the ISL facility lifecycle can potentially generate additional noise, and impacts are evaluated in the GEIS Sections 4.2.7, 4.3.7, 4.4.7, and 4.5.7. This evaluation includes noise from well field development, uranium processing activities, and trucking activities associated with all phases of the ISL facility lifecycle.

- **Historic and Cultural.** Scoping comments were provided on historic and cultural resources including recommendations for documenting compliance with the National Historic Preservation Act requirements protecting historic properties on tribal lands, concerns about the notification process when cultural artifacts are found at an ISL facility, and opportunities for public participation regarding historic and cultural concerns. A number of individuals and organizations, primarily in New Mexico, expressed concerns on topics regarding proximity of uranium facilities to Native American communities and requested government-to-government consultations and documentation of consultations in the GEIS. The GEIS assesses potential impacts from all phases of the ISL facility lifecycle on historical and cultural resources in Sections 4.2.8, 4.3.8, 4.4.8, and 4.5.8. Local and regional historic and cultural properties and practices in ISL milling regions such as those involving Native American communities and governments are included. A description of NRC's process for consultation with Native American governments is provided in GEIS Chapter 9.

- **Visual Resources.** Scoping comments on visual resource impacts were varied. Potential impacts to visual resources in uranium milling regions from all phases of the ISL facility lifecycle are assessed in GEIS Sections 4.2.9, 4.3.9, 4.4.9, and 4.5.9. Assessments consider scenic vistas and sensitive viewsheds within uranium milling regions and ISL facility lifecycle impacts on these resources based on proximity.

- **Socioeconomics.** Scoping comments recommended evaluating social and economic impacts to local communities including job creation impacts; changes to tax base; and cumulative impacts on housing, roads, services, and labor to towns already overburdened by oil, gas, and coal development. The GEIS assesses potential impacts to socioeconomic conditions in uranium milling regions from all phases of the ISL facility lifecycle in Sections 4.2.10, 4.3.10, 4.4.10, and 4.5.10. Local and regional characteristics pertaining to demographics, income, tax structure and distribution, housing, employment, finances, education, and services are considered.

- **Public and Occupational Health.** A number of scoping comments expressed general public and worker safety concerns and more specific concerns about potential contamination of soils, surface water, air, and groundwater; risks from radon gas and spills and from processing chemicals and resins; and emergency response and reporting. Potential impacts to public and occupational health from all phases of the ISL facility lifecycle are assessed in GEIS Sections 4.2.11, 4.3.11, 4.4.11, and 4.5.11. Both nonradiological (including chemical) and radiological effluents and releases under normal (routine) and accident conditions are assessed. Dose calculation results from previously licensed ISL facilities that include airborne uranium particulate and radon gas are provided. Hazards and risks for ISL processing chemicals are also considered. Potential soil contamination impacts from leaks and spills are discussed in Sections 4.2.3, 4.3.3, 4.4.3, and 4.5.3, and potential groundwater contamination is addressed in 4.2.4, 4.3.4, 4.4.4, and 4.5.4.

- **Waste Management.** Scoping comments expressed concerns about waste management in general and also about handling and disposal practices, deep well injection and permitted discharges, land application, disposal capacity, annual waste volumes, transportation, and applicable regulations. The GEIS considers impacts from waste management activities in all phases of the ISL facility lifecycle in Sections 4.2.12, 4.3.12, 4.4.12, and 4.5.12. Generation, handling, treatment, transportation, and final disposal of chemical, radiological, and municipal wastes are addressed. Constituents in various waste streams are identified, and volume estimates are provided.

- **Decontamination, Decommissioning, Reclamation.** A number of scoping comments expressed concerns about the site cleanup after operations end. The GEIS assesses impacts to the environment from terminating ISL operations, which include removal of facilities and equipment, disposal of waste materials, cleanup of contaminated areas, and reclamation of lands to pre-milling conditions. Decommissioning impacts are assessed for each resource area discussed in Chapter 4. Waste volume estimates by type of waste are provided, and applicable requirements are discussed.

- **Accidents.** Scoping comments requested consideration of credible accident scenarios. Potential accident conditions are assessed in various sections in the GEIS. This includes considering a range of possible accidents and off-normal operating conditions and estimating and evaluating consequences including well field leaks and spills, excursions, processing chemical spills, and ion-exchange resin and yellowcake transportation accidents.

- **Environmental Justice.** A range of opinions was provided in scoping comments on environmental justice in the GEIS. Some commenters thought it should be included in the GEIS, and others thought it should not be included. Still others provided various suggestions on how to do the analysis. GEIS Chapter 6 discusses the potential for disproportionately high and adverse environmental and health impacts on minority and low income populations from future ISL licensing in the specified uranium milling regions.

- **Cumulative Impacts.** Scoping comments on cumulative impacts offered a number of suggestions for reasonably foreseeable future actions to be included in the GEIS, including coal bed methane operations and oil and gas development. GEIS Chapter 5 describes past, present, and reasonably foreseeable future actions in the uranium milling regions and evaluates which resource areas would be potentially impacted by both ISL facilities and the types of reasonably foreseeable future actions identified in the regions. Due to the complex and site-specific nature of a cumulative impact assessment, the

GEIS provides useful information for understanding the potential for cumulative impacts when licensing future ISL facilities in the milling regions, but does not make conclusions regarding cumulative impacts for specific sites.

- **Monitoring.** Scoping comments on monitoring recommended the GEIS discuss monitoring programs designed to assess impacts from operations and waste management practices. The GEIS discusses various monitoring techniques and programs (Chapter 2, Chapter 8) used to detect radiological and nonradiological contaminants within and beyond ISL facility boundaries. This discussion includes effluent monitoring, workplace radiological monitoring, groundwater monitoring to detect potential excursions, and environmental monitoring at the facility boundary.

- **Financial Assurance.** Scoping comments recommended the GEIS discuss bonding for complete restoration of groundwater and land. Requirements and practices designed to ensure companies engaged in ISL recovery have sufficient funds to close down operations, restore aquifers, decontaminate and decommission facilities, and reclaim lands are described in GEIS Section 2.10.

1.5.3 Issues Eliminated From Detailed Study

The analyses presented in this GEIS focus on potential impacts within the four geographic regions described in Section 1.1 and illustrated in Figure 1.1-1; they are not intended to provide a detailed assessment of any specific site. Yellowcake transportation from uranium mills to the uranium hexafluoride (UF_6) conversion facility in Metropolis, Illinois, is anticipated to be by truck over existing highways. Access roads may need to be constructed to bring the yellowcake from the mill to the state and national (interstate) highway system. The existing national transportation routes are not expected to be altered. Because the environmental impacts of national transportation of yellowcake uranium have been previously analyzed, they are not studied in detail within this GEIS (NRC, 1977, 1980). These previous studies evaluated potential impacts by applying conservative risk assessment methods and assumptions to yellowcake transportation under conditions that remain applicable to present-day transportation conditions (see Section 3.2.2).

1.5.4 Issues Outside of the Scope of the GEIS

NRC has determined that comments received on topics in the following areas are outside the scope of this GEIS:

- NRC licensing process and the decision to prepare the GEIS

- General support or opposition for GEIS or uranium milling

- Requests for cooperation or agreements

- Matters that are regulated by Agreement States

- Impacts associated with conventional uranium milling past or present

- Requests for compensation for past mining impacts

- Resolution of dual regulation issues
- Consideration of human-induced climate change
- Analysis of all variations of ISL technology
- Alternative sources of uranium feed material
- Expanded cumulative impact analysis
- Energy debate
- NRC credibility

A discussion of why NRC determined that comments in these topic areas were outside the scope of the GEIS is provided in the Scoping Summary Report (Appendix A of the GEIS).

1.6 Agencies Involved in Uranium ISL Facility Licensing

A variety of federal, tribal, state, and local agencies potentially have a role in licensing and permitting an ISL uranium facility. Specific statues and regulations that may be applicable for uranium ISL facilities are detailed in Appendix B.

1.6.1 Federal Agencies

1.6.1.1 NRC

NRC responsibilities include regulating the nuclear industry in a manner that

- Protects public health and safety;
- Protects the environment; and
- Protects and safeguards materials and nuclear facilities in the interest of national security.

NRC is the federal agency with lead responsibility in licensing and regulating uranium ISL facilities through the statutory requirements of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 and the Atomic Energy Act of 1954, as amended. In part, these statutes require that NRC ensure source material, as defined in Section 11z of the Atomic Energy Act and byproduct material, as defined in Section 11e.(2) of the Atomic Energy Act, is managed to conform with applicable regulatory requirements. Congress authorized the U.S. Environmental Protection Agency (EPA) to promulgate standards of general application for 11e.(2) material in Section 275 of the Atomic Energy Act. EPA standards of general application for 11e.(2) byproduct material were established in 40 CFR Part 192. The UMTRCA and the Atomic Energy Act also require that the generally applicable standards EPA promulgates for nonradiological hazards under UMTRCA be consistent with the standards EPA promulgates under the Solid Waste Disposal Act/Resource Conservation and Recovery Act for such hazards. NRC conforming regulations are in 10 CFR Part 40, Appendix A.

NRC is the regulatory authority for ISL facilities unless NRC relinquishes its authority to a state in a written agreement. Additional information on the Agreement State Program can be found at http://www.nrc.gov/about-nrc/state-tribal/agreement-states.html.

1.6.1.2 EPA

EPA also has a role in permitting nonradiological emissions and effluents. Water quality issues are administered predominantly through underground injection control (UIC) programs and National Pollutant Discharge Elimination System (NPDES) permits. Air quality issues are addressed through National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants programs. These programs may be administered directly by EPA, by states and tribes granted primacy, or by joint programs between EPA and a state (EPA, 2008a–f). EPA issues permits in unauthorized states or tribal areas that are subject to exclusive federal jurisdiction.

1.6.1.3 Occupational Safety and Health Administration

The mission of the Occupational Health and Safety Administration (OSHA) is to assure the safety and health of workers in the United States, and it is the lead federal agency with responsibility for regulating the industrial safety of the work force at uranium ISL facilities. Recognizing the different agency responsibilities, NRC and OSHA have entered into a memorandum of understanding to coordinate their inspection programs and avoid duplication of effort (Occupational Safety and Health Administration, 1988). As part of this program, NRC inspectors do not perform the role of OSHA, but they may identify safety concerns or receive complaints from employees about working conditions within the areas of responsibility for OSHA, notifying the OSHA Regional Office as appropriate (Occupational Safety and Health Administration, 1988).

1.6.1.4 U.S. Department of Transportation

The U.S. Department of Transportation regulates the shipments of radiological and nonradiological hazardous materials and sets regulatory requirements for type and condition of hazardous material containers, the mechanical condition of the transportation vehicles, the training of personnel, and the routing requirements, package labels, vehicle placards, and shipping papers associated with shipments of radioactive materials. The U.S. Department of Transportation also inspects containers, storage facilities, and carrier equipment (Office of Technology Assessment, 1986).

1.6.1.5 U.S. Department of Interior, U.S. Bureau of Land Management

The U.S. Department of Interior, U.S. Bureau of Land Management (BLM) is responsible for managing the National System of Public Lands and the federal minerals underlying these lands. The BLM is also responsible for managing split estate situations where federal minerals underlie a surface that is privately held or owned by state or local government (see Section 3.1.2.2). In certain cases, the BLM also manages federal surface estates overlying privately or state-owned minerals. Operators on mining claims, including ISL uranium recovery operations, must submit a plan of operations and obtain BLM approval before beginning operations beyond those for casual use. For exploration operations disturbing less than 2 ha [5 acres], operators must submit a notice at least 15 days prior to commencing these operations. The BLM will periodically field inspect operations on plans of operation and notices. The BLM surface management program is more fully explained at 43 CFR Part 3809.

1.6.1.6 Other Federal Agencies

For individual new uranium ISL facilities proposed near or on federally managed lands, agencies such as the U.S. Forest Service or National Park Service may have jurisdiction or special expertise that leads to a role in reviewing applications for these facilities. The Bureau of Indian Affairs has responsibilities under 25 CFR Part 216 to evaluate mineral leases involving lands held in trust for Native American tribes. Other federal agencies that may be consulted on specific resource areas include the U.S. Army Corps of Engineers (wetlands), the U.S. Department of Energy Office of Legacy Management (e.g., administration of adjacent legacy sites), and the U.S. Fish and Wildlife Service (endangered and threatened species).

1.6.2 Tribal Agencies

Native American tribes do not formally have licensing authority over uranium ISL facilities. Consultations with Native American tribes would be conducted in a government-to-government relationship that exists based on applicable federal law and treaties (NRC, 2003a) during the ISL licensing process. EPA can authorize tribes to implement specific environmental permitting programs. Tribes may also have their own local laws that impact ISL facilities. Additionally, tribes may have a tribal historic preservation officer that would coordinate with NRC to support cultural resource inventories for ISL facility applications.

1.6.3 State Agencies

Individual states have regulatory authority over construction, operation, aquifer restoration, and decommissioning and reclamation at uranium ISL facilities through state-administered permitting processes. For the purposes of the GEIS, specific agencies within each state that have regulatory authority over uranium ISL facilities are identified in the following sections.

1.6.3.1 Wyoming Department of Environmental Quality

The lead agency for permitting uranium ISL facilities in Wyoming is the Wyoming Department of Environmental Quality (WDEQ). With statutory authority from the Federal Surface Mining Reclamation and Control Act and the Wyoming Environmental Quality Act, the Land Quality Division within WDEQ administers and enforces permits and licensing requirements for all operators engaged in land-disturbing activities related to mining and reclamation within Wyoming. In the context of Wyoming regulations, uranium ISL facilities are considered to be noncoal mining activities that are subject to Land Quality Division permits. Each operation must be covered by a reclamation bond to provide financial surety that reclamation requirements can be met. Through its review and consultation program, the Wyoming State Historic Preservation Office (SHPO) coordinates with NRC and WDEQ to support cultural resource inventories for uranium ISL facilities.

1.6.3.2 Nebraska Department of Environmental Quality

The Nebraska Department of Environmental Quality (NDEQ) regulates air and water quality, with statutory authority from the Nebraska Environmental Protection Act. General water quality standards and use classifications are established in Title 117 (surface water) and Title 118 (groundwater) of the Nebraska Administrative Code (NDEQ, 2006a,b). The Nebraska NPDES program is described in Title 119 (NDEQ, 2005), and the regulatory requirements for underground injection, mineral production wells, and waste disposal wells related to ISL uranium recovery are governed by UIC requirements in Title 122 of the Nebraska Administrative

Code (NDEQ, 2002a). The Nebraska SHPO is a division of the Nebraska State Historical Society. The Nebraska SHPO manages historic preservation programs within the state, which includes developing and maintaining a statewide historic preservation plan and providing supporting planning programs for other state agencies.

1.6.3.3 South Dakota Department of Environment and Natural Resources

With renewed interest in uranium resources in South Dakota, the 2006 State Legislature passed legislation to fill gaps in the existing state laws that govern uranium exploration and recovery. This legislation authorized the South Dakota Board of Minerals and Environment to develop rules to issue state permits and licensing requirements to ISL facilities under the South Dakota Mined Land Reclamation Act (South Dakota Codified Law 45–6B). The final rules were adopted in April 2007 (South Dakota Department of Environment and Natural Resources, 2007a). The South Dakota SHPO is a program of the South Dakota State Historical Society within the Department of Tourism and State Development. The South Dakota SHPO manages historic preservation programs within the state and coordinates and plans historic preservation efforts across the state.

1.6.3.4 New Mexico Environment Department

The New Mexico Environment Department was established under the provisions set forth in the Department of the Environment Act by the 40th State Legislature, enacted July 1, 1991 (Laws of 1991, Chapter 25). The New Mexico Environment Department, with statutory authority from the New Mexico Oil and Gas Act and the New Mexico Water Quality Act, has UIC permitting authority over uranium ISL facilities. The New Mexico SHPO is part of the Historic Preservation Division within the New Mexico Department of Cultural Affairs. The New Mexico SHPO administers historic preservation programs within the state and provides information and technical assistance to state agencies, local governments, and private owners.

1.7 Licensing and Permitting Process for a Uranium ISL Facility

As noted in Section 1.6, NRC has statutory authority through the Atomic Energy Act and UMTRCA to regulate uranium ISL facilities. In addition to obtaining an NRC license, uranium ISL facilities must obtain the necessary permits from the appropriate federal, tribal, and state agencies. The NRC licensing process and other potential federal, tribal, and state permitting processes are briefly discussed in this section to provide a basic understanding of potential permitting requirements for uranium ISL facilities in the four geographic regions in Figure 1.1-1. This is not intended to be an exhaustive description of all permits that may be necessary for a specific facility.

1.7.1 The NRC Licensing Process

The general NRC process for licensing facilities is described in NRC (2003b) and illustrated in Figure 1.7-1. This process has been modified for ISL facilities. After receiving a license application for either a new facility or the renewal or amendment of an existing facility license, NRC conducts an acceptance review to determine whether the application is complete enough

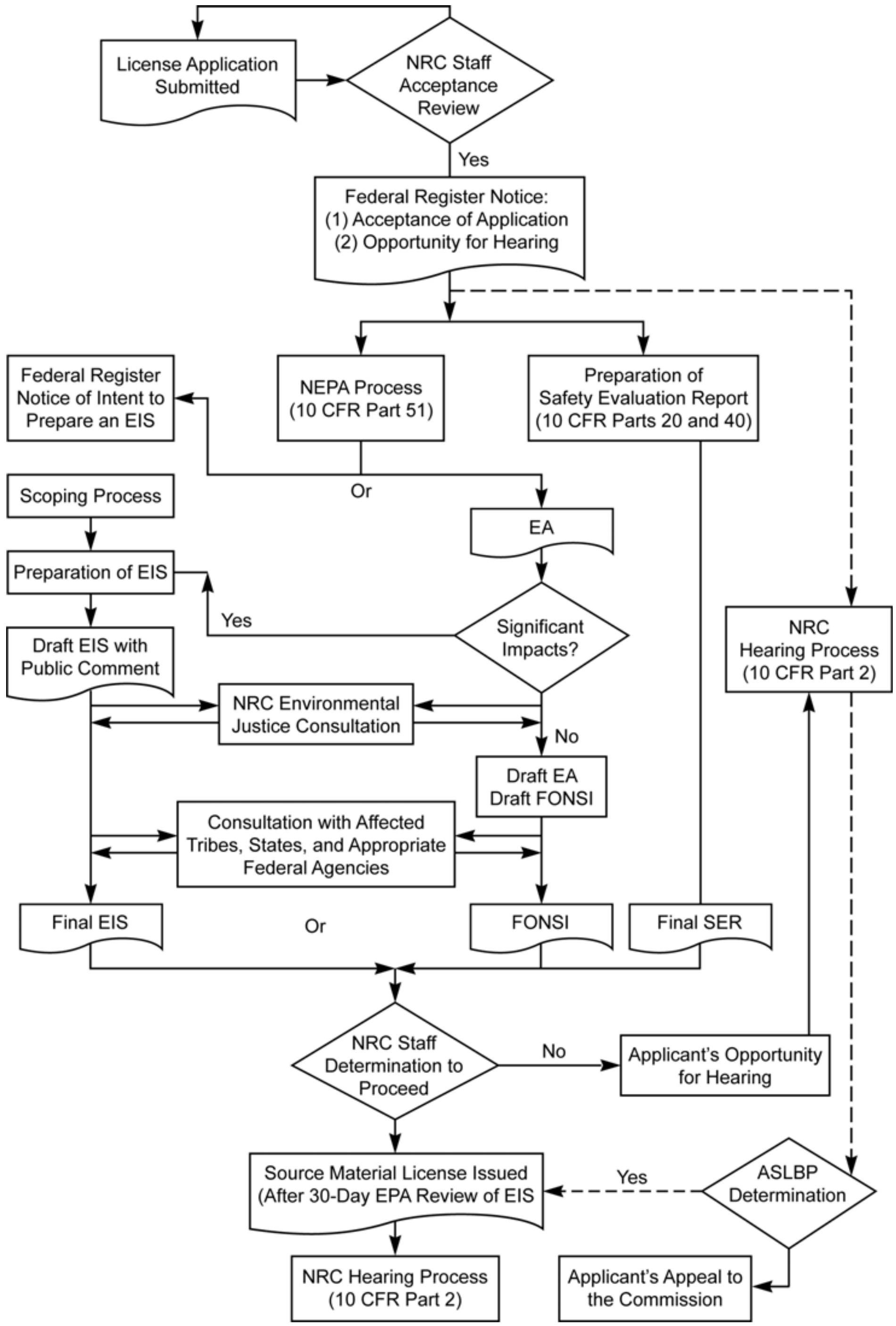

Figure 1.7-1. General Flow Diagram of the NRC Licensing Process for 10 CFR Part 40 Licenses (From NRC, 2003a). ASLBP–Atomic Safety Licensing Board Panel; EA–Environmental Assessment; EIS–Environmental Impact Statement; FONSI–Finding of No Significant Impact; NEPA–National Environmental Policy Act; SER–Safety Evaluation Report.

to support more detailed technical review. If NRC determines that a new license or license renewal application is acceptable for detailed review, it will formally docket the application and publish a Notice of Availability of the application in the *Federal Register.* For license amendment applications, the results of NRC's acceptance review can be documented in a letter to the licensee. NRC's detailed technical review of an application (either for a new license or for the renewal or amendment of an existing license) is composed of a safety review and an environmental review. NRC conducts the safety review to assess compliance with the regulatory requirements of 10 CFR Part 20 and 10 CFR Part 40, Appendix A. In parallel with the safety review, the NRC staff is required under NEPA to conduct an environmental review for each license application. The NRC environmental protection regulations applicable to licensing actions are found in 10 CFR Part 51. As appropriate, the NRC staff may propose license conditions to ensure that specific features of a given site are taken into account in protecting worker and public health and safety and the environment. The NRC hearing process (10 CFR Part 2) applies to NRC licensing actions and offers stakeholders a separate opportunity to raise concerns with the proposed action during the licensing process.

If a new license is issued or a license amendment granted, NRC ensures that the licensee complies with the conditions of its NRC license and the applicable regulations through an inspection program managed out of one of its four regional offices. The NRC Region IV office in Arlington, Texas, would manage inspection programs for ISL uranium recovery facilities located in each of the four regions analyzed in this GEIS.

NRC inspections are guided by the NRC inspection manual, which includes detailed procedures for various types of inspections. Examples of topics addressed by ISL facility inspections include construction, management organization and controls, training of personnel, radiation protection programs, facilities and equipment, environmental protection, financial assurance, transportation of radioactive materials, radioactive waste management, efforts to maintain effluents as low as is reasonably achievable (ALARA), emergency preparedness, decommissioning, and security of nuclear materials. Inspections occur at least annually, but NRC inspection staff can adjust the inspection frequency based on a number of variables, including licensee performance. Inspections can be announced or unannounced. In addition to inspections, the NRC staff reviews the licensee-submitted semiannual effluent and environmental monitoring reports and takes the necessary actions to respond to reported incidents at ISL facilities (e.g., spills, excursions, and other reportable events).

The inspection process may identify violations that are subject to enforcement actions by the agency. The NRC enforcement policy endeavors to deter non-compliances by emphasizing the importance of compliance with NRC requirements. The enforcement policy also encourages prompt identification and comprehensive correction of violations. Accordingly, licensees, contractors, and their employees who do not achieve the high standard of compliance expected by NRC, are subject to enforcement sanctions. As part of the enforcement process, NRC considers the recent performance history and the number and severity of violations for a given licensee. Further, licensees, employees, and contractors who engage in deliberate misconduct or who deliberately submit incomplete or inaccurate information to NRC are subject to significant enforcement sanctions, including civil penalties and legally binding orders.

1.7.2 EPA Permitting

Under environmental laws such as the Clean Water Act, the Safe Drinking Water Act, and the Clean Air Act, EPA has statutory authority to regulate activities that may affect the environment. EPA permitting that is most relevant for uranium ISL facilities is related to underground injection of the leaching solution (i.e., the lixiviant) and liquid effluents, surface discharge of treated waters and industrial and construction stormwaters, and air quality.

1.7.2.1 Water Resources

Under the Safe Drinking Water Act, EPA was granted primary authority to regulate underground injection and protect current and future sources of drinking water. Underground injection is broadly defined as the process of placing fluids underground through wells or other similar conveyance systems. EPA implements this responsibility through its UIC program (EPA, 2008a). EPA may administer the programs directly for states or tribal lands or jointly with the state or tribal government. Alternatively, EPA may also authorize individual states or tribes to administer the UIC programs in accordance with EPA regulations. Currently, Wyoming, Nebraska, and New Mexico are authorized states. South Dakota administers the UIC program jointly with EPA, with the state administering the program for UIC Class II permits (EPA, 2008b).

Native American tribes can follow the same rules as states for obtaining authorization (40 CFR Part 145) if they are considered a “Federally Recognized Tribe” and have been designated for “Treatment Similar to a State.” Tribes that want to enforce the federal UIC requirements must submit an application for approval of their program to EPA. As of this writing (April 2009), EPA has approved applications from two tribes (the Fort Peck Assiniboine and Sioux Tribes in Montana and the Navajo Nation) to implement UIC programs for Class II (oil and gas-related) injection wells. In the absence of tribal authorization, EPA can directly administer the UIC program in tribal areas even if they are located in a State with an approved UIC program.

UIC Permitting (from EPA, 2008a)

In the four regions covered in this GEIS, the state implements UIC permitting for all five UIC permit classes for Wyoming, Nebraska, and New Mexico and for UIC Class II for South Dakota. Classes I and III are most applicable to uranium ISL facility operations.

- *Aquifer Exemption*. UIC criteria for exemption of an aquifer that might otherwise be defined as an underground source of drinking water are found at 40 CFR 146.4. These criteria include whether the aquifer is currently a source of drinking water and whether the water quality is such that it would be economically or technologically impractical to use the water to supply a public water system.

- *Industrial and Municipal Waste Disposal Wells (UIC Class I)*. This permit class governs deep disposal of industrial, commercial, or municipal waste below the deepest usable aquifer. This type of injection uses wells and requires applied pressure. It includes all wells that dispose of waste on a commercial basis, even if the waste would be otherwise eligible for disposal into a Class II well (e.g., WDEQ, 2005, 1993). For uranium ISL facilities, this type of UIC permit is necessary to use deep well injection for waste disposal.

- *Mining Wells (UIC Class III)*. These permits govern injection wells drilled to recover minerals. They includes experimental technology wells; underground coal gasification wells; and wells for the *in-situ* recovery of materials such as copper, uranium, and trona. For uranium ISL facilities, this type of UIC permit covers wells that inject the lixiviant into the uranium mineralization.

- *Shallow Nonhazardous Injection Wells (UIC Class V)*. This permit class covers all injection wells not included in Classes I-IV. In general, Class V wells inject nonhazardous fluids into or above underground sources of drinking water and are typically shallow, onsite disposal systems. However, some deep Class V wells inject below underground sources of drinking water.

Unless authorized by rule or by permit, any underground injection is unlawful and violates the Safe Drinking Water Act and UIC regulations. Before an NRC-licensed uranium ISL facility can begin operations at any project site, the licensee must obtain the necessary UIC authorizations. These will include (1) an aquifer exemption (also called exempting the aquifer as an underground source of drinking water) for the aquifer or portion of the aquifer where the uranium mobilization and recovery will occur and (2) a Class III UIC permit to operate injection wells. In addition, if deep well injection will be used to dispose of certain liquid wastes, the licensee will need to obtain a Class I UIC permit.

Under the provisions of the Clean Water Act, the NPDES program regulates discharges of pollutants from a point source into surface water of the United States. Operators of a point source discharge must obtain an NPDES discharge permit (EPA, 2008d). The permits contain limitations and conditions that are intended to protect surface water quality. Permits can cover either operational (industrial stormwater and process water including dewatering, produced water, and treated wastewater) or construction phases. Construction stormwater NPDES authorizations are applied for and issued annually under a general permit based on projected construction activities. For a construction stormwater authorization, a notice of intent is filed before construction activities begin.

As with the UIC program, EPA either directly administers the NPDES permitting program or may authorize the permitting authority to a state or tribe (EPA, 2008e). State-implemented NPDES programs (covering commercial industrial facilities such as ISL uranium mills) are authorized in Wyoming, Nebraska, and South Dakota. EPA directly administers the NPDES program in New Mexico and in Indian Country (EPA, 2008f).

1.7.2.2 Air Quality

EPA was given the primary responsibility to set standards and oversee the Clean Air Act. Similar to water protection programs, EPA may authorize the states, tribes, and local agencies to prevent and control air pollution. Under the Clean Air Act, EPA developed the following standards:

- National Primary and Secondary Ambient Air Quality Standards in 40 CFR Part 50
- National Emission Standards for Hazardous Air Pollutants in 40 CFR Part 40
- Prevention of Significant Deterioration in 40 CFR Part 52

As described in 40 CFR Part 51, Requirements for Preparation, Adoption, and Submittal of Implementation Plans, states must develop state implementation plans consisting of regulations, programs, and policies that describe how each state will control air pollution under the Clean Air Act. Agencies must obtain EPA approval for these implementation plans. The permitting process is a mechanism agencies use to put the implementation plans into effect. EPA’s Tribal Authority Rule gives tribes the ability to (1) develop air quality management programs, (2) write air pollution reduction rules, and (3) implement and enforce these rules. Similar to the states, tribes must obtain EPA approval for these implementation plans.

The Clean Air Act permitting process is divided into two programs: the New Source Review program (preconstruction) and the Title V program (operation). NRC is not the regulatory authority for Clean Air Act permitting. Permitting authorities are identified in Table 1.7-1. The New Source Review requires stationary air pollution sources to obtain permits prior to construction. This is commonly referred to as construction or preconstruction permitting.

Three types of New Source Review permits exist: (1) Prevention of Significant Deterioration, (2) nonattainment New Source Review, and (3) minor New Source Review. In attainment areas (i.e., those areas where air quality meets the NAAQS), Prevention of Significant Deterioration permits are required for major stationary pollutant sources that are new or making major modifications. The threshold for classification as a major source in an attainment area is either 90.7 or 227 metric tons [100 to 250 short tons] of a regulated pollutant, depending on the source. In nonattainment areas, the nonattainment New Source Review permits are required for major stationary pollutant sources that are new or making major modifications. The threshold for classification as a major source in a nonattainment area is generally 90.7 metric tons [100 short tons] of a regulated pollutant. This threshold can be lower for areas with more serious nonattainment problems. The minor New Source Review permits are for sources that do not require Prevention of Significant Deterioration or nonattainment New Source Review permits. A minor New Source Review permit is intended to support the Prevention of Significant Deterioration and nonattainment New Source Review programs by implementing permit conditions as needed that limit emissions from sources not covered by those two programs. The factors that determine which permit applies to a particular proposed ISL facility are the NAAQS compliance status and whether the facility was classified as a major or minor source. Specific requirements would be determined by the appropriate regulatory authority on a site-specific basis.

Operating permits, called Title V permits, are required for most large sources and some smaller sources of air pollution. State or local agencies issue most Title V permits. In general, ISL facilities do not meet the emissions thresholds that invoke Title V requirements or require operating permits. However, to the extent that an ISL facility would meet the general requirements identified for EPA regulations at 40 CFR Part 70 and 71 {e.g., by exceeding either a general emissions threshold of 90.7 metric tons [100 short tons] for any air pollutant, lower thresholds for areas that are in nonattainment with air quality standards, or major source thresholds for hazardous air pollutants}, the licensee or applicant would need to obtain the necessary Title V permit before beginning operations.

Table 1.7-1. New Source Review Permit Summary Information for Nebraska, New Mexico, South Dakota, and Wyoming*

Area	Permitting Authority	Regulations
Nebraska†	State and local agencies	State Implementation Plan
New Mexico†	State and local agencies	State Implementation Plan
South Dakota†	State agency	State Implementation Plan‡
Wyoming†	State agency	State Implementation Plan
Indian country (all four states)	Appropriate U.S. Environmental Protection Agency regional office	40 CFR 52.21

*Modified from U.S. Environmental Protection Agency. "Prevention of Significant Deterioration (PSD) Permit Program Status: February 2009." 2009. <http://www.epa.gov/nsr/where.html> (29 April 2009).
†Except for Indian country.
‡Except for Prevention of Significant Deterioration permitting that is regulated by 40 CFR 52.21.

1.7.3 Other Federal Agencies

NRC and the U.S. Department of Transportation jointly regulate the safety of radioactive material shipments. The NRC regulations to transport radiological materials such as yellowcake and uranium-loaded resins are established in 10 CFR Part 71. For example, refined yellowcake is packaged and shipped in 208-L [55-gal], 18-gauge steel drums holding an average of 430 kg [950 lb]. The U.S. Department of Transportation classifies this as Type A packaging (49 CFR Parts 171–189 and 10 CFR Part 71).

Because the federal government manages a portion of the land in the four geographic regions discussed in this GEIS, BLM may control surface access at uranium ISL sites proposed for federal lands. BLM administers grazing on public ranchlands through field offices located in each state. The licensee must obtain the necessary mineral rights and environmental clearances from BLM for surface disturbances and approval for temporary occupancy. BLM requires (per 43 CFR 3809) the ISL licensee or applicant to submit a plan of operations. The BLM-required information can be (and usually is) included as part of the applicant's state-required forms/applications. Unlike NRC, BLM considers all mineral recovery to be mining. BLM regulates land use for operations proposed on BLM land and where the surface rights are privately owned and the mineral rights are under federal jurisdiction.

1.7.4 Tribal Agencies

Like states, Native American tribes can be authorized to implement the EPA Clean Water Act and Clean Air Act programs and can have their own permitting authority (e.g., Navajo Nation Environmental Protection Agency). This is discussed further in Sections 1.7.2.1 and 1.7.2.2. Additionally, NRC has a responsibility to consult with tribes; the process for doing so is discussed in GEIS Chapter 9.

At least one tribe, the Navajo Nation, has enacted tribal legislation that prohibits all uranium processing activities. On April 29, 2005, Navajo Nation President Joe Shirley, Jr. signed the Diné Natural Resources Protection Act of 2005. The Navajo ban on uranium milling and processing presents a number of complex legal and policy issues, including whether a particular site falls under the definition of "Navajo land" in the Diné Natural Resources Protection Act of 2005.

The NRC approach to these types of jurisdictional issues has been to fulfill NRC statutory mandates to evaluate license applications and determine whether a particular application complies with the Atomic Energy Act and NRC regulations. At the same time, NRC recognizes that other governmental entities, in this case the Navajo Nation, may also have jurisdiction over some issues. The Commission acknowledges and recognizes that the Navajo Nation has certain sovereign powers under federal law. In general, although a license applicant may demonstrate that it meets the Atomic Energy Act and NRC regulations and thereby receives an NRC license, the applicant may nonetheless need to address other applicable requirements and obtain other necessary permits from appropriate regulatory authorities to go forward with its project.

1.7.5 State Agencies

The following sections briefly describe relevant state permitting requirements for Wyoming, Nebraska, South Dakota, and New Mexico.

1.7.5.1 Wyoming

WDEQ provides general guidance on Wyoming regulatory requirements for ISL operations in several reports (WDEQ, 2000a, 2005). WDEQ issues state permits relevant to ISL uranium recovery operations under Title 35, Chapter 11, of the Wyoming Environmental Quality Act. Most of these permits are related to water supply and air and water quality issues and include aquifer exemption; UIC Class I, III, and V permits; and NPDES permits (WDEQ, 2007, 2005, 2001, 2000b, 1993, 1984). In Wyoming, injection of fluids at an ISL mine unit for uranium production operations requires UIC Class III wells. Injection of ISL waste for disposal underground requires either a Class I or Class V UIC permit. In addition, the WDEQ Land Quality Division issues permits to mine for noncoal resources and for *in-situ* recovery operations (WDEQ, 2003, 2000a). These permits identify site-specific requirements related to establishing baseline conditions (e.g., water, soils, vegetation, cultural values) and establishing reclamation bonds based on estimated site-specific costs. The WDEQ Land Quality Division holds joint bonds with BLM for exploration and mining on BLM lands. A memorandum of understanding exists between WDEQ Land Quality Division and BLM for surface management of locatable mineral operations. Wyoming also implements the NPDES program regarding discharges to surface waters. With regard to air quality permitting, WDEQ establishes the NAAQS requirements (WDEQ, 2006) (see Table 1.7-1). In addition, the Wyoming State Land Use Planning Act established a State Land Use Commission to govern leases, easements, and temporary uses of state lands. The state also regulates drilling and well spacing and requires drilling permits for wells, regardless of land ownership.

1.7.5.2 Nebraska

The regulations established in Title 122 of the Nebraska Administrative Code ensure proper well construction and regulate the injection of fluids containing potential contaminants into, above, or below underground sources of drinking water. NDEQ must approve injection wells, which must be operated and managed in accordance with the applicable NDEQ regulations. NDEQ issues and reviews UIC permits, conducts inspections, and performs compliance reviews for wells that inject fluids into the subsurface to ensure that injection activities comply with state and federal regulations and that groundwater is protected from potential contamination sources. Similar to WDEQ in Wyoming, NDEQ has authority over and manages Class I, III, and V wells in Nebraska. Injection wells not included in the other specific classes are considered Class V wells. In Nebraska, regulations adopted in 2002 prohibit a number of Class V well types, including radioactive waste disposal wells. The NDEQ UIC program is currently closing existing waste disposal systems that fall into these prohibited types. EPA reviews and approves the aquifer exemption portion of the NDEQ UIC program (40 CFR 146.4). Nebraska also implements the NPDES program regarding discharges to surface waters. With regard to air quality permitting, NDEQ establishes the ambient air quality standards through a state-administered NAAQS program described in Title 129 of the Nebraska administrative code (NDEQ, 2002b).

1.7.5.3 South Dakota

As described in Section 1.6.3.3, recent legislation passed in South Dakota establishes permitting requirements for uranium recovery activities. Activities covered under these permits include sinking shafts, tunneling, and drilling test holes, cuts, or other works to extract samples (including bulk samples) to confirm the commercial grade of a uranium deposit before mining operations or test facility development begins. Uranium milling, including ISL uranium recovery, requires a state mine permit issued under South Dakota Codified Law 45-6B and South Dakota

Administrative Rule Chapter 74:29. The Board of Minerals and Environment evaluates permit applications for uranium exploration in South Dakota (South Dakota Department of Environment and Natural Resources, 2007a, 2006). South Dakota implements the NPDES program regarding discharges to surface waters. The South Dakota Department of Environmental and Natural Resources is the air quality permitting authority through its NAAQS program (South Dakota Department of Environment and Natural Resources, 2007b).

1.7.5.4 New Mexico

Water quality standards in New Mexico are established in accordance with Water Quality Control Commission regulations in Title 20, Chapter 6, Part 2 of the New Mexico Administrative Code. The New Mexico Environment Department administers the state's UIC programs. For ISL uranium milling operations on state-regulated lands in New Mexico, an operator must obtain a Class III injection well permit and an aquifer exemption from EPA requiring aquifer cleanup and monitoring to protect surrounding underground sources of drinking water. For operations outside Indian lands in New Mexico, operators need to obtain the Class III injection well permit and a temporary aquifer designation from the New Mexico Environment Department, subject to EPA review and approval. EPA directly administers the NPDES program for surface water discharges in New Mexico. With regard to air quality permitting, the New Mexico Environment Department is the permitting authority through its NAAQS program (New Mexico Environmental Department, 2002).

1.8 Use of the GEIS in the NRC Licensing Process

NRC plans to use the GEIS to fulfill the requirement at 10 CFR 51.20(b)(8) for the preparation of an EIS or supplement to an EIS for the issuance of a source material license for an ISL uranium milling facility. NRC will use the GEIS to prepare a supplemental EIS (SEIS), incorporating by reference the relevant sections of the GEIS, and supplementing the GEIS evaluations with site-specific analysis as necessary for the issuance of a new ISL license. Additionally, NRC will use the GEIS in its review of applications to renew or amend existing ISL licenses.

As an independent federal agency, NRC uses other CEQ regulations as guidance for its NEPA reviews. In this case, CEQ's regulation at 40 CFR 1502.4 allows, and in some cases requires, preparation of EISs for "broad federal actions." In preparing EISs on broad actions, the CEQ offers different approaches for agencies to take in their evaluations. These include evaluating proposals (1) geographically (i.e., those actions occurring in the same general location) and (2) generically (i.e., those actions which have relevant similarities, such as common timing, impacts, alternatives, methods or implementation, media, or subject matter).

Another concept associated with the preparation of "broad action" EISs is tiering. Tiering (defined in 40 CFR 1508.28) is a procedure by which more specific or more narrowly focused environmental documents can be prepared without duplicating relevant parts of previously prepared, more general, or broader documents. The more specific environmental document incorporates by reference the general discussions and analyses from the existing broader document and concentrates on the issues and impacts of the project that are not specifically covered in the broader document. NRC environmental regulations, in discussing the format for presentation of material in EISs, note that the techniques of tiering and incorporation by reference described respectively in CEQ's NEPA regulations may be used as appropriate to help present issues, eliminate repetition, or reduce the size of the EIS (see 10 CFR Part 51, Subpart A, Appendix A). NRC plans to use tiering and incorporation by reference in making use of the GEIS for environmental reviews of site-specific ISL license applications.

The following discussion provides a more detailed description of how the NRC staff will use the GEIS as part of the staff's environmental reviews for new ISL license applications and for applications to renew or amend existing licenses. The discussion is also applicable to NRC's review of applications to renew or amend existing NRC ISL licenses.

1.8.1 Applicant or Licensee Environmental Report

License applicants must submit an environmental report to support their application for an NRC license to possess and use source material for ISL uranium milling. NRC regulations at 10 CFR 51.45 list the general content of the environmental report to include, among other things

- A description of the proposed action
- A statement of its purposes
- A description of the environment affected
- Consideration of the impact of the proposed action on the environment
- Identification of any adverse environmental effects that cannot be avoided
- Discussion of alternatives to the proposed action

To help potential uranium milling license applicants develop their environmental reports, NRC provides additional guidance in

- Regulatory Guide 3.46, "Standard Format and Content of License Applications, Including Environmental Reports, for *In-Situ* Uranium Solution Mining" (NRC, 1982)

- NUREG–1569, "Standard Review Plan for *In-Situ* Leach Uranium Extraction License Applications" (NRC, 2003a)

- NUREG–1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NRC, 2003b)

1.8.2 Acceptance Review of the License Application and Environmental Report

After receiving a new license or license renewal application and accompanying environmental report, the NRC staff first reviews the application and environmental report for completeness. This initial "acceptance review" ensures that the application and environmental report are sufficiently comprehensive and address all relevant aspects of the applicant's proposed actions. When the NRC staff determines that the application is acceptable to warrant detailed technical review, the application is officially docketed in accordance with NRC's regulations at 10 CFR Part 2. Then NRC publishes in the *Federal Register* notice of the public availability of the application and accompanying notice of opportunity for hearing on the application.

In its subsequent detailed technical review of an ISL license application, the NRC staff analyzes the health and safety impacts (documented in a Safety Evaluation Report) and the potential environmental impacts of the proposed action (discussed in a separate environmental review document—a SEIS for issuance of a new ISL license, or EA, SEIS or EIS for license renewals or amendments).

1.8.3 NRC's Site-Specific Environmental Review

To meet its NEPA obligations related to a site-specific license application, the NRC staff will conduct an independent, detailed, comprehensive evaluation of the potential environmental impacts of the applicant's proposed action for construction, operation, aquifer restoration, and decommissioning of an ISL facility. This site-specific evaluation will make use of the discussion and conclusions reached in the GEIS to the extent applicable to the specific site.

As the basis for its independent evaluation, the NRC staff will rely initially on the applicant's detailed environmental report for information on the proposed action. The applicant's environmental report would include detailed information about the potential ISL facility location, the extent of proposed operations and schedule, and the surrounding local and regional affected environment. The NRC staff will confirm important attributes of these descriptions through visits to the proposed site location and vicinity, independent research activities, and consultations with appropriate federal, tribal, state, and/or local agencies. Additionally, the NRC staff typically requests additional information from the applicant. These requests require the applicant to provide the information and data the NRC staff considers necessary to determine the potential environmental impacts.

The NRC staff will focus on the applicant's assessment of potential environmental impacts from the proposed action and the identified alternatives. In its site-specific environmental review document, NRC will evaluate a reasonable range of alternatives to the applicant's proposal, including the "no-action" alternative. This range of alternatives may include alternatives not identified by the applicant, as well as those outside NRC's jurisdiction. The NRC staff will independently evaluate the applicant's analysis of the potential impacts to each resource area identified in NRC (2003b) (e.g., air quality, transportation, groundwater). As needed, the NRC staff will independently confirm and verify essential aspects of the analysis. Confirmatory analyses could involve the use of computer codes and other verification techniques.

The NRC Safety Review

In addition to meeting its responsibilities under the Atomic Energy Act of 1954, as amended, NRC prepares a Safety Evaluation Report to analyze the safety of the proposed action and assess its compliance with applicable NRC regulations.

The safety and environmental reviews are conducted in parallel (Figure 1.7-1). Although there is some overlap between the content of a Safety Evaluation Report and the environmental review document, the intent of the documents is different.

To aid in the decision process, the environmental review document summarizes the more detailed analyses included in the Safety Evaluation Report. For example, the environmental review document would not address how accidents are prevented but the environmental impacts that would result if an accident occurred.

Much of the information describing the affected environment in the environmental review document also is applicable to the Safety Evaluation Report (e.g., demographics, geology, and meteorology) (NRC, 2003b).

The GEIS is intended to improve the efficiency of the licensing process by (1) providing an evaluation of the types of environmental impacts that may occur from ISL uranium milling facilities, (2) identifying and assessing impacts that are expected to be generic (the same or similar) at all ISL facilities (or those with specified facility or site characteristics), and (3) identifying the scope of environmental impacts that need to be addressed in site-specific environmental reviews. The GEIS also provides information that will aid in the preparation of site-specific environmental documents.

First, the NRC staff will compare the applicant's description of the proposed facility, ISL process, and affected environment to those in the GEIS. The NRC staff will then summarize and incorporate by reference the relevant sections of the GEIS into the site-specific environmental review document. Secondly, the NRC staff will use the GEIS to help determine the significance of site-specific environmental impacts. The GEIS provides criteria for each environmental resource area to help determine the significance level of potential impacts (e.g., SMALL, MODERATE, or LARGE). The NRC staff will apply these criteria to site-specific conditions to determine the significance of potential impacts. Finally, the NRC staff will compare the conditions of the proposed site and activities under review to the conditions and aspects identified and discussed in the GEIS to see whether the conclusions for the environmental impact to a particular resource area can be adopted in the site-specific environmental review document. The NRC staff may determine that the GEIS conclusions for a specific resource area can be adopted in full, only in part, or not at all. The determination of the extent to which the GEIS conclusions can be adopted will be discussed in detail in the site-specific review, including the supporting information and data that form the basis for that determination. Additionally, the NRC staff will also determine the significance of environmental impacts for resource areas where the GEIS conclusions can be adopted only in part or not at all. The NRC staff will document the basis for that determination in the site-specific evaluation. The site-specific review will incorporate by reference and adopt significance conclusions from the GEIS, as appropriate. This process of using the GEIS in site-specific environmental reviews is consistent with the concept of tiering, discussed previously (see Section 1.8).

1.8.4 Public Participation Activities

As stated in Section 1.8.2, upon acceptance of a license application for detailed technical review, NRC publishes in the *Federal Register* a notice of opportunity for hearing on the application. Individuals or entities that may be affected by the potential issuance of the site-specific ISL license may request a hearing under the NRC formal hearing process. 10 CFR Part 2 provides the requirements that must be met to be granted a hearing.

As discussed previously, the NRC staff will prepare an environmental review document in support of its review of ISL-related licensing actions (i.e., new license, renewal or amendment). For new ISL license applications, the NRC staff will prepare a SEIS. The NRC staff will follow the public participation procedures outlined in 10 CFR Part 51, which can include requests for public input on the scope of the SEIS and for public comment on the draft SEIS.

Before taking a licensing action on a licensee’s proposal to amend or renew its existing NRC license, the NRC may prepare an environmental assessment and if so, also may make the draft EA and the accompanying draft Finding of No Significant Impact (FONSI) available for public comment. The decision to do so would take into account the provisions in 10 CFR 51.33 concerning the similarity of the proposed action to actions normally requiring preparation of an EIS and the precedent-setting nature of the proposed action. Additionally, NRC may consider the level of public interest and the contentious nature of the proposed action in determining whether to publish a draft EA/FONSI for public comment. The NRC staff would address public comments received on the draft environmental assessment/FONSI in the staff’s final environmental review document. This approach is consistent with NRC regulations.

1.8.5 The NRC Final Environmental Review Document and Findings

The NRC staff will issue the final environmental review document as part of the licensing review documentation for each site-specific licensing action (i.e., new license, renewal, amendment). The final document will provide the NRC staff’s site-specific environmental review determinations that consider public input and the evaluations in the GEIS, to the extent applicable. The final environmental document and the site-specific Safety Evaluation Report together form the basis for the NRC's decision on whether to issue a 10 CFR Part 40 source material license to the applicant for ISL uranium milling or to grant a licensee's application to renew or amend its existing NRC license.

The NRC final action to issue a license may also be subject to a formal NRC hearing. As discussed in Section 1.8.4, 10 CFR Part 2 provides NRC's requirements concerning hearings.

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