UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 6, 1999

MEMORANDUM TO: Docket File 40-8584

FROM: Elaine Brummett, Project Manager
Uranium Recovery and
Low Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: ENVIRONMENTAL ASSESSMENT REGARDING LICENSE RENEWAL AND THE RECLAMATION DESIGN FOR THE KENNECOTT URANIUM COMPANY'S SWEETWATER URANIUM MILL SITE IN WYOMING

The U.S. Nuclear Regulatory Commission (NRC) is considering a request to renew NRC Source Material License SUA-1350 to authorize the licensee, Kennecott Uranium Company (KUC), to resume commercial milling operations at the Sweetwater facility as proposed in its letter of June 11, 1997, and according to the Operations Plan submitted September 18, 1997, as amended. KUC also requested approval to reclaim the mill facility, existing and proposed new tailings impoundments, and the proposed evaporation ponds, according to the 1997 Reclamation Plan, as amended. The Sweetwater uranium mill site is located in Sweetwater County, Wyoming.

An Environmental Assessment (EA) was performed by the NRC staff in support of its review of KUC's license renewal for operation and the amendment request for the reclamation plan, in accordance with the requirements of 10 CFR Part 51. The conclusion of the EA is a Finding of No Significant Impact for the proposed licensing actions. The EA was provided to the docket file on June 25, 1999. After reviewing additional information, a slight revision was made to Sections 4.4.2 and 8.0 with no change to the conclusion. The revised version is provided as an attachment to this memorandum to be placed in the licensee's docket file.

Docket No. 40-8584
License No. SUA-1350

Attachment: As stated

ENVIRONMENTAL ASSESSMENT FOR SOURCE MATERIAL LICENSE SUA-1350, RENEWAL FOR OPERATIONS AND AMENDMENT FOR THE RECLAMATION PLAN
(Revision 1)

SWEETWATER URANIUM COMPANY
SWEETWATER URANIUM MILL
SWEETWATER COUNTY, WYOMING

JULY 1999

DOCKET NO. 40-8584

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety
and Safeguards
Division of Waste Management

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1.0 INTRODUCTION

With the 1999 renewal of license SUA-1350 for the restart of the Sweetwater Uranium Mill, the U.S. Nuclear Regulatory Commission (NRC) will be using the Performance-Based License Condition (PBLC) format. This license format change was requested by the Kennecott Uranium Company (KUC) by letter dated June 11, 1997, and documented by proposed draft license conditions submitted February 3, 1999. Under Performance-Based Licensing, the licensee has the burden of ensuring the proper implementation of the PBLCs. The licensee may:

- Make changes in the facility or process, as presented in the application,
- Make changes in the procedures presented in the application, or
- Conduct tests or experiments not presented in the application, without prior NRC approval, if the licensee ensures that the following conditions are met:

  (1) The change, test, or experiment does not conflict with any requirement specifically stated in this license (excluding material referenced in the PBLC), or impair the licensee's ability to meet all applicable NRC regulations;

  (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan; and

  (3) The change, test, or experiment is consistent with the NRC's conclusions regarding actions analyzed and selected in the Environmental Assessment (EA).

  Otherwise, the licensee is required to submit an application for a license amendment from the NRC. The licensee's determinations regarding whether the above conditions are satisfied will be made by a Safety and Environmental Review Panel (SERP).

  The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have expertise in implementation of any changes; and, one member shall be the corporate radiation safety officer or equivalent. Additional members may be included in the SERP, as appropriate, to address technical aspects in several areas, such as health physics, ground water hydrology, surface water hydrology, specific earth sciences, and others. Temporary members, or permanent members other than the three identified above, may be consultants.

  The licensee shall maintain records until license termination of any changes made pursuant to the PBLC. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining that the change complies with the requirements referred to in the above conditions. The licensee shall furnish an annual report to the NRC that describes such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit any pages of its license application that have been revised to reflect changes made under this condition.

The licensee submitted its standard operating procedure (SOP) for operation of the SERP on February 25, 1999. The NRC staff reviewed this document and determined that the SERP should operate as the NRC intended.

NRC's inspection function remains unchanged with the administration of Performance-Based Licensing. Operational changes, regulatory commitments, and record keeping requirements implemented through the PBLC are subject to NRC inspection and possible enforcement actions.

To support the decision-making process concerning the request for resumption of mill operation and approval of the reclamation plan (stabilization of impoundments and decommissioning of land and buildings), the NRC staff has prepared this Environmental Assessment (EA) to ascertain the mitigation efforts and likely impacts to the environment from the proposed activities. The staff also has prepared a Safety Evaluation Report (SER) to document the mitigation of health impacts related to the proposed activities, and a Technical Evaluation Report (TER) to document the technical review of the reclamation plan.

1.1 Background Information

The Sweetwater Uranium Project (Site), as defined by the proposed NRC bonded area (Figure 7, KUC, 1998f), covers approximately 1432 acres, consisting of a mill, ancillary buildings, existing tailings impoundment, and the area of proposed impoundments, evaporation ponds, and diversion channels. Bordering the Site is an overburden soil pile and an uranium ore pit. The Site is operated by KUC under NRC Source Materials License SUA-1350. The license was obtained in February 1979, to permit processing of uranium ore. The mill was constructed in 1979 and 1980, and processed ore mined from an adjacent open pit from February 1981 through April 1983. The 60-acre below-grade impoundment was partially filled with tailings.

The mill has been in standby status since cessation of operation, and staff were retained to maintain the facility and perform environmental monitoring. Current license conditions authorize operation of an ion exchange uranium recovery facility and disposal of a limited amount of byproduct material originating from off-site, but ore may not be processed.

The licensee requested restart of the mill by letter dated March 9, 1993, with submittal of the Radiation Safety Program and Standard Operating Procedures (SOPs) revised for operation of the mill. On August 4, 1993, the licensee submitted the "Conceptual Design - Tailings Management Study." To also support the restart of mill operations, KUC submitted: 1) Revised Radiation Safety Program (KUC, 1994a) that was approved April 18, 1994; 2) Revised Environmental Monitoring Manual (KUC, 1994b); and 3) Revised Environmental Report (ER) (KUC, 1994c), subsequently modified based on comments from NRC staff, including addenda on aquifer information (KUC, 1995e), Background Ground Water Quality and Detection Standards (KUC, 1996a) approved May 28, 1998; and Regional Seismicity (KUC, 1996b) approved February 12, 1997. The environmental monitoring issues were closed with submittal of revisions to Section 5 of Volume VII of the Final Design (KUC 1998e,g).

The licensee also provided a Reclamation Plan for the existing impoundment, future impoundments, and for the mill facility, a final design for construction of up to 6 tailings impoundments and up to 10 evaporation ponds, and a Facility Operations Plan in 1997 and

1998. Based primarily on NRC staff comments, KUC revised and clarified these submittals (see Section 12 for details). The NRC staff has reviewed these documents and is now completing the written evaluation to accompany the license amendment for restart of the mill and eventual reclamation and decommissioning of the Site.

The actual resumption of mill operations would be conditional on: 1) a 90-day notice to NRC; 2) completion of the pre-operational inspection; and 3) resolution of any associated safety issues. The inspection will confirm that operating procedures are in place, the facility was constructed as designed, pre-operational testing was completed, and that approved radiation safety and environmental monitoring programs are in place. Due to the recent low price for uranium, the mill is not expected to resume operations until the year 2000 or later.

1.2 Proposed Action

KUC, operator and manager of the Sweetwater Site for the Green Mountain Mining Venture (GMMV), is proposing to process uranium ore mined from a deposit owned by the GMMV in Green Mountain (the Jackpot Mine), and approximately 62.7 km (39 miles) north of the Site. The proposed mill operation could last for 20 years and the final design contains plans to construct up to 6 new tailings impoundments and 10 evaporation ponds. Approval is being considered for construction of one new impoundment and up to eight evaporation ponds at this time. The licensee would request approval of the other structures, if warranted by extended mill operation. The new impoundment(s) is to cover approximately 40 acres. The contiguous evaporation ponds will cover 10 acres each. The existing below-grade tailings impoundment will be reclaimed according to the approved reclamation plan, but if the impoundment is reused during mill operation, additional design justification must be provided.

The milling operation involves grinding uranium ore, dissolving the uranium, and separating uranium from the solution and tailings (sandy residue/waste). The mill circuit (see Section 3 for details) is similar to the original 1981 operation, except: 1) some process water is recycled back into the mill circuit; 2) the ore grade is higher; and 3) the mine is farther away. The impact of these changes were assessed as discussed below under ground-water impacts, environmental monitoring, and transportation accidents, respectively. The area of the licensed Site will increase by approximately 30 percent with the proposed design (Figure 5-9 in Volume VII of Final Design, KUC, 1998g), and this impact was also considered.

Milling operations are expected to begin when it is economically feasible. The mill will operate 24 hours per day, 365 days per year, over its expected life of 20 years. Mill throughput is expected to range from 2,500 to 3,500 tons (dry weight) of ore per day, with an average rate of 3,000 tons per day. The mill is expected to yield about 1,859,748 kg (4,100,000 pounds) of product (yellowcake) annually, and the licensee will be limited to this amount of yellowcake by license condition.

The reclamation of the impoundments involves placing a 6-m (20 to 21-foot) thick soil cover over the tailings followed by riprap (rock) for erosion protection. Decommissioning the mill and land would include demolition of buildings and disposal of contaminated debris, equipment, and soil in the impoundment (see Section 6 for details).

1.3 Review Scope

1.3.1 Federal and State Authorities

NRC source material licenses are issued under Title 10, Code of Federal Regulations, Part 40 (10 CFR Part 40). As stated in 10 CFR 40.3, "A person subject to the regulations in this part may not receive title to, own, receive, possess, use, transfer, provide for long-term care, deliver or dispose of byproduct material or residual radioactive material, as defined in this part, or any source material after removal from its place of deposit in nature, unless authorized in a specific or general license issued by the Commission ...." Source material is defined under 10 CFR 40.4 as (1) uranium or thorium, or any combination thereof, in any physical or chemical form; or (2) ores which contain by weight 0.05 percent or more of uranium, thorium, or any combination thereof. In addition, the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), as amended, requires persons who conduct uranium source material operations to obtain a byproduct material license to own, use, or possess tailings and wastes generated by the operations (including above-ground wastes from in situ operations).

This EA has been prepared under 10 CFR Part 51, "Licensing and Regulatory Policy and Procedures for Environmental Protection," which implements NRC's environmental protection program under the National Environmental Policy Act (NEPA) of 1969. In accordance with 10 CFR Part 51, an EA serves to: (a) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI); (b) facilitate preparation of an EIS when one is necessary; and (c) aid the NRC's compliance with NEPA when an EIS is not necessary.

Impacts from the commercial scale operation of the site were previously evaluated in the Final Environmental Statement (FES) (NRC, 1978). Should the NRC issue a FONSI based on this EA, a renewed commercial source material license would be issued to KUC.

Other Federal agencies are involved with certain aspects of the Site activities. For example, KUC consulted the U.S. Environmental Protection Agency (EPA) concerning modification of an existing source (tailings impoundment) and construction of a new source under authorization of 40 CFR Part 61. Also, the State of Wyoming Department of Environmental Quality (DEQ) administers and implements the State's environmental protection rules and regulations. The licensee has committed to comply with all applicable Federal regulations, as well as State regulations.

1.3.2 Basis of NRC Review

The NRC, Division of Waste Management, staff has assessed the environmental impacts associated with the renewal of KUC's license for commercial operation of the mill and reclamation of the facility, as proposed, and documented the results of the assessment in this report. The staff performed this appraisal in accordance with the requirements of 10 CFR Part 51.

In conducting its assessment, the staff considered the following:

- Information contained in the previous environmental evaluations of the Sweetwater project;

- Information contained in KUC's amended renewal application, and supplementary information;
- Information contained in land use and environmental monitoring reports;
- Personal communications with staff for the Sweetwater facility, State of Wyoming, and Federal agencies (see Section 9); and
- Information derived from NRC staff site visits and inspections of the Site.

2.0 SITE DESCRIPTION

2.1 Location

The Sweetwater Uranium Site is located in Sweetwater County, Wyoming, in the Red Desert, approximately 68 km (42 miles) northwest of Rawlins, WY. Site access is provided by the paved Minerals Exploration Road connecting Highway 287 with the Wamsutter - Jeffery City road (Figure 2.1).

The facility is constructed on privately owned land. The land consists of two tracts totaling about 1975 acres. The Site covers more than 1000 acres and includes an open mine pit, overburden pile, mill, associated buildings, and a tailings impoundment (Figure 2.2). Additional acreage related to the project is held by a combination of unpatented lode claims and mill sites totaling 822 unpatented mill sites and 62 unpatented mining claims.

2.2 Climate and Weather

The climate of the Site vicinity is determined by its location in a high elevation desert basin, with the following general features: abundant sunshine, little rainfall occurring primarily in the warmer months, moderate to high wind speeds, and a large diurnal variation in temperature.

The Red Desert is the lowest region of the Continental Divide and provides a convenient passageway for cold arctic air masses and so cold air tends to collect in the bottom of the basin, affecting temperature and wind patterns. Winters are relatively long and cold, and summers are relatively short. The average frost-free season in Rawlins is 106 days. Winds also display diurnal variability with calm conditions prevailing near sunrise and wind speeds peaking in mid-afternoon.

Severe weather potential is relatively low in the Red Desert, with the exception of windstorms and severe cold. The potential for thunderstorm-associated severe weather, such as tornadoes, hail, and heavy rains, is lower in the Red Desert than in the eastern third of Wyoming because the Red Desert has low atmospheric moisture. Average hourly wind speeds of 64.4 km/hr (40 mph) or greater have been reported at the site every month except July. The strongest average hourly wind speed reported at the site from 1980 through 1993 was 90 km/hr (56 mph) in January 1987.

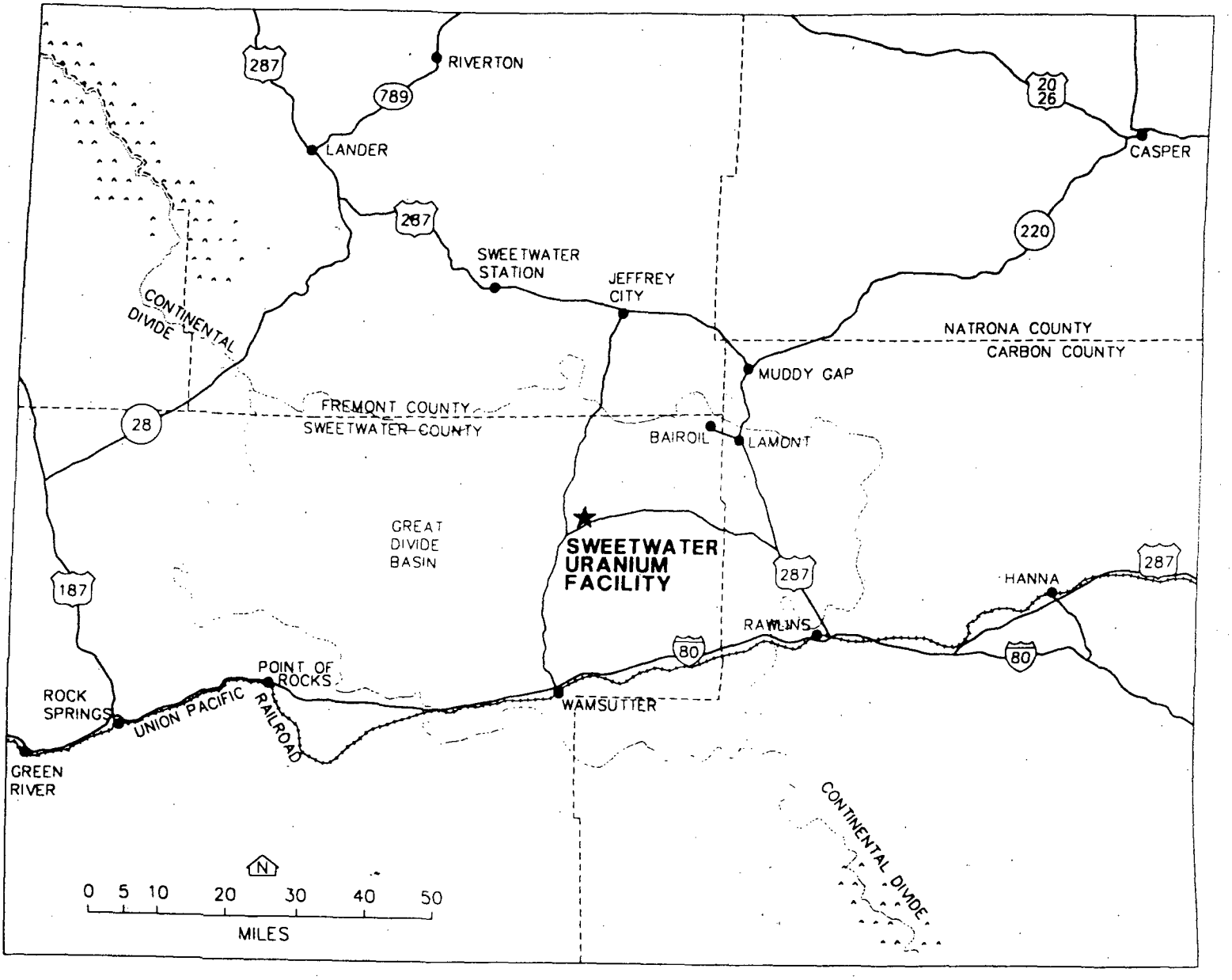

Figure 2.1
Location of the Sweetwater Uranium Facility

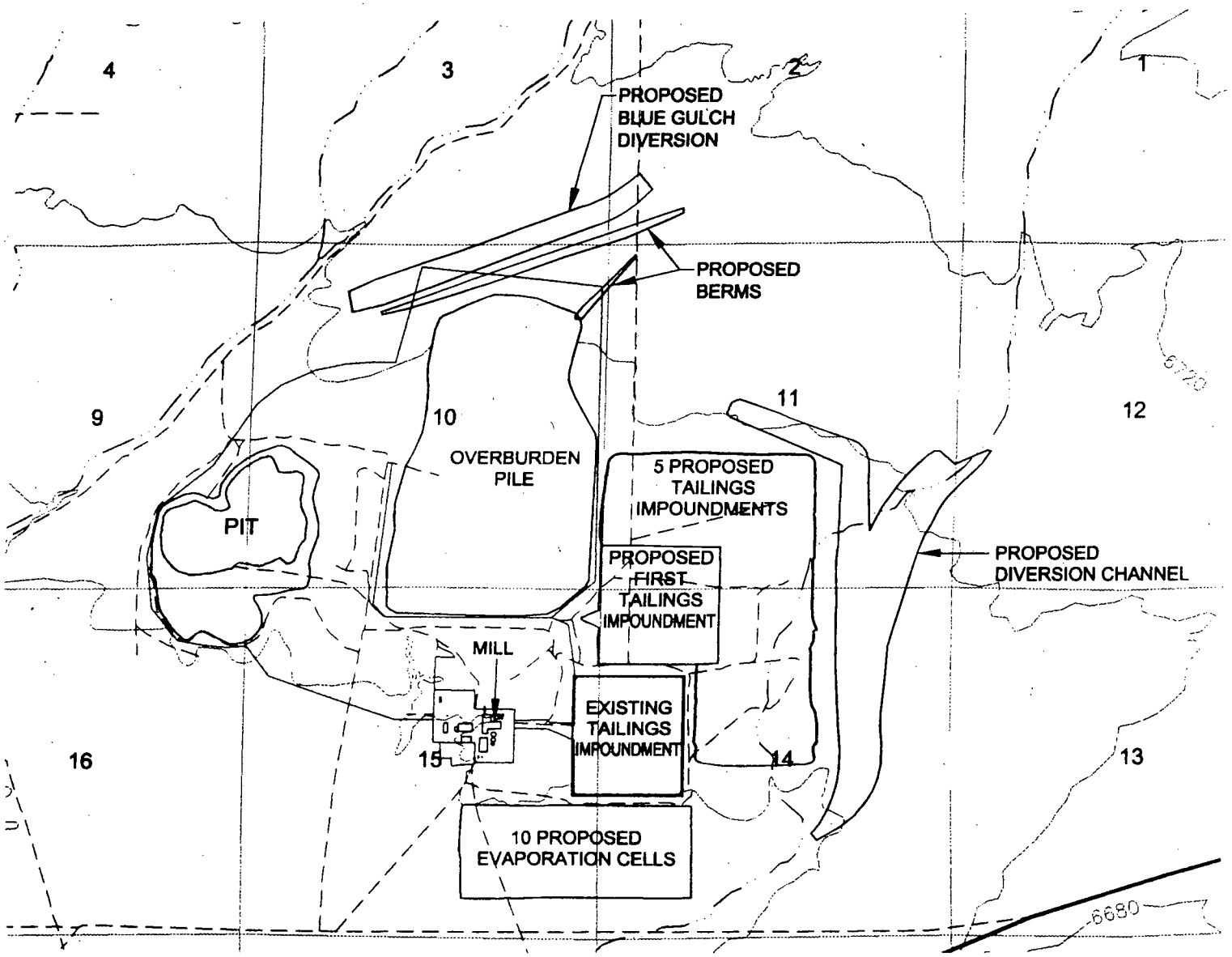

Figure 2.2
Sweetwater Facility and Proposed Impoundment and Ponds

Thunderstorms are common in the spring and summer in Wyoming in general. As a rule, however, related precipitation is light in the site area, typically a few hundredths of an inch. Heavy local storms occur which can produce 2.5 to 5.1 cm (1 or 2 inches) of rainfall. The 6-hour probable maximum precipitation (PMP) at the site is 26.7 cm (10.5 inches), according to the U.S. Department of Commerce's Hydrometeorological Report No. 55-A (1988).

2.3 Geology

2.3.1 Regional and Local Geology

The Site is located in south-central Wyoming in the Red Desert area of the Great Divide Basin. The present configuration of the Great Divide Basin is a result of tectonic activity associated with the Laramide orogeny (Late Cretaceous). In Early Cenozoic time, erosion of the Sweetwater, Rawlins, Rock Springs, and Wind River Uplifts supplied sediments to the basin. The coarser clastics came from the north and east of the basin as movement of the uplifts continued until Middle Cenozoic time. In the late Middle Cenozoic, volcanic debris consisting of tufts and tufaceous material was introduced into the basin. Subsequent regional uplift caused erosion and exhumation of the basin, which defined its present form.

Deposits in the basin consist of conglomerates, sandstones, siltstones, mudstones, and lignitic and subbituminous coals. All of these rocks are of continental origin and were deposited under fluvial, lacustrine, and paludal conditions. The Tertiary rocks have been divided into six formations, the oldest being the Fort Union Formation of Paleocene age that is only known from drilling records. The Fort Union is unconformably overlain by interfingering sediments of Eocene age of the Green River, Wasatch, and Battle Spring Formations. These beds are conformably overlain by the Eocene Bridger Formation, which in turn is unconformably overlain by the Brown's Park Formation of Oligocene to Miocene age. Holocene alluvium consisting of sands, silts, and gravels covers much of the present surface.

The uranium deposits in the area are contained in the Battle Spring Formation, which outcrops partially in the Site area. It consists of interfingered beds of arkosic sandstone, siltstone, and mudstone. The sandstones are generally fine-to-coarse grained, poorly sorted, and slightly clayey. These sandstones often grade into interchannel deposits of siltstone and mudstone. The uranium contained in the Battle Spring Formation was previously mined and milled at the Sweetwater site, however, the current application indicates that the mill will process ore from the Jackpot mine in near-by Green Mountain.

The surface at the Site is covered by thin Holocene alluvium derived from the immediate underlying Battle Spring Formation. The sandstones in this formation generally form lenses or channels that are enclosed by finer clastics. Beds of impermeable, finer clastics are found throughout the stratigraphic interval underlying the mill and tailings impoundment. No fractures, joint patterns or faults have been observed in the vicinity of the tailings impoundment. Results of bores drilled in 1976 and 1982 showed the upper 1.2 to 3.0 m (4 to 10 feet) of soil to contain silty fine sands of the topsoil series. Below this, the soils grade transitionally to poorly-to-moderately-indurated siltstones and sandstones.

2.3.2 Seismicity

The small amount of historical data and the fact that recorded events report only moderate intensities can be at least partially attributed to the sparse population in the area. However, in recent years, a network of seismic recording stations has been established across most of the western United States. This network affords a way of recording and locating seismic activity instrumentally, without relying upon the subjective reports of the general populace. Earthquakes with magnitudes too small for humans to detect are easily recorded on a seismograph, and the frequency of such small earthquakes may indicate the relative seismicity of an area, even within a relatively short period. Although the network has been in existence since about 1960, the low frequency and low magnitude of the earthquakes recorded instrumentally in Wyoming support the historical belief that Wyoming is a relatively quiescent seismic area.

Horizontal accelerations at the site corresponding to two conceptual level maximum credible earthquake magnitudes were determined by the licensee (KUC, 1993b). For the Green Mountain segment of the South Granite Mountains Fault, at a distance of 40 km (24.8 miles) and a magnitude of 6.75, the horizontal acceleration at the site is 0.14 g. For the random earthquake, at a distance of 24 km (14.9 miles) and a magnitude of 6.5, the horizontal acceleration at the site is 0.18 g. The higher of these two values, 0.18 g was used in the conceptual design of the tailings impoundments.

In the "Revised Addendum to the Revised Environmental Report -Regional Seismicity" (KUC, 1996b), KUC revised the methodology to assume that a magnitude 6.25 earthquake occurs 15 km (9.3 miles) from the Site, and took the median ground motion from the Campbell attenuation model, yielding a value of 0.15 g. The Chicken Springs fault was also analyzed. The staff determined that the estimated peak ground acceleration (PGA) of 0.22 g for the Site, from a magnitude 6.5 event 49 km (30.5 miles) away on the Chicken Springs fault system, conservatively estimates the seismic hazard.

2.4 Water Resources

2.4.1 Surface Water

The Great Divide Basin is an internally drained basin defined by a bifurcation of the Continental Divide. The Site lies in the east-central portion of this basin in the ephemeral Battle Spring Draw watershed. The Battle Spring Draw watershed empties into Battle Spring Flat, a playa located approximately 9.7 km (6 miles) southwest of the site.

There is very little surface water in the Great Divide Basin. Some shallow perennial lakes are located a few miles south of the Site in Chain Lakes Flat, which is near the center of the basin. Heavy precipitation can cause some surface flow in draws; however, these flows are infrequent, since average annual precipitation is only about 12.7 to 15.2 cm (5 to 6 inches). No surface drainage leaves the basin.

2.4.2 Ground Water

Hydrogeologic units that occur beneath the Site and vicinity include the following: recent alluvial, windblown, and lake deposits; the Eocene Battle Spring Formation; the Paleocene Fort

Union Formation; and the Cretaceous Lance Formation. These units are classified as aquifers and depending on their hydrologic characteristics, yield ground water to wells and springs. The Battle Spring and Wasatch Formations are the two most important aquifers in the Great Divide Basin.

The Site is located within a closed ground-water system. The low point of this ground-water basin lies within the 1981-m (6500-foot) contour located south and southwest of the site. Ground water moves toward the center of the basin and discharge occurs principally in the playa lakes to the south (Chain Lakes) and southwest (Battle Spring Flat) of the site. Since the Basin is also closed topographically, the discharged water is ponded, and most of this water is lost to evaporation. In addition, there is some discharge from springs near Battle Spring and Chain Lakes Flats. This water is also subject to evaporation.

The Battle Spring Aquifer is recharged mainly by infiltration of precipitation in its outcrop area near the perimeter of the Great Divide Basin. Precipitation may also seep into the aquifer in smaller amounts throughout the basin, especially in areas where sand dunes directly overlie the surface.

Regional wells are completed in either the Battle Spring or Wasatch Formations. The Battle Spring Formation underlies the site and interfingers with the Wasatch Formation southwest of the site. Uses of these aquifers include potable water supplies for industry, stock watering, domestic, and miscellaneous. All non-Kennecott water uses within a 16.1-km (10-mile) radius of the site are for stock watering purposes. These are owned by the Bureau of Land Management (BLM), the State of Wyoming, and private parties. There are no non-Kennecott domestic or potable water supplies down gradient of the Site because the 16.1-km (10-mile) radius circle encompasses the hydrologic low point of the basin, Battle Spring Flat.

2.5 Topography

The Site is located in the east-central portion of the Great Divide Basin, in an area north of the playa and alkali lakes that occupy the topographically lowest part of the basin. The relatively flat surface of the Site is broken by a few low ridges.

This basin is part of the Wyoming Basin physiographic province as defined by Fenneman (1931). The floor of the Wyoming Basin is a plateau marked by elongated ridges and isolated mountains. The Great Divide Basin is an internally drained basin bounded on most sides by major structural uplifts - the Sweetwater Uplift to the north and northeast, the Rawlins Uplift to the east and southeast, the Rock Springs Uplift to the west and the Wind River Uplift to the northwest. To the south, the Great Divide Basin is separated from the Washakie Basin by Laney Rim and Cathedral Bluffs. Elevations in the immediate project area range from 1981 to 2041m (6500 to 6700 feet) above mean sea level. The surface slope is less than one degree - about 12.2 m (40 feet) per mile.

2.6 Demography

The Sweetwater mill is located in Sweetwater County, approximately 68 km (42 miles) northwest of Rawlins, the community most likely to experience socioeconomic impacts from recommenced mill operation. Rawlins is located in Carbon County. Secondarily, Jeffrey City, in Fremont County, Sinclair, in Carbon County, and Wamsutter and Bairoil in Sweetwater County

may be affected by mill operation. Bairoil is the nearest community to the Site, located approximately 36 km (22 air miles) northeast of the Site. The nearest resident is located 28 km (17 air miles) east of the Site. The 1990 census data for communities within 80 km (50 miles) of the site are: Rawlins 9380, Sinclair 500, Wamsutter 240, and Bairoil 228. These four communities are the only ones within 80 km (50 miles) of the site for which census data were provided.

2.7 Land Use

The region where the Site lies is primarily used for livestock grazing, dispersed recreation, wildlife range, oil and gas production, and mineral exploration. The rangeland surrounding the Site supports cattle, sheep, horses, and antelope. The area's climate is harsh for agriculture, with low precipitation and a short growing season. The growing season for Rawlins is approximately 100 days. Soil and climate conditions are not conducive to crop production and will most likely prevent the area from being used for any agricultural purpose except rangeland.

The primary recreational pursuits in the Great Divide Basin consist of hunting and sightseeing. Antelope, sage grouse and, to a lesser extent, mule deer are hunted in the Red Desert area. No numbers are available for area sightseers, but the remoteness of the area from large population centers limits these numbers.

3.0 PROCESS DESCRIPTION

3.1 Mill Circuit

A flow diagram of the generalized Sweetwater mill circuit is provided in this EA as Figure 3.1. Details of the circuit are provided in the figures of Appendix A to Volume VII of the Final Design (KUC, 1997f). During operations, uranium ore and other feed material are delivered to the Site by truck and placed on to the ore pad. Preliminary analyses with a beta scanner or similar type probe will determine the uranium oxide content. Front-end loaders then haul stockpiled ore to the mill grizzly for size sorting. The material that passes through the stationary grizzly will be transported to the semi-autogenous grinding (SAG) mill. The resultant slurry is pumped to a cyclone circuit to separate larger pieces that are returned to the SAG mill for further grinding. The discharge from the cyclone circuit is then pumped to the leach circuit, where the uranium materials are dissolved through the addition of a solution of sulfuric acid and sodium chlorate and steam heat. The discharge from the leach circuit is pumped to a series of six countercurrent decantation thickeners where the uranium-rich (pregnant) acid solution will be separated from the barren tailings in multiple stage thickeners. The tailings are pumped to a double-lined storage impoundment while the uranium-rich solution is filtered and then pumped to a solvent extraction system. The solution passes through a series of stages in which the dissolved uranium is transferred from the aqueous phase to an organic or solvent phase. The uranium is removed from the organic phase by ammonium sulfate and then precipitated by the injection of ammonia gas. The final precipitate, commonly called "yellowcake" (U_3O_8), is washed, calcined (dried under high heat), and packed into 55-gallon steel drums. The finished product will then be shipped to a uranium hexafluoride conversion plant and eventually turned into fuel for nuclear power plants.

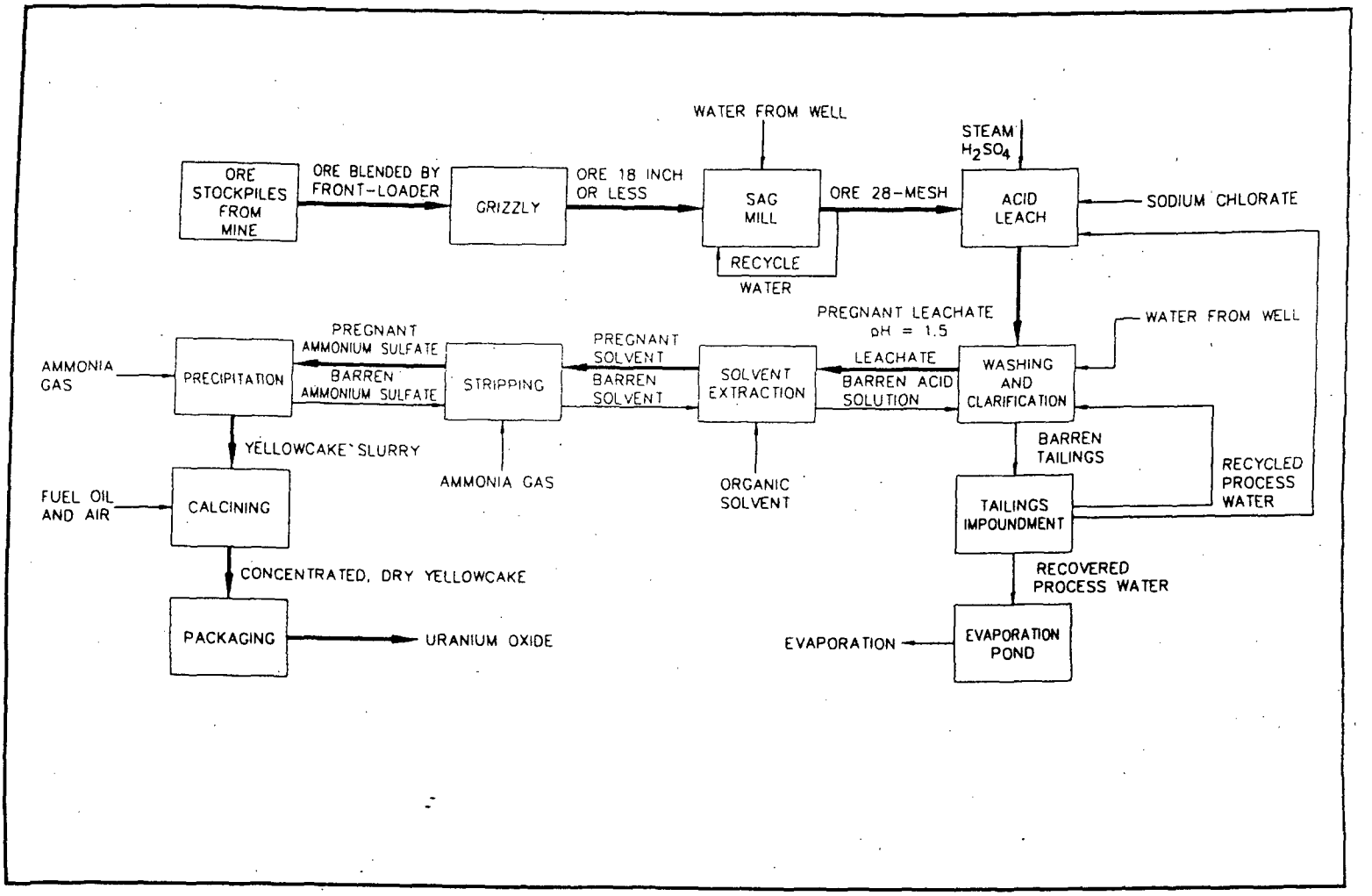

Figure 3.1
Generalized Circuit for the Sweetwater Mill

3.2 Mill Waste Disposal

Mill tailings are deposited within a tailings cell/impoundment located at the facility. The tailings, along with liquid waste, are slurried by pipeline to the impoundment system, which consists of a series of synthetically lined cells that are designed for phase construction and reclamation. The 300-acre impoundment area may contain up to six cells to provide the required adequate disposal capacity for the estimated 20-year project life. The impoundment area will be fenced to keep game animals and livestock out of the tailings impoundment.

Each of the tailings impoundments is designed to accept approximately 3,000 tons of waste per day, but only two impoundments should be in operation at a time. Each new cell will be constructed by excavating 15.2 m (50 feet) deep, and will be surrounded by 15.2-m (50-feet) high engineered embankments. Double liners with clay and composite layers, along with attendant leak-detection/recovery systems will be constructed to retard and collect seepage. A process water recovery system will be constructed on the cell bottom and on the embankment face opposite the discharge lines, at the location of the decant pool. Drains along the cell bottom and side will reduce the seepage potential. Water from the process water recovery system or the surface pump will be sent to a geomembrane-lined surge pond constructed on re-graded tailings in the existing cell for recirculating to the mill and/or evaporation. Discharge into the tailings impoundment will occur from a common center cell wall which will create a gently sloped tailings surface and a drainage divide. As each cell is filled, an additional cell will be constructed. The cover surface and side slope rock is designed to provide erosion protection for the Probable Maximum Precipitation event.

Prior to construction of any new tailings impoundments, the topsoil will be removed from the area and stockpiled for use in future reclamation activities. A diversion ditch for Battle Spring Draw will be constructed around the east edge of the impoundment area. Additionally, a new diversion ditch, lined with riprap, will be constructed to divert storm waters when a new cell is built.

KUC has committed, in its license renewal application, to returning all liquid effluents from the mill process buildings, with the exception of sanitary wastes, to the mill circuit or discharging them to the tailings impoundment. This is currently required by license condition and will continue to be so required. Non-salvageable solid wastes (e.g., filters, pumps) contaminated in the mill process, and which cannot be decontaminated below NRC unrestricted release limits, will be placed in the tailings impoundment. KUC states that void space in such material will be minimized prior to its emplacement in the impoundment.

3.3 Inspections of the Tailings Disposal System

As specified in the current license, a weekly inspection of the tailings shall be performed. During operation of the mill, visual inspections of the tailings system will be conducted during each shift by a qualified engineer or scientist (Appendix F, Volume VII, of the Final Design). Also, instrumentation installed to detect ruptures of tailings discharge and solution return lines will be used during tailings disposal operations to alert staff of problems.

4.0 EVALUATION OF ENVIRONMENTAL IMPACTS

4.1 Introduction

Operation of the mill will directly use about 640 acres of land for mill buildings, one tailings impoundment, and evaporation ponds. During operation and reclamation, effluent releases (e.g. fugitive dust, hydrocarbons, radionuclides) will be maintained at levels as low as is reasonably achievable (ALARA). Tailings, which are produced in large quantities and contained in double-lined tailings impoundments, will be reclaimed at the end of the project, in accordance with the NRC-approved reclamation plan.

Mill operations and reclamation should not have a significant impact on air and water quality. Environmental impacts estimated before the original construction of the facility were assessed (NRC, 1978) and impacts during previous operations (1981-1983) were documented in environmental reports at that time, and in the 1984 license renewal application (MEC, 1984). For example, the licensee indicated that particulate concentrations during operation are maintained below permissible standards and ALARA through prevention, entrapment, and collection. The dust collecting, venting, and fume control systems in the plant are designed to control all possible emissions when the plant is operating. In addition, the cover letter of the 1984 application indicated that environmental and economic impacts of the mining activities are unchanged from those described in the Environmental Report prepared before mill operation.

Environmental monitoring on and near the Site, as required by proposed license conditions 11.5 and 11.6, would alert the licensee to increased radiation levels so that corrective actions could be taken, as required.

4.2 Air Quality Impacts

During operation of the mill, gaseous emissions from process chemicals, fugitive dust, and radon emissions from the ore pad will occur. Gaseous emissions are expected to be mainly from the operation of heavy-duty equipment engine exhaust. The control systems used to minimize emission from the mill are incorporated into the design of the mill process and equipment. The air and gases from vessels will be passed through scrubbers to remove mists, gaseous pollutants, and dust. Gaseous effluent and dust will be discharged from high stacks in order to promote rapid dilution and dispersion.

Fugitive dust is expected to be generated by construction and earth-moving equipment during construction and covering (reclamation) of the tailings impoundment, and from soil cleanup, and by wind erosion from developed areas. Dust and radon levels will be controlled through water spraying, while the other emissions should not exceed regulatory standards. Estimates of airborne radionuclide releases caused by the resumption of mill operations and compliance with regulations were demonstrated by the licensee with the dose modeling codes MILDOS-AREA and COMPLY (Section 5.2.3, Volume VII of Final Design, KUC, 1997f).

4.3 Historical and Cultural Resources

The proposed milling operation and reclamation activities at the Site will affect additional acreage beyond that studied in 1976 for historical and cultural resources, because of the

additional area to be used for construction of tailings impoundments, evaporation ponds, and a diversion channel. Therefore, an archaeological study was undertaken in 1993 to evaluate impacts on historic and prehistoric sites on the area not studied in 1976. The new study area totaled 880 acres. Additionally, 640 acres of land to be impacted by resumed mill operation, and studied in 1976, was reexamined because the state of practice for archaeological studies has improved. A Class III cultural resource inventory, including a literature search, was conducted for a total of 1,520 acres.

The 1993 inventory was executed via a series of zigzag pedestrian transects placed no more than 30 meters (98.4 feet) apart. Special attention was given to areas where subsurface cultural materials may have been exposed due to differential erosion. When a cultural item was observed, the location was marked for subsequent closer examination to determine if the object was an isolated find or if it represented a portion of an archaeological site. When a site limit was defined, an intensive inspection was carried out to locate all visible artifacts and features.

The intensive Class III cultural resource inventory resulted in three new sites, 48SW9827, 48SW9828, and 48SW9829, and five isolated finds. Only one of these sites, 48SW9829, is considered by Pronghorn Archaeological Services to be eligible for inclusion in the National Register of Historic Places. The presence of 53 to 80 cm (20.8 to 31.5 inches) of deposition on this site indicates that this site has potential to contribute additional information important to the prehistory of the area. Small, single component activity areas are critical in understanding the extent of prehistoric land use, settlement patterns, and subsistence strategies of the aboriginal occupants of the area.

The State Historic Preservation Office (SHPO) reviewed Pronghorn's 1993 results and determined that the documentation "meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation," and recommended that additional testing be done on area 48W9829 if it could be impacted by construction activities (SHPO, 1993). The letter indicated that eligibility of the site remain unevaluated until then. In addition, KUC is required by license condition to perform an archeological survey and obtain approval before disturbing any previously unsurveyed areas, and to cease work if buried cultural deposits are unearthed until approval to proceed is granted by the NRC and SHPO.

On March 5, 1998, NRC staff requested BLM consultation on tribal entities to determine the absence or presence of areas of cultural significance to Native American tribes on the Sweetwater Site. The BLM replied on May 13, 1998, that of the four groups contacted, none of the entities responded with an interest in this project.

Based on the license condition and commitments made by the licensee, the NRC staff considers that historical and cultural resources will be protected from destruction or disruption by the proposed activities.

4.4 Impacts to Water Resources

4.4.1 Surface Water Impacts

The NRC staff has determined previously that the operation of the mill and reclamation of the Site will have minimal effects on the surface waters in the site vicinity (NRC, 1978). This has been recently re-confirmed based on the finding that: (1) mill effluents will not discharge to

surface waters; (2) the site will not use any surface water in its milling process; (3) there will be no change in the milling process that would result in a significant change in the environmental impacts at the site; and (4) mill liquid effluents (spills) should not leave the mill area. The licensee will not use any surface water for mill operation or reclamation.

4.4.2 Ground Water Impacts

a. Existing Tailings Impoundment

The existing tailings impoundment has a single 36-mil synthetic liner that leaked several times between 1980 and 1984, and was repaired. Actions were taken to reduce the wave action that led to failure of the liner seams on the sideslopes of the tailings pond. The contamination did not leave the site but did enter the upper aquifer. An NRC-approved ground-water corrective action program is reducing the contaminated plume created by the leaks. The 1998 data from this program indicates that the contamination is in the upper 50 feet of the aquifer, all the hazardous constituents have stabilized below the standards except uranium which is confined to the northern edge of the tailings cell and radium which covers approximately 127 acres, of which nearly half is under the tailings cell. The standards will be met before license termination, and afterwards, DOE, as the site custodian, will continue ground-water monitoring to ensure the standards are maintained.

b. New Tailings Impoundment

Because of new technology and an improved design, ground water in the vicinity of the Site should not be adversely impacted by the resumption of milling operations. The new tailings impoundment will be lined with a layered system composed of two flexible membrane synthetic liners over a three-foot minimum thickness of compacted clay, as specified in Final Design Volumes I (Figure 4-1), IV, and VII (KUC, 1997g,c,f). A leak detection and recovery system installed between the two synthetic liners will be monitored regularly by the licensee. In addition, ground-water monitoring wells will be located immediately down gradient of the tailings impoundment to detect any potential ground-water contamination as early as possible, as required by 10 CFR Part 40, Appendix A, and 40 CFR 264.221.

Management of the tailings impoundment during site operations is also designed to minimize the potential for ground-water contamination. The tailings impoundment is designed to dewater tailings through the use of a process water recovery system (PWRS). The PWRS will be installed above the liner and beneath the tailings, to continually dewater the tailings above the liner. This will further protect ground water by eliminating a hydraulic head in the tailings pile which could enhance infiltration of the tailings fluid into the area surrounding the tailings pile.

Reclamation of the impoundment(s) will provide long-term ground-water protection after Site closure as the final cover will reduce rainfall infiltration to a negligible amount. This will prevent rainfall from becoming a source of leachate and building a hydraulic head that would cause the leachate to move through the tailings.

c. New Evaporation Ponds

The evaporation ponds will also have a dual synthetic liner with leak detection and recovery system, which will be installed on prepared base. Monitoring wells will be located immediately

down gradient, and monitored monthly for the first year then, quarterly after the first year for indicator parameters. This sampling schedule conforms to regulatory requirements, and establishes baseline data for each well in the first year of monthly monitoring. When site operations cease, evaporation ponds will be decommissioned by evaporating all liquid, then disposing of liners and any accumulated solids in the tailings cell.

As discussed in the SER for this licensing action, the staff determined that the operational plan and liner system for both the new impoundments and the new evaporation ponds would be protective and that leakage of contaminants into ground water is unlikely. In the event of any leakage, monitoring would detect the problem so that corrective actions could be taken quickly. In evaluating the operational plan (inspections, monitoring, design), the staff determined that it would comply with NRC ground water regulations.

4.5 Impacts on Ecological Systems

The vegetation on approximately 350 acres will be removed over the proposed 20-year life of the project, because of tailings impoundment, evaporation pond, and diversion channel construction. Most of the Site vegetation consists of Wyoming sagebrush, big sagebrush, grasses, and a variety of forbs and other shrubs. No Federally listed endangered, threatened or candidate plant species are know to occur within the Site area. The Wyoming Natural Heritage Program has noted that only the Wyoming point-vetch (*Oxytropsis nana*), has a recent record of occurrence in the vicinity of the Site. The Wyoming point-vetch has been classified as S3, which signifies rare or local throughout its range, or found locally in a restricted range. This plant has been found approximately 11 km (7 miles) northwest of the mill site, and should not be disturbed by the proposed operations.

The ER indicates that the wildlife ecology data was updated in 1993 and included an on-site survey. The survey data covers the area within a 40-km (25-mile) radius of the Site. An October 1993 field survey was performed in order to evaluate the presence of a prairie dog community near the existing tailing impoundment. Another wildlife survey was done in 1997 (KUC, 1998c).

Large wild and domestic animals occurring on or near the survey area include: pronghorn antelope, cattle, feral horses, and sheep. The pronghorn antelope (*Antilocaprac americana*) use the area seasonally and utilize sagebrush-grasslands. The survey indicated that approximately 400 and 8000 antelope remained in the Site area during the relatively mild winter of 1975 and 1976. However, antelope migrated out the area to crucial winter ranges further south and east during the severe winter of 1983-84. Pronghorn disperse widely during the summer months. A study concluded that operation of the facility during 1980 through 1983 had no measurable impacts on pronghorn antelope, and, therefore, no mitigative actions were deemed necessary. The other large mammals are less numerous and seldom approach the Site, so they should not be adversely affected by mill operation or reclamation.

Other mammals known to be in the general Site area are: seven species of small rodents, two rabbit species, coyotes, badgers, and long-tailed weasels. These animals are not expected to be adversely impacted by Site operations. Additionally, prairie dog towns were not evident within 8 km (5 miles) of the Site. Various bird species traverse the Site and the most abundant raptor species in the region is the ferruginous hawk (see discussion below). Sage grouse have also been noted within 8 km (5 miles) of the Site. A few reptiles and amphibians occur in the

general region, but there is little riparian vegetation and permanent water in the area which restricts the habitat for most of these species.

Three wildlife species, designated as endangered by the Endangered Species Act of 1973, as amended, have been identified by the U.S. Fish and Wildlife Service (FWS) as having the potential to occur in the vicinity of the Site. Theses species are the black-footed ferret (*Mustela nigripes*), bald eagle (*Haliaeetus leucocephalus*) and the peregrine falcon (*Falco peregrinus*). The back-footed ferret is exclusively associated with prairie dog towns, however, there is a marked absence of large active towns, in the general Site area. The bald eagle is known to winter within the Great Divide Basin, although no known observations have been recorded at the Site. Due to the lack of open water and potential roosting trees around the Site, bald eagles are unlikely to utilize the area, except during occasional flyovers. The peregrine falcon is also known to nest within the general region, although no observations have been recorded at the site for this species either. Due to the lack of high cliff areas within the mill region, the peregrine falcon is unlikely to nest in the area, but may occasionally cover the region in search of prey.

Certain wildlife species that may exist in the Site area and have been designated as candidate species under the Endangered Species Act were also considered. There has been no evidence of nesting trumpeter swans, white-faced ibises, harlequin ducks, or black terns. Because of a lack of suitable habitat requirements in the mill area, it seem unlikely that these species will occur. However, the ferruginous hawk, mountain plover, long-billed curlew, and loggerhead shrike have all been observed nesting in the general region. The ferruginous hawk is a common summer resident of the region. Seven observations of the hawk were documented within 8 km (5 miles) of the mill between 1988 and 1991 and ferruginous hawk nests have been found within 16 km (10 miles) of the mill. Circumstantial evidence of nesting by the long-billed curlew has been found in the region, although no nesting has ever been documented. Mountain plover and loggerhead shrike nests have been sited also in the region, however, no currently known active loggerhead shrike or mountain plover nests will be affected by mill operation or reclamation.

The 1997 study concluded that no threatened, endangered, or candidate species were found on the Site during the survey and no documentation of occurrence of any of these species on the Site was found in the records of the Wyoming Game and Fish Department.

4.6 Radiological Impacts

KUC has proposed to define two modes of activity at the mill: (1) "operational" and (2) "interim" or "standby." The operational mode is defined as any time the mill is in the normal commercial production of yellowcake, as contrasted with the interim mode which occurs when no yellowcake is produced for a period of 90 days or more. In examining potential radiological impacts, the NRC staff has chosen to address these modes separately in the following discussion. Ground-water sampling is required, as specified for each mode of operation, by license condition.

4.6.1 Operational Mode

Radiological impacts from the previous operation were evaluated (NRC, 1992) and estimated potential doses to the public were a small fraction of background which is approximately

212 mrem/yr whole body, for the region. Results from NRC-specific MILDOS-AREA dose modeling (based on expected ore grade from the Green Mountain mine), including radon, indicated effective whole body doses to the nearest resident of no more than 0.23 mrem/year; and to residents of Bairoil, the nearest community, of 0.24 mrem/year as a result of the resumption of mill operations. The effective doses in Bairoil are slightly higher due to the direction of the prevailing winds. The above-mentioned values are less than 0.25 percent (0.0025) of the corresponding 10 CFR 20 standard of 100mrem/year and about 0.14 percent (0.0014) of regional background radiation. Therefore, it can be concluded that the resumption of the mill operations, using the higher ore grade, will not result in the nearest resident or the nearest community being subject to radiation that exceeds the regulatory standard or is significantly different than background radiation.

The NRC staff has reviewed KUC's proposed operational monitoring program against the staff's recommendations in Regulatory Guide 4.14 (1980a) and considers the program acceptable. In addition, KUC will need to comply with the U.S. Environmental Protection Agency's (EPA) requirements under 40 CFR 61.252 to keep radon-222 emissions from its mill tailings pile from exceeding 20 pCi/m^2-s of radon-222.

4.6.2 Interim/Standby Mode

During the years since the 1992 EA examined potential impacts, the semi-annual effluent monitoring results and annual ALARA Audit Report indicate that the licensee has maintained potential radiation exposure levels to a reasonable level below the regulatory limits. During the current standby mode, KUC has not conducted, performed, or measured stack, surface water, soil, or vegetation samples. In addition, airborne particulate sampling is at a single location downwind of the tailings impoundment and ore stockpiles. Samples are collected semiannually and analyzed for U-nat, Ra-226, Th-230, and Pb-210. This approach has been approved by NRC staff. This level of monitoring is also considered adequate for the reclamation mode of activity.

4.6.3 Radiological Assessment

a. Off-site Impacts

The radiological impacts from milling operations at the Sweetwater site have been previously estimated (NRC, 1978) and documented in the monitoring reports during and after operation of the mill. The ground water contamination resulting from the tailings pond leakage in 1984, has not migrated off-site and the plume is maintained within 213.4 m (700 feet) of the impoundment and in the upper 80 km (50 feet) of the aquifer by pumping the water to the tailings impoundment (KUC, 1999b). The air monitoring samples for radionuclides indicate levels at a small fraction of the regulatory limits. The air sample location is on site, therefore, it is anticipated that radiation levels at the Site boundary approach background. During mill operation and reclamation, potential off-site radiation doses will be monitored and action would be taken if any radiation levels approach the regulatory limits.

b. Radiological Impact on Biota Other than Humans

Although no guidelines concerning acceptable limits of radiation exposure have been established for the protection of species other than man, it is generally agreed that the limits for humans are also conservative for other species. Doses from gaseous effluents to terrestrial biota (such as birds and mammals) are quite similar to those calculated for man and arise from the same dispersion pathways and considerations. Because the effluents of the facility will be monitored and maintained within safe radiological protection limits for man, no adverse radiological impact is expected for animals residing on or near the Site.

4.7 In-Plant Safety

The office, shop, and mill buildings have 9-kg (20-pound) portable, dry chemical fire extinguishers and all vehicles are equipped with 1.1- to 4.5-kg (2.5- to 10-pound) portable, dry chemical fire extinguishers. There are two 68-kg (150-pound) portable, dry chemical extinguishers also on site. An over-tank sprinkler system capable of foam injection is installed in the solution extraction building. Fire hydrants with 76 m (250 feet) of hose are installed every 183 m (600 feet) around the mill area. Additionally, there are fire hydrant hose stations internally in most project buildings.

An on-site Radiation Safety Officer (RSO) is part of the facility staff. A safety engineer will also be included on the staff during mill operation. At least one person trained in first aid will also be present during each work shift. The office building contains a first aid treatment room, and an ambulance is maintained on-site at all times.

The NRC, through 10 CFR Part 20 and license conditions, requires a radiological safety program that contains the basic elements needed to assure that exposures are kept ALARA. A revised radiation safety program was submitted March 13, 1994, and approved by the NRC by letter of April 18, 1994. The program includes requirements for:

- Qualified management of the radiation safety program and appropriate training of personnel;
- Written radiation procedures;
- Airborne and surface contamination sampling and monitoring;
- Internal and external radiation monitoring programs;
- An approved respiratory protection program; and
- Daily inspections of process areas and weekly inspections of general radiation control.

Also, by license condition, an annual ALARA audit report will be submitted to the NRC. The NRC considers that the proposed KUC program for in-plant safety will meet the required Federal regulations, and the radiation safety program as defined by 10 CFR Part 20. The licensee has also submitted a Radiation Protection Program for Decommissioning (KUC, Section 12 of Volume VI, Part 2, June 9, 1999). The NRC evaluation of the licensee's radiation safety program is discussed more fully in the SER.

4.8 Socioeconomic Impacts

The primary negative impact likely to occur would be due to the increased truck traffic associated with mill operations. The positive effects for the area would be an increase in jobs and tax revenues. Because there are no near-by residents, there is no one to be affected by the noise or visual impacts of proposed activities.

5.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS

5.1 Failure of Storage Tanks and Piping

At the mill, tanks are used to store a variety of industrial chemicals, process fluids, and slurries, as well as flammable liquids. Various systems have been implemented to contain or direct routine or unplanned spillage. Tanks which are most likely to overflow are equipped with high-level alarms (alarm sounds in the control room) to reduce the possibility of spillage due to tank overflow. Spills resulting from the failure of any chemical holding tank would first be contained by engineered dikes or curbs and mill sumps. If the volume was too great, such as that from a rupture in one or more of the large production tanks, flow would be captured by the catchment basin.

Minor pipe or tank leakage of uranium-bearing slurries and solutions can occur at the acid leach, washing and clarification, and solvent extraction stages of the mill circuit. Human error, during the filling or emptying of tanks or the failure of valves or piping in the circuit, would result in spills which may occur periodically during operation of the mill. The entire content of any spill will be contained within the mill sumps or diked area, and would not leave the mill building. Any spillage which may occur will be pumped back into the process system.

5.2 Fires and Explosions

The solvent extraction (SX) circuit is located in a separate building and can hold up to approximately 3038.5 kg (6,700 pounds) of uranium at a time, assuming an ore grade of 0.2 percent U_3O_8. Approximately 47,312.5 L (12,500 gallons) of kerosene are contained in the SX circuit and this kerosene represents the greatest potential for a serious fire at the Site. The SX building is equipped with an automatic sprinkler system capable of foam injection, and 13.6-kg (30-pound) portable foam fire extinguishers are spaced at 15.2-m (50-foot) intervals around the area. Safety precautions are in place to ensure that a fire in one of the process tanks would be contained before other tanks are damaged. Smoke generated by a fire would be released to the atmosphere through air vents in the top of the building.

Fire is not expected to cause significant impact beyond the NRC permit area. The short-term release of smoke, soot, and unburned hydrocarbons would decrease air quality and potentially cause some damage to vegetation within the immediate vicinity of the plant, but the effects would be minimal in nature due to wind dispersion. The conservative release estimate dose is approximately 0.25 mSv/yr (25 mrem/yr).

The consequences of explosion accidents are limited by the concentration of yellowcake that can be maintained in the air of the enclosed yellowcake dryer room. The quantity of yellowcake that could be released from the room is estimated to be approximately 1 kg (2.25 pounds).

Individuals at the closest residence (28 km) could receive a 50-year committed dose to the lungs and whole body of approximately 4.9×10^{-3} and 3×10^{-6} mSv (0.49 and 3×10^{-4} mrem), respectively. These values are significantly below the dose standards.

5.3 Centrifuge Failure

Prior to drying, the thickened yellowcake slurry will be dewatered by use of a centrifuge. If the centrifuge rotor fails, it could conceivably penetrate a tank containing uranium solution or slurry, releasing radioactive materials into the interior of the mill building. The entire contents of a tank, however, will be contained within sumps and will not leave the mill building

5.4 Tailings Impoundment System Accidents

At the average estimated processing rate, approximately 125 tons per hour of sand, silt and clay-sized particles will be transported to the tailings cells through the tailings disposal system piping. A rupture in the main tailings delivery pipe between the mill and operating tailings cell would release material within containment berms then into sumps for reentry into the mill process circuit, or the slurry would be pumped to the tailings cell. The tailings will be pumped into an impoundment through multiple discharge laterals. The flow of any material released from the rupture of one these laterals will be toward the interior of the tailings impoundment, where it will be contained along with the existing tailings material.

The potential for seismic and flood damage to the tailings dam has been addressed in the Operational Plan and the Reclamation Plan for the Site and the impoundment design has been determined acceptable by NRC staff. A diversion channel will be built, designed for the probable maximum precipitation event, to protect the tailings impoundment dams for up to 1000 years.

A worst case scenario was used (NRC, 1980b) in assessing the potential radioactive release from a tornado strike. It was assumed that 3 days of yellowcake production at average throughput rates and an ore grade of 0.2 percent U_3O_8 (11,160 lbs/day of yellowcake x 3 days = 33,480 pounds) is not packaged in containers; an inventory of 50 tons of yellowcake is on site when a tornado strikes; and 15 percent of the contained material is released. Thus it is assumed that the tornado lifts about 21,986 kg (48,480 pounds) of yellowcake. Further, it is conservatively assumed that all of the yellowcake is in a respirable form, and that all of the material is entrained as the vortex passes over the Site.

The maximum exposure was predicted at approximately 4 km (2.5 miles) from the mill, where the 50-year committed dose to the lungs of an individual is estimated to be 1.6×10^{-5} mSv (1.60×10^{-3} mrem). For individuals at the closest residence to the Site, the 50-year committed dose was estimated to be 6.6×10^{-7} mSv (6.6×10^{-5} mrem), assuming the wind is directed that way. These values are significantly lower that the 40 CFR Part 190 standard for nuclear fuel cycle facilities (25 mrem annual dose equivalent), or the 10 CFR Part 20 50-year dose commitment limit.

5.5 Transportation Accidents

Transport of ore to the mill was not addressed in the ER because that aspect is not regulated by NRC. However, a truck accident along that route could contribute a minor, temporary environmental impact. The larger pieces of ore spilled during an accident can be found and retrieved. The ore fragments and dust would create small and very localized areas of elevated radiation and the effort to clean the area would be directed by the State.

During transport of the uranium product from the mill, an accident could occur in which some of the uranium oxide (U_3O_8) would be released. This is the only radioactive material expected to be transported from the Site. Because most of the radioactive decay products of uranium will have been removed in the extraction process (note: there are 14 isotopes in the uranium-238 decay chain), and because of the very slow regrowth of the gamma emitting decay products, the uranium oxide will have a very low level of radioactivity. Under the regulations of the U.S. Department of Transportation, uranium oxide is classified as low specific activity material (49 CFR Part 173, Sections 173.389C and 173.392).

The product will be packed into steel drums to a net weight of approximately 408 kg (900 pounds) and then shipped to customers. The drums will be sealed and marked as per the requirements of 49 CFR Part 173. The extent of the environmental impact of a transportation accident involving the product would be very small. Even in the case of a severe accident, only a few drums are likely to be breached. The material has a very high density (approximately 7 g/cm^3) and is not easily dispersed.

The vehicles transporting the product will be properly marked for the shipment of radioactive material. Carriers will only be used that have Spill Prevention Control and Countermeasures (SPCC) plans, trained drivers, and special procedures for transporting yellowcake.

6.0 RECLAMATION AND DECOMMISSIONING

Ground water restoration will continue to be conducted under the Corrective Action Program, as authorized by the NRC license. Mill decommissioning and tailings area reclamation are governed by NRC regulations and descriptions of these proposed activities for the Site were provided in the Final Design (KUC, 1997-1999). The Design (including the Decommissioning Plan) has been evaluated and the NRC review will be documented in a Technical Evaluation Report. Other associated Site reclamation and restoration activities for the pit and overburden pile and associated mining disturbances are regulated by the Wyoming DEQ and are not addressed in this EA.

The purpose of mill decommissioning and tailings area reclamation is defined by 10 CFR 40, Appendix A, which establishes the objective of permanent isolation of tailings and associated contamination, and to do so without ongoing maintenance. The proposed reclamation at the Site will:

- provide reasonable assurance of 1000-year control of radiological hazards,
- minimize wind and water erosion potential for the impoundment(s),

- provide a reclamation cover which will limit radon emanation, infiltration, and erosion to acceptable levels,
- ensure that reclamation measures are undertaken in a timely fashion,
- include a post-closure monitoring plan, and
- provide financial surety for decommissioning and reclamation.

Contaminated equipment will either be: 1) decontaminated so that it meets the requirements of release for unrestricted use; 2) sold or otherwise transferred to another licensee authorized to accept contaminated equipment; 3) placed for disposal in the tailings impoundment; or 4) placed for disposal in another impoundment authorized to accept 11(e)2 byproduct material. Contaminated buildings that do not meet the release requirements will be: 1) decontaminated and/or remediated so that they meet the unrestricted release requirements; 2) dismantled and placed for permanent disposal in the tailings impoundment; 3) transferred to another licensee authorized to accept contaminated materials; or 4) placed for disposal in another impoundment authorized to accept 11(e)2 byproduct material. Cleanup of contaminated soils in the mill vicinity will be conducted as per Criterion 6(6) of Part 40, Appendix A.

The impacts from the planned decommissioning of land and buildings and the reclamation of the impoundments have been addressed in previous sections of this EA. In summary, significant or long-term impacts should not occur off-site. On-site restoration will be performed to include regrading and seeding disturbed areas.

7.0 ALTERNATIVES

The action under consider action is the renewal of Source Material License SUA-1350, for restart of operations at the Sweetwater mill, as requested by KUC. The alternatives available to the NRC are to:

(1) Renew the license with such conditions as are considered necessary or appropriate to protect public health and safety and the environment; or

(2) Deny the renewal of the license.

If the existing mill were not used to process the ore from the Jackpot Mine, the potential environmental impacts discussed above would be avoided. On the other hand, to deny the renewal for operation would prevent the creation of an estimated 79 direct and indirect jobs within Fremont, Sweetwater, and Carbon Counties. It would also result in a loss of at least $755,200 per year in tax revenues.

Uranium is the only fuel used for the generation of nuclear power. It is estimated that United States (U.S.) utilities inventories of uranium oxide decreased by 2.2 million pounds or 3 percent, and U.S. supplier inventories decreased 15 percent in 1997. The United States produced a total of 8.1 million pounds of U_3O_8 equivalent in 1997, and this represents only 19 percent of the amount received by U.S. utilities (DOE, 1998). Of this national production, 14 percent came from conventional uranium mills. For the years 2002 through 2007, the utilities' reported

enrichment deliveries are less than their anticipated market requirements (DOE, 1998). Based on this projected demand for uranium and the current national production levels, it is quite possible that a long-term shortage of yellowcake (uranium oxide) could develop within the U.S. in the coming years.

Based on its review of the information identified in Section 1.3.2, the NRC staff has concluded that the environmental impacts associated with the proposed actions do no warrant denial of the license renewal. It is the staff's conclusion that the impacts associated with the license renewal and reclamation plan are within the realm of impacts anticipated in the FES (NRC, 1978). Additionally, in the SER prepared for this action, the staff has reviewed the licensee's proposed action with respect to the criteria for license issuances specified in 10 CFR Part 40, section 40.32, and has no basis for denial of the proposed action.

8.0 FINANCIAL SURETY

Under 10 CFR Part 40, Appendix A, Criterion 9, licensees are required to establish a financial surety adequate to cover the estimated cost for: (1) decommissioning and decontamination of the mill and mill site; (2) reclamation of any tailings or waste disposal area; (3) ground water restoration, as warranted; and (4) the long term surveillance fee.

The surety is based on an estimate which must account for the total cost that would be incurred if an independent contractor were contracted to perform the reclamation and decommissioning work. The surety estimate must be approved by NRC and be based on an NRC-approved decommissioning and reclamation plan. The licensee must also provide the surety arrangement through a financial institution acceptable to the NRC. The licensee's surety mechanism will be reviewed by NRC annually to assure that sufficient funds are available to complete reclamation. Additionally, the amount of the surety should be adjusted annually to recognize any increases or decrease in liability resulting from inflation, changes in engineering plans, or other conditions affecting cost. The licensee will be required by license condition to maintain a financial surety arrangement in accordance with the requirement of Criterion 9.

The revised 1999 annual surety for the Sweetwater mill was reviewed by NRC staff. The amount includes funds to decommission the existing facility, complete ground-water restoration, and reclaim the existing impoundment. As required by License Condition 9.7 in the renewed license, the surety amount will be increased within three months of NRC approval of the cost estimate. For the new structures (impoundment, ponds) proposed to support renewed operation of the mill, the estimated amount for their reclamation, as approved by NRC, will be provided in the surety bond before commencement of construction of these structures.

9.0 CONSULTATION WITH AFFECTED FEDERAL AND STATE AGENCIES

As documented in the references, the NRC staff contacted representatives of the EPA, BLM, FWS, the Wyoming Fish and Game Department, the Wyoming State Historic Preservation Office, and the Wyoming DEQ regarding the proposed restart of the mill and eventual reclamation of the site. Any comments received from these agencies were adequately addressed. The licensee also contacted Federal, State, and county agencies during development of the ER. In addition to these agencies, the staff also consulted the Wyoming Outdoor Council to determine if additional concerns needed to be addressed in this EA.

10.0 FINDING OF NO SIGNIFICANT IMPACT

KUC has applied to NRC to renew Source Material License SUA-1350 to authorize the resumption of operations at the Sweetwater uranium mill, located in Sweetwater County, Wyoming. The NRC staff has reexamined actual and potential environmental impacts associated with yellowcake production at the mill site, and has determined *that* renewal of the source material license (1) will be consistent with requirements of 10 CFR Part 40; (2) will not be inimical to public health and safety; and (3) will not have long-term detrimental impacts on the environment.

Therefore, based on an evaluation of KUC's renewal request, the NRC staff has determined that the proper action is to issue a FONSI in the Federal Register. The following statements support the FONSI and summarize the conclusions resulting from the staff's environmental assessment:

- An acceptable environmental sampling program will be in place to monitor effluent releases and to detect if appropriate limits are exceeded;

- The licensee will implement an intensive, routine inspection program of the mill process building, associated facilities, and tailings retention impoundments, and conduct an annual ALARA audit program;

- Standard operating procedures will be in place for all operational process activities involving radioactive materials that are handled, processed, or stored;

- Mill tailings and process liquid effluents from the mill circuit will be discharged to a double-lined tailings impoundment, with a leak detection system;

- The licensee will implement an acceptable ground-water detection monitoring program to ensure compliance with the requirements of 10 CFR Part 40, Appendix A;

- The licensee will conduct site decommissioning and reclamation activities in accordance with NRC-approved plans; and

- Because the staff has determined that there will be no significant impacts associated with approval of the license renewal and reclamation plan amendment, there can be no disproportionately high and adverse effects or impacts on minority and low-income populations. Consequently, further evaluation of `Environmental Justice' concerns, as outlined in Executive Order 12898 and NRC's Office of Nuclear Material Safety and Safeguards Policy and Procedures Letter 1-50, Rev.1, is not warranted.

Based on these findings, the NRC staff recommends that KUC's license for the resumption of yellowcake production at the Sweetwater uranium mill be renewed. The source material license shall be based upon the licensee's renewal application, this EA, the SER, and the license conditions which address environmental issues.

1.0 CONCLUSION AND ENVIRONMENTAL LICENSE CONDITIONS

Upon completion of the environmental review of KUC's application for renewal of Source Material License SUA-1350, the NRC staff has concluded that operation and reclamation of the Sweetwater uranium mill, in accordance with the following conditions to be included in the renewed source material license, is protective of health, safety, and the environment, and fulfills the requirements of 10 CFR Part 51. Therefore, the NRC staff recommends renewal of SUA-1350 for operation, subject, in part, to the following conditions:

1. The mill production rate shall not exceed 4,100,000 pounds of yellowcake per year.

2. A. The licensee may, without prior NRC approval, and subject to the conditions specified in Part B of this condition:

   (1) Make changes in the facility or process, as presented in the application.

   (2) Make changes in the procedures presented in the application.

   (3) Conduct tests or experiments not presented in the application.

   B. The licensee shall file an application for an amendment to the license, unless the following conditions are satisfied.

   (1) The change, test, or experiment does not conflict with any requirement specifically stated in this license, or impair the licensee's ability to meet all applicable NRC regulations.

   (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan.

   (3) The change, test, or experiment are consistent with the conclusions of actions analyzed and selected in this EA.

   C. The licensee's determinations concerning Part B of this condition, shall be made by a "Safety and Environmental Review Panel (SERP)." The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have responsibility for implementing any operational changes; and, one member shall be the corporate radiation safety officer (RSO) or equivalent, with the responsibility of assuring changes conform to radiation safety and environmental requirements. Additional members may be included in the SERP as appropriate, to address technical aspects such as health physics, ground water hydrology, surface-water hydrology, specific earth sciences, and other technical disciplines. Temporary members or permanent members, other than the three above-specified individuals, may be consultants.

D. The licensee shall maintain records of any changes made pursuant to this condition until license termination. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining changes are in compliance with the requirements referred to in Part B of this condition. The licensee shall furnish, in an annual report to NRC, a description of such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit to the NRC changed pages to the Operations Plan and Reclamation Plan of the approved license application to reflect changes made under this condition.

3. Standard operating procedures (SOPs) shall be established and followed for all operational process activities involving radioactive materials that are handled, processed, or stored. SOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. Operational SOPs will be available for the pre-operational inspection. Additionally, written procedures shall be established for non-operational activities to include in-plant and environmental monitoring, bioassay analyses, and instrument calibrations. An up-to-date copy of each written procedure shall be kept in the mill area to which it applies.

   All SOPs (both operational and non-operational activities) shall be reviewed and approved in writing by the RSO before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the RSO shall perform a documented review of all existing operating procedures at least annually.

4. The licensee shall have an archeological survey performed prior to disturbing any previously unsurveyed areas. Such surveys shall be submitted to the NRC and the State Historic Preservation Office (SHPO) for review and approval. No such disturbance shall occur until authorization to proceed has been granted by NRC and SHPO. In addition, all work in the immediate vicinity of any buried cultural deposits unearthed during the disturbance of land shall cease until approval to proceed has been granted by the NRC and SHPO.

5. All liquid effluents from mill process buildings, with the exception of sanitary wastes, shall be returned to the mill circuit or discharged to the tailings impoundment.

6. Upon resumption of milling operations, the licensee shall implement a ground-water detection monitoring program for the tailings impoundment and evaporation ponds to ensure compliance with 10 CFR 40, Appendix A, in accordance with the "Addendum to the Revised Environmental Report, Background Ground Water Quality and Detection Standards," January 1996, as revised by the submittals of January 8, 1998, and March 25, 1999. The licensee shall conduct an environmental monitoring program in accordance with on-file standard operating procedures for environmental monitoring (Environmental Procedures, EPs), and in accordance with Table 5-2 of the Final Design Volume VII, submitted as a page change March 25, 1999.

7. During the period of mill standby, the licensee shall conduct an environmental monitoring program in accordance with on-file standard operating procedures for environmental monitoring (Environmental Procedures), and in accordance with Table 5-1 of the Final Design Volume VII, submitted as a page change March 25, 1999.

8. The licensee shall conduct a corrective action program (CAP) with the objective of returning the concentrations of chromium, natural uranium, and combined radium-226/228 to the levels referenced in "Addendum to the Revised Environmental Report, Background Ground Water Quality and Detection Standards," January 1996, as amended January 8, 1998, and approved by the NRC May 28, 1998.

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