

**SAFETY EVALUATION REPORT  
REVIEW OF REQUEST FOR PAGE CHANGES TO THE TECHNICAL REPORT,  
SURETY UPDATE, AND THE ADDITION OF TWO VACUUM DRYERS  
LOST CREEK ISR, LLC LOST CREEK PROJECT  
SWEETWATER COUNTY, WYOMING**

**Docket No.:** 40-9068

**License No.:** SUA-1598

**Date:** April 18, 2013

**Facility:** Lost Creek Project

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## **1.0 Summary and Conclusions**

Lost Creek ISR, LLC (LCI) submitted an application for a source materials license to operate the Lost Creek Project uranium in situ recovery (ISR) facility in Sweetwater County, Wyoming, in a letter dated March 20, 2008, and submitted page changes to the technical report in a letter dated April 22, 2010 (LCI, 2008; LCI, 2010a). The U.S. Nuclear Regulatory Commission (NRC) issued source material license, SUA-1598, on August 17, 2011 (NRC, 2011e). Prior to NRC issuance of the license, LCI submitted clarification and additional page changes to the technical report in letters dated November 11, November 16, and December 3, 2010 (LCI, 2010b; LCI, 2010c; LCI, 2010d). These changes involved the meteorology station, use of a designee for daily inspections, and the decommissioning plan and were not included in the NRC staff's safety evaluation report (SER) that supported issuance of the license (NRC, 2011d).

Subsequent to issuance of the license, LCI submitted several requests to remove several preoperational license conditions, update its surety, increase its annual production rate, the operation of two yellowcake dryers, and shipment of dried yellowcake in addition to the option of shipping yellowcake slurry (LCI, 2011b; LCI, 2012a; LCI, 2012b LCI, 2012h; LCI, 2013a). The NRC staff's review included preparation of this SER and an Environmental Assessment (EA) (NRC, 2013). This SER addresses the following:

- 1 Page changes to the technical report in Sections
  - a 2.5 Meteorology
  - b 5.4.3.2 Designee
  - c 5.5 Radiation Safety Training
  - d 6.0 Groundwater Quality Restoration, Surface Reclamation, and Facility Decommissioning
  - e 6.2 Plans and Schedules for Groundwater Quality Restoration
  - f 6.5.1 Determination of Site Soil Cleanup Criteria
- 2 If site specific meteorology data is representative of long-term conditions

- 3 The qualifications and training of the health physics designee
- 4 Additional supporting information for the decommissioning plan
- 5 The addition of two yellowcake vacuum dryers and the subsequent shipment of vacuum dried yellowcake as an additional option to shipping yellowcake slurry
- 6 Increase annual production rate to the equivalent of 909,000 kg (two million lb) of dried yellowcake
- 7 Revised surety estimate of \$1,747,878
- 8 Removal of preoperational license conditions (LC) 12.6, 12.8, and 12.13, which required the licensee to submit a copy of the solid byproduct material disposal agreement, collect meteorological data, and submit a revised decommissioning, decontamination, and reclamation plan.
- 9 Clarification in several license conditions to ensure compliance with 10 CFR Parts 20 and 40.

This SER presents the results of the NRC review of the proposed actions and the potential safety impacts on operations at the Lost Creek Project. Based on its review, the NRC staff concludes that the proposed action satisfies the requirements of 10 CFR 40.32(c), which requires that the licensee's equipment, facilities, and procedures be adequate to protect health and minimize danger to life or property; and 10 CFR Parts 20.2202 and 20.2203, which define response program requirements for radiological accidents. Therefore, in accordance with 10 CFR 40.32(d), the staff finds that issuance of an amendment to Source Materials License SUA-1598 that removes three preoperational license conditions, and allows LCI to operate two vacuum dryers, increase production rate to 909,000 kg (two million lb) per year, and ship dried yellowcake, as well as yellowcake slurry and resins, will not be inimical to the common defense and security or to the health and safety of the public.

## **2.0 Background**

LCI is currently constructing the Lost Creek Project ISR facility in northeastern Sweetwater County, which is located in south-central Wyoming. The Lost Creek Project is comprised of approximately 1,707 hectares (ha) (4,220 acres (a)), and located on public land administered by the Bureau of Land Management (BLM) and the State of Wyoming. Although, the NRC issued Source Materials License SUA-1598 in August 2011 (NRC, 2011e), and the State of Wyoming Department of Environmental Quality (WDEQ) approved a Permit to Mine in October 2011, LCI could not begin construction until the BLM approved LCI's Plan of Operations. The BLM issued the Record of Decision (ROD) in October 2012, approving LCI's Lost Creek Project, which was the final regulatory requirement needed to begin construction at the licensed area. The WDEQ and the US Environmental Protection Agency (EPA) approved an aquifer exemption authorizing LCI to conduct injection activities in the production well fields and the WDEQ issued the permit to install and operate Class I water disposal wells.

LCI is constructing mine units using patterns of wells that consist of four corner injection wells and one central production well (5-spot pattern). Buried pipelines will transfer lixiviant between the mine units and the processing plant. Pipes will connect small groups of injection and production wells to header houses, where LCI will add oxygen or hydrogen peroxide as oxidants to the injection fluid. LCI will add carbon dioxide to the injection solution at the processing plant or the header houses and plans to use a carbonate/bicarbonate lixiviant to maximize efficiency

of uranium recovery and reduce reactions with other minerals. The licensee designed the plant to process 22,712 liters per minute (Lpm) (6,000 gallons per minute (gpm)) of lixiviant through an ion exchange (IX) circuit and process 909,000 kg (two million lb) per year of yellowcake slurry from the elution and precipitation circuits. The licensee designed the elution circuit to accept equivalent feed as defined in NRC Regulatory Issue Summary (RIS) 2012-06 (NRC, 2012f). The processing plant in the original license application did not contain a dryer, thus the license approved the product of the ISR as yellowcake slurry that LCI will ship offsite to a licensed facility for further processing. LCI estimated that it would produce approximately 455,000 kg (1 million lb) of yellowcake ( $U_3O_8$ ) per year for a period of at least eight years.

The NRC's supplemental environmental impact statement (SEIS) (NRC, 2011c) was generally prepared for an ISR facility designed to produce up to 909,000 kg (two million lb) equivalent of dried yellowcake product per year. However, because LCI described its average estimate of 455,000 kg (one million lb) of yellowcake per year in several parts of the document, the SEIS addressed the potential environmental impacts associated with only that amount for the following resource areas: Transportation, Groundwater, Air Quality, Public and Occupational Health, and Waste Management. Because the SEIS did not address all potential environmental impacts associated with a production rate of 909,000 kg (two million lb) per year and the public did not have an opportunity to comment on the expanded impacts before the SEIS was published, the NRC issued the license with a maximum production rate of 455,000 kg (one million lb) per year. The license condition limits the facility throughput to an average daily flow rate equivalent to 6,000 gallons per minute or a maximum instantaneous flow rate of 6,300 gallons per minute, excluding restoration flow. The licensee intends to increase production at the facility by accepting yellowcake slurry or resins from its future satellites and other facilities. LCI has not requested a license amendment to increase the flow rate at the Lost Creek Project. The licensee is requesting that the license be changed to allow the operation of two vacuum dryers and the subsequent shipment of dried yellowcake as an additional option to the shipment of yellowcake slurry. This additional option will allow the licensee to continue to process yellowcake slurry and ship the slurry to another licensed facility and avoid a shutdown in the event that its dryers are not operational. The annual production of yellowcake slurry shall not exceed two million pounds equivalent of dried yellowcake product.

The licensee cannot begin operations until the NRC staff performs a preoperational inspection to confirm, in part, that written operating procedures and approved radiation safety and environmental monitoring programs are in place, and that preoperational testing is complete. A tentative inspection is scheduled in June 2013.

### **3.0 Description of License Amendment Request**

LCI is seeking NRC approval of the following:

1. Site specific meteorology data is representative of long-term conditions
2. The qualifications and training of the health physics designee
3. Additional supporting information for the decommissioning plan
4. The addition of two yellowcake vacuum dryers and the subsequent shipment of vacuum dried yellowcake
5. Increase production rate to 909,000 kg (two million lb) of dried yellowcake
6. Revised surety estimate
7. Removal of preoperational LCs 12.6, 12.8, and 12.13, which require providing NRC staff

with a copy of the solid byproduct material disposal agreement, collect meteorological data, and submit a revised decommissioning, decontamination, and reclamation plan.

In addition to the changes requested by the licensee, the NRC has made editorial changes to several license conditions for clarifications and to ensure compliance with 10 CFR Parts 20 and 40.

#### **4.0 Scope of Review**

The NRC staff has performed an evaluation of the safety and environmental aspects of the license amendment request. This SER constitutes the safety portion of the NRC's evaluation. This SER follows the applicable framework outlined in NUREG 1569 – Standard Review Plan for In Situ Leach Uranium Recovery License Applications (SRP) (NRC, 2003). Note that the intent of this effort is to assess the aspects of LCI's facility that would change if the NRC staff approves the license amendment request. This SER compares the license amendment request to the approved conditions at the Lost Creek Project to identify the changes and review the safety aspects of these changes. An environmental assessment (EA) (NRC, 2013) has been prepared in parallel with this SER to address the environmental impacts of the addition of two vacuum dryers and increasing the production rate to two million lb per year in accordance with 10 CFR 51.21. Four of the six actions requested meet the criteria for categorical exclusion as defined in 10 CFR 51.22:

- The qualifications and training requirements of the health physics designee meet the criterion in § 51.22(c)(3)(iv).
- The revised surety estimate meets the criterion in § 51.22(10)(iv).
- Editorial changes to license conditions meet the criterion in § 51.22(10)(v).
- Additional supporting information for the decommissioning plan and the meteorological data meet the criterion in § 51.22 (11) because the changes are procedural that do not result in significant change (i) in the amounts of any effluents that may be released offsite, (ii) in individual or cumulative occupational radiation exposure, and (iii) in the potential for or consequences from radiological accidents.

#### **5.0 Editorial Changes to Administrative and Operational License Conditions**

##### **5.1 License Condition 9.2**

Several license conditions (LC), such as 9.7, 10.12, 11.5, 12.11, and 12.14 require the licensee to submit information to the NRC for review and verification. The licensee misunderstood the meaning of the term verification when it submitted the designee qualifications and training program, and the Mine Unit 1 wellfield package as required by license conditions 9.7 and 10.12, respectively. The licensee assumed that the NRC staff's acknowledgement of receipt of the submissions was verification and did not realize until receiving requests for additional information that the NRC staff intended to provide a written acknowledgement that the specified submitted material is consistent with commitments in the approved license application. Therefore, the staff will add the following explanation at the end of LC 9.2:

The use of "verification" in this license with respect to a document submitted for NRC staff review means a written acknowledgement by U.S. Nuclear Regulatory

Commission staff that the specified submitted material is consistent with commitments in the approved license application, or requirements in a license condition or regulation. A verification will not require a license amendment.

## **5.2 License Condition 9.4**

NUREG/CR-6733, "A Baseline Risk-Informed, Performance-Based Approach for In Situ Leach Uranium Extraction Licensees," (NRC, 2001) states that performance-based uranium ISR licenses require that a safety and environmental review panel (SERP) be established to review proposed changes, tests, or experiments to determine whether they require a license amendment. According to NUREG/CR-6733, changes, tests, or experiments may be conducted without prior NRC approval if: (i) they do not conflict with any requirements specifically stated in the license or impair the licensee's ability to meet all applicable NRC regulations, (ii) there is no degradation in the essential safety or environmental commitments in the license application or those provided in an approved reclamation plan, and (iii) they are consistent with NRC conclusions regarding actions analyzed and selected in the facility environmental assessment.

Part 40 of Title 10 of the Code of Federal Regulations does not currently allow for the licensee to make these types of changes as allowed for production facilities in Part 50; thus, this criteria is included in a license condition for uranium recovery facilities, such as Source Materials License SUA-1598 license condition 9.4 B. LC 9.4 B describes the type of proposed changes, tests, or experiments that require a license amendment pursuant to 10 CFR 40.44. Changes, tests, or experiments require an amendment pursuant to § 40.44 that result in more than (i) a minimal increase in the likelihood of occurrence of a malfunction or (ii) create a possibility for a malfunction with a different result, of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application. However, Source Materials License SUA1598 LC 9.4 iv, vi, and viii inadvertently dropped the phrase "important to safety" after SEMS (NRC, 2011e). The affected subparagraphs should read as follows (change highlighted):

Change, Test, and Experiment License Condition:

- A) The licensee shall obtain a license amendment pursuant to 10 CFR 40.44...
- B) The licensee shall obtain a license amendment pursuant to 10 CFR 40.44 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would:
  - i Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated);
  - ii Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated);
  - iii Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated);
  - iv Result in more than a minimal increase in the consequences of a

- malfunction of an SEMS **important to safety** previously evaluated in the license application (as updated);
  - v Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated);
  - vi Create a possibility for a malfunction of an SEMS **important to safety** with a different result than previously evaluated in the license application (as updated);
  - vii Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA) or technical evaluation reports (TERs) or other analysis and evaluations for license amendments.
  - viii For purposes of this paragraph as applied to this license, SEMS **important to safety** means any SEMS that has been referenced in a staff SER, TER, EA, or EIS and supplements and amendments thereof.
- C) Additionally, the licensee must obtain a license amendment unless the change, test, or...

### 5.3 License Condition 10.7

As the NRC staff developed the draft license conditions, LCI representatives proposed a modification to the language for this license condition in a public meeting on January 27, 2011 (NRC, 2011a). The modification consisted of replacing the phrase “until the restoration target values (RTVs) have been reached” to “until initiation of the stabilization period.” Staff agreed to the modification and included the revised language in the second draft license dated May 5, 2011 (NRC, 2011b). In the approved license, the language was inadvertently reverted to the original text. Therefore, staff is revising the language in this license condition to reflect that in the second draft.

Staff agrees with LCI that this language would reduce ambiguities and clearly define the time that the licensee has to maintain an inward gradient. Staff has included similar language in license conditions for licenses being prepared subsequent to Lost Creek. The license condition is (change **highlighted**):

The licensee shall maintain an inward hydraulic gradient in each individual production area, starting when lixiviant is first injected into the production zone and continuing until **initiation of the stabilization period**.

### 5.4 License Condition 10.16

The staff found that the wording of LC 10.16 is not consistent with 10 CFR 20.1301(a)(2), which states that dose limits for individual members of the public are limited such that the dose in any unrestricted area from external sources does not exceed 0.002 rem (0.02 millisievert) in any one hour. The license condition states that exposure rates that exceed 2 mrem in any one hour must be immediately treated as either a controlled or restricted area in accordance with § 20.1301(a)(2). Controlled area, as defined in § 20.1003, means an area outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason. Restricted area, as defined in § 20.1003, means an area, access to which is limited

by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Therefore, the staff proposes to remove the words “either” and “controlled area or” from the license condition to be consistent with the regulation. The license condition will read as:

Any area with exposure rates that exceed 2 millirem in any 1 hour must be immediately treated as a restricted area in accordance with 10 CFR 20.1301(a)(2).

## **5.5 License Condition 11.3**

Staff evaluated the language for LC 11.3 for clarity. Staff proposes modifications of two phrases within this license condition. The first phrase is in the last sentence in subsection (A). Staff proposes to replace the phrase “those” with the phrase “the same ones.” This change clarifies the language of the license condition. The second phrase is in the last sentence in subsection (B). Staff proposes to replace the phrase “UIC permit area approved” with the phrase “exempted aquifer as defined by the UIC permit issued.” This change clarifies the intent of the passage and is consistent with the language on the May 5, 2011 draft license (NRC, 2011b). The license condition is (change highlighted):

Establishment of Background Water Quality. Prior to injection of lixiviant in each production area, the licensee shall establish background groundwater quality data for the ore zone, and overlying and underlying aquifers. The background water quality...

The data for each production area shall consist, at a minimum, of the following sampling and analyses:

- A) Ore Zone. Samples shall be collected from production and injection wells at a minimum density of one production or injection well per 4 acres. A minimum of six wells will be required for the baseline data per mine unit. The data for subhorizons may be combined if the licensee demonstrates that the grouping of data is statistically valid. Wells selected for the baseline data will be the same ones used to determine when restored groundwater meets the NRC’s groundwater protection standards in 10 CFR Part 40, Appendix A, Criterion 5B(5).
- B) Perimeter Monitoring Wells. Samples shall be collected from all perimeter monitoring wells that will be used for excursion monitoring in the HJ Horizon. Perimeter wells will be installed for a mine unit in accordance with information presented in Section 3.2.2.2 of the approved license application. In no case will the perimeter monitoring wells be installed outside of the exempted aquifer as defined by the UIC permit issued by the Wyoming Department of Environmental Quality. If the production patterns include multiple subhorizons within the HJ Horizon, the above requirements will be applicable to all subhorizons.
- C) Overlying and Underlying Aquifers. Samples shall be collected ...

## **6.0 Increase in Production Rate**

In Section 1.6 of the technical report submitted in March 2008 (LCI, 2008), LCI describes the design of the processing plant to process 22,712 Lpm (6,000 gpm) of lixiviant through an IX circuit and process 909,000 kg (2 million lb) per year of yellowcake slurry from the elution and precipitation circuits. Although the technical report refers to the listed rate of 6,000 gpm as a nominal rate in one section (Section 3.2), language in other sections of the application (Sections 3.2.7.3, 3.2.7.4 & 3.3) implies that the listed rate is a maximum rate. During discussions on the draft license, LCI explained that the maximum instantaneous production capability of the plant would be 7,500 gpm (NRC, 2011a). In this meeting, LCI explained that operations might have rates that are slightly above the nominal rate. The NRC staff stated that the license condition needed to limit the short-term production rate (instantaneous or daily rate) and provide a meaningful measure for inspectors to use in future compliance inspections.

During this meeting (NRC, 2011a) LCI also requested the staff to increase the annual yellowcake production rate from one to two million pounds per year in accordance with its design as described in the technical report. LCI stated it listed 909,000 kg (two million lb) in the application as the capacity of the plant, which would include production from toll milling (e.g., equivalent feed) or future satellite sites (NRC, 2011a). The staff explained that LCI describes the expected annual production as one million pounds in several sections of the technical report (LCI, 2008) as that amount anticipated for the initial operations at the Lost Creek facility. The staff stated that as LCI did not propose a dryer for the Lost Creek facility in the initial application, the production rate for yellowcake slurry was not a substantial risk factor in assessing dose to the workers or public.

Although the SEIS (NRC, 2011c) was generally prepared for an ISR facility designed to produce up to 909,000 kg (two million lb) equivalent of dried yellowcake product per year, several potential environmental impacts only addressed one million pounds of yellowcake production per year because LCI describes that amount as its average estimate in most of the document (NRC, 2013). The SEIS based traffic impacts on the facility shipping two trucks of yellowcake slurry per week (NRC, 2011c). Using 15,000 pounds of  $U_3O_8$  per slurry truckload, the environmental assessment equated to an annual production of 1.56 million pounds of  $U_3O_8$  per year. In addition to traffic impacts, the SEIS addressed the following potential environmental impacts associated with the production of a maximum of one million pounds of yellowcake per year:

- Transportation,
- Groundwater,
- Air Quality,
- Public and Occupational Health, and
- Waste Management

Because the SEIS did not address all potential environmental impacts associated with a production rate of 909,000 kg (2 million lb) per year and the public did not have an opportunity to comment on the expanded impacts before the SEIS was published, the NRC issued the license with a maximum production rate of one million lb per year.



LCI submitted a request on November 29, 2012 (LCI, 2012h), to increase the production rate to the design capacity of 909,000 kg (two million lb) of yellowcake per year, as described in the technical report Section 1.6 submitted in March 2008 (LCI, 2008). The production rate increase did not include any proposed change to the flow rate, therefore the staff assumed that the additional 404,000 kg (one million lb) of dried yellowcake would result from processing additional resins from LCI's satellite facilities and equivalent feed from third party facilities. In accordance with 10 CFR 51.21, the NRC staff prepared an EA that evaluates the potential environmental effects of the Lost Creek Project producing 909,000 kg (two million lb) of yellowcake per year for the five resources areas listed above, so that the license amendment can increase annual production to 909,000 kg (2 million lb) of yellowcake (NRC, 2013).

During the initial review (NRC, 2011d), the NRC staff reviewed the water balance provided by the licensee and found it to be acceptable because the information provided is consistent with the operation plans and design of the plant described in the application, and similar to water balances reported for existing ISR facilities. The staff found the licensee's discussions consistent with acceptance criterion (5)(c) in SRP Section 3.1.3 because the proposed plant material balances and flow rates are acceptably described, as the mass balance inputs and calculations were independently verified by staff. The staff found that from a safety standpoint, the initial license could have been issued with an annual production rate of 909,000 kg (2 million lb) because the licensee's proposed ISR processes would meet the following safety criteria:

- overall production rates are higher than injection rates to create and maintain a cone of depression;
- plant material balances and flow rates are appropriate;
- reasonable estimates of gaseous, liquid, and solid wastes and effluents are provided (used in evaluation of effluent monitoring and control measures in SRP Section 4.0).

Based on the staff's review of the licensee's components with respect to safety risk and current industry practice at existing NRC-licensed ISR facilities, the staff concludes that the licensee provided an acceptable description of the instrumentation and monitoring that will prevent and correct spills and/or excursions. The licensee also provided acceptable operating plans, schedules, and timetables for mine unit operation, surface reclamation, and groundwater restoration in the technical report submitted (LCI, 2008; LCI, 2010a). The staff enumerated requirements for several aspects of the operations (in particular, lixiviant makeup, limitations on throughput capacity, ground water monitoring, and spill reporting), in the following standard license conditions in the initial license:

- LC 10.1 for lixiviant makeup,
- LC10.2 for facility throughput, and
- LC's 11.1 through 11.6 for monitoring and reporting requirements

As discussed in Section 5.5 above, the staff proposes to amend LC 11.3 for clarification. In addition to the licensee's request, the staff concludes that LC 10.2 be amended to retain the average daily and maximum instantaneous flow rates and allow an annual increase to two million lb as follows:

Facility Throughput. The Lost Creek processing facility throughput shall not exceed an average daily flow rate equivalent to 6,000 gallons per minute or a

maximum instantaneous flow rate of 6,300 gallons per minute, excluding restoration flow. The annual production of yellowcake slurry and/or dried yellowcake shall not exceed two million pounds equivalent of dried yellowcake product.

## **7.0 Meteorological Data**

LCI's letters dated November 11 and 16, 2010 (LCI, 2010b; LCI, 2010c), submitted changes to the technical report that removed its commitment to continue to operate meteorological stations at both the Lost Creek and Lost Soldier sites until sufficient data was collected to support site operations without further measurements at one or both of the stations. This commitment was included in the changes to the technical report provided to the NRC in an email dated June 24, 2010 (Brown, 2010), and is included in LC 9.2 of SUA-1598 (NRC, 2011e). LCI has not provided the staff with any rationale for removing this commitment, which conflicts with the email and letter providing clarification dated September 13 and November 8, 2011, respectively (LCI, 2011a; LCI, 2011b). Nor has LCI provided data demonstrating that it has met the requirements in LC 12.8.

Regulatory Guide 3.63 (NRC, 1988) defines the minimum amount of meteorological data needed to be that amount of data collected on a continuous basis for a consecutive 12-month period that is representative of long-term (e.g., 30 years) meteorological conditions in the site vicinity. To verify if the period of record is characteristic of long-term meteorological conditions, the regulatory guide suggests comparing a concurrent period of meteorological data from a National Weather Service (NWS) station with the long-term meteorological data from that same NWS station. Twelve months is the minimum period of data collection. If the 12-month period is not representative of long-term conditions, then the licensee needs to collect additional data until it has the licensee has demonstrated that the sample collection period is representative of long-term conditions.

LCI did not perform the proper statistical analysis to determine whether the data collected at the Lost Creek Project is representative of long-term climate trends per Regulatory Guide 3.63. Statistical approaches may include testing summary statistics, such as the mean from the short and long-term data, and testing the statistics for similarity or validity of the data by using a statistical method such as the Student's T test, Chi square test for distribution, Kolmogorov-Smirnov test for distribution, etc. Thus, the NRC staff cannot determine if the licensee collected the minimum amount of data or if the data collected is sufficient to represent long-term conditions.

The staff provided its evaluation described above to the licensee in a request for additional information (NRC, 2011f). LCI in its response to the staff agreed with the staff that insufficient meteorological data has been collected at the Lost Creek Station and that the supportive statistics have not been presented to fully determine that data from the NWS Station at Rawlins is sufficiently representative of the Lost Creek licensed area (LCI, 2012c). Therefore, LCI commits to operating the meteorological station at Lost Creek indefinitely until the licensee has collected site specific and regional data that demonstrates the data represents long-term conditions to support site operations without further measurements. LCI changed Page 2.5-2 of the Technical Report (LCI, 2012c) to reflect this commitment and included the page change with its response.

Because the licensee did not provide the necessary statistical analyses, the licensee did not meet SRP Section 2.5.3 acceptance criteria (1) and (3), which require that the onsite program be designed in accordance with Regulatory Guide 3.63, and that the meteorological data used for assessing impacts are substantiated as being representative of expected long-term conditions at and near the site (NRC, 2003). Therefore, the staff determines that continued collection of data is required by license condition, and thus the requirement to continue collecting meteorological data is not changed, until the licensee has demonstrated that sufficient data has been collected to represent long-term conditions, which is needed to demonstrate compliance with 10 CFR Part 40, Appendix A, Criterion 7. However, the staff will delete LC 12.8 from Section 12 "Preoperational Conditions" and add the unchanged requirements as LC 10.19 in Section 10 "Facility Specific Conditions."

## **8.0 Use of a Designee to Conduct Daily Inspections**

The staff concluded that the designee's qualifications and training described in the technical report (LCI, 2008; LCI, 2010a) do not meet the training and experience requirements of a radiation safety officer (RSO) or health physics technician (HPT) as suggested by Regulatory Guide 8.31 (NRC, 2002). In Section 5.3.1.1 of the technical report (LCI, 2010a), the licensee limits the designee to performing inspections only on week-ends or holidays or when both the RSO and HPT are absent because of illness or training, to no more than 3 consecutive days. Additionally, the RSO or HPT must be available by telephone for assistance (LCI, 2010a). Although the licensee's minimum qualifications for the designee do not meet the requirements for an RSO or HPT as suggested in Regulatory Guide 8.31, the staff recognizes that the regulatory guides provide an example of merely one method of satisfying the NRC's regulatory requirements. In this particular instance, the staff approved the use of a designee proposed by the licensee contingent upon the NRC's review and verification of the designee's training requirements, as stated in LC 9.7 (NRC, 2011e).

The licensee provided revisions to pages 5-19, 5-19a, 5-20, and 5-21 in Sections 5.4 and 5.5 of the technical report to the NRC that described the qualifications and radiation safety training of the health physics designee to meet LC 9.7 requirements (LCI, 2010b). The staff found that the licensee had proposed a good, solid program for the designee, but the staff identified inconsistencies with LCI's license that could result in an inspection finding. The staff found that the licensee's description of the precise scope of the daily inspections described in technical report Section 5.3.1.1 is not consistent with RG 8.31 regarding areas inspected, and therefore is in conflict with LC 9.7, which requires that LCI follow guidance in RG 8.31 (NRC, 2011f). RG 8.31 states that the RSO or designated HPT should conduct a daily walk-through (visual) inspection of all work and storage areas of the facility to ensure proper implementation of good radiation safety procedures, including good housekeeping and cleanup practices that would minimize unnecessary contamination. In its response to the NRC staff's request for additional information (NRC, 2011f), LCI amended technical report Section 5.3.1.1 to include reference to an inspection checklist, TR Attachment 5.7-5, "Daily Radiation Safety Inspection Checklist", which will serve as the initial daily inspection tool (LCI, 2012c).

The staff found that the licensee's changes to technical report Section 5.3.1.1 (LCI, 2012c) commits to having the inspector conducting the daily inspection to look for and report to the Operations Manager, Site Supervisor EHS/RSO, and Mine Manager all non-conformances with regulations, standing operating procedures (SOP), and as low as is reasonably Achievable (ALARA) principle. The NRC observed that not "all non-conformances" to regulations and

SOPs are addressed in the licensee's proposed training program, which was discussed with the licensee in a public meeting on April 30, 2012 (NRC, 2012c). The staff found that the checklist was not consistent with TR Section 5.3.1.1, which states: "The areas inspected will include, but shall not be limited to, the Plant, byproduct storage area, and Storage Ponds." The checklist submitted in February 2012 (LCI, 2012c) was limited to the central processing plant (CPP) and did not include all work areas of the licensed facility where radiation areas or radioactive materials may be used as recommended in Regulatory Guide (RG) 8.31 (NRC, 2012c). The staff also found that the licensee did not provide a minimum set of qualifications that describes how the RSO determines that the designee candidate has demonstrated "advanced proficiency" (NRC, 2012c). For example, technical report Section 5.5 states that a test score of 70 percent is a passing grade of the written or oral test following radiation safety training for new employee and annual refresher classes. The staff could not conclude how the licensee will determine that a designee has demonstrated "advanced proficiency" (NRC, 2012c).

In its response to the NRC staff's comments, the licensee committed to having the checklist as part of LCI's SOPs, which may be modified, as necessary, through the licensee's SOP change process to better meet the intent of the RG 8.31 guidance (LCI, 2012g). Revised Section 5.3.1.1 and the new TR Attachment 5.7-5 were included in LCI's response to the staff. The licensee committed to providing the current checklist to the designee before directing the designee to conduct the inspection. The licensee also committed to modifying the checklist to include other buildings, as they become radiation areas or areas where LCI may use radioactive materials, such as header houses. The licensee committed to modifying the designee's training and certification to require training and testing to demonstrate knowledge of relevant regulations, SOPs, and ALARA considerations. LCI stated that the licensee would require the designee to demonstrate functional knowledge through written testing of other topics, in accordance with the licensee's SOPs and Regulatory Guide 8.31, Section 2.5. The licensee determined that a minimum test score of 85 percent would demonstrate the designee's advanced proficiency and that additional proficiency will be measured through the RSO's evaluation of performance of supervised daily inspections. The minimum number of supervised inspections will consist of five pre-designation and five annually. The last of each series of supervised inspections will be un-coached, graded for 100 percent accuracy, and the licensee will file a copy in the designee's training file (LCI, 2012g).

The staff finds the licensee's proposed alternative to allow a designee to perform daily inspections at the facility during the absence of both the RSO and HPT acceptable. The following amended LC 9.7 reflects the staff's approval of the alternative to Regulatory Guide 8.31 (change highlighted):

The licensee shall follow the guidance set forth in NRC, Regulatory Guides 8.22, "Bioassay at Uranium Mills," (as revised) and 8.30, "Health Physics Surveys in Uranium Recovery Facilities," (as revised) or NRC approved equivalent.

The licensee shall follow the guidance set forth in Regulatory Guide 8.31, "Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Recovery Facilities Will Be as Low as Is Reasonably Achievable (ALARA)," (as revised) or NRC approved equivalent, with the following exception:

The licensee may ...The qualified designee(s) will have health physics training **as specified in the licensee's training program**. The qualified designee(s) may perform daily inspections on weekends...

Based upon the review conducted by the staff as indicated above, the information provided in the application, as supplemented with the noted license condition, meet the applicable acceptance criteria of this section and the requirements of 10 CFR 40.32(b) and 10 CFR 40.32(c).

## **9.0 Decommissioning Plan**

During the review of the license application (LCI, 2008; LCI, 2010a), the staff found that the decommissioning, decontamination, and reclamation procedures provided in the application were acceptable except for the licensee's omission of soil cleanup criteria for uranium or other radionuclides, excluding radium 226, which are otherwise required per 10 CFR Part 40, Appendix A, Criterion 6(6) (NRC, 2011d). Soil cleanup criteria are necessary for the licensee to determine the extent to which soil reclamation is required and when it has achieved reclamation. The staff finds that cleanup following spills should not rely solely on radiation measurements with a survey meter because uranium-238 (specific activity (SA) =  $3.3 \times 10^{-7}$  curies/gram (Ci/g)), unlike radium-226 (SA = 1 Ci/g), emits low energy gamma radiation. The low energy gamma radiation emitted might not exceed background radiation exposure readings (e.g. mR/hr) in soils that contain uranium concentrations (e.g.  $\mu\text{Ci/g}$ ) that exceed background uranium concentrations; whereas increases in radium-226 concentrations in soils usually are indicated by higher gamma radiation readings with survey meters. The staff has reasonable assurance that the licensee will decommission the Lost Creek Project appropriately because of its decommissioning plans and commitment to submit final plans prior to final mine unit and facility decommissioning, which was addressed in SER Section 6.2.3 (NRC, 2011d). The staff's reasonable assurance determination was contingent upon the fulfillment of LC 12.13, which, among other things, required the licensee to include soil cleanup criteria in its revised decommissioning plan (NRC, 2011e).

In a letter dated November 11, 2010 (LCI, 2010b), LCI stated it had discussed soil cleanup criteria in Sections 4.2.5.6, 5.7.1.3, and 6.5 of the technical report (LCI, 2008; LCI, 2010a). LCI stated that it does not anticipate any soil cleanup activities will be required during mining or post mining because LCI expects relatively low concentrations of radium and uranium in the lixiviant at the Lost Creek Project because of the administrative and engineering controls it will employ (LCI, 2010b). LCI stated that the licensee would use reverse osmosis to treat a slipstream of production fluid throughout the production life of each mine unit, which will remove approximately 98 percent of the radium in treated water at the Lost Creek Project. Although LCI stated that soil cleanup at the site is not expected to be necessary, the licensee committed in the technical report to perform radiological surveys and soil analysis of areas post-spills and post-operations and use the cleanup criteria in 10 CFR Part 40, Appendix A, Criterion 6 and provided page changes to the technical report (LCI, 2010b).

The staff reviewed the cleanup criteria for uranium concentrations in soils following spills in technical report Section 4.2.5.6, Activity Concentration Cleanup Criteria (LCI, 2008; LCI, 2010a). The basis of the criteria according to the licensee was exposure limits to members of the public and workers as stated in 40 CFR 190.10 and 10 CFR Part 20, and was determined using RESRAD (LCI, 2011a). The natural uranium concentrations in soils that comply with the

regulatory exposure limits for workers and the public were determined to be 1,500 picocuries (pCi)/g and 300 pCi/g, respectively, for the thickener and yellowcake, and 1,000 pCi/g and 120 pCi/g, respectively, for pregnant lixiviant (LCI, 2008; LCI, 2010a). The staff observed that the licensee may be using concentrations for workers in operational areas that are restricted from public access and comply with 10 CFR Part 20 (NRC, 2011f). However, it was not clear to the staff whether these concentrations exceed exposure limits (i.e., 25 mrem/yr per 40 CFR 190.10) for the public in areas that the public has unrestricted access (e.g., a hunter). The staff found that the licensee's response describing plans for reclaiming disturbed lands were acceptable and consistent with the acceptance criteria in NUREG-1569 Section 6.2.3, except acceptance criterion (1). Contrary to acceptance criterion (1), the licensee omitted soil cleanup criteria for radionuclides other than radium-226. LC 12.13 required the licensee to submit the soil cleanup criteria to the NRC for review and approval (NRC, 2011f).

In its response to the NRC staff's request for additional information (NRC, 2011f), LCI provided results of its RESRAD analysis in revised Attachment 5.7-4 to Section 5 of the technical report (LCI, 2012c). The licensee used RESRAD modeling to determine soil concentration cleanup criteria to ensure the licensee complied with ALARA and the 10 CFR Part 20 and 40 CFR 190.10 occupational and public annual exposure limits of 100 and 25 mrem, respectively. LCI observed transcription errors in the technical report text that were inconsistent with the RESRAD results. LCI provided revisions pages 4-21 and 4-22 and Table 4.2-2 in Section 4.2.5.6 in the technical report (LCI, 2012c). The licensee acknowledged that the technical report Section 6.5.1 that was reviewed by the NRC staff in writing the SER for the initial license (LCI, 2008c; LCI, 2010a), did not specify the cleanup criteria nor was there a cross reference to technical report Section 4.2.5.6 that presented and discussed the cleanup criteria (LCI, 2012c). The revised Table 4.2-2 shows that natural uranium soil concentrations in soils contaminated from the thickener and yellowcake slurry to be somewhat lower than originally calculated for public exposure, which is 240 pCi/g rather than 300 pCi/g. Natural uranium and Ra-226 concentrations in soil contaminated with pregnant lixiviant were also somewhat lower for public exposure limits of 25 mrem, which were determined as 90 and 1.8 pCi/g, respectively.

Based upon the review conducted by the staff as indicated above, the information provided in the licensee's responses dated November 11, 2010, September 13, 2011, November 8, 2011, and February 17, 2012 (LCI, 2010b; LCI, 2011a; LCI, 2011b; LCI, 2012c), meet the applicable acceptance criteria of SRP Section 6.4.3 and the requirements of 10 CFR 20.1501 and 10 CFR Part 40, Appendix A, Criterion 6(6). The staff finds the licensee met the preoperational requirements in LC 12.13, and therefore, the staff will delete LC 12.13 from the license.

## **10.0 Surety Update**

License condition 9.5 (NRC, 2011e) required the initial surety estimate be submitted for NRC review and approval within 90 days of license issuance, and that the surety instrument be submitted for NRC review and approval 90 days prior to commencing operations. LCI provided a decommissioning cost estimate of \$6,772,488 in the license application (LCI, 2010a); this estimate consisted of 47 pages of itemized costs for surface reclamation of all facilities and groundwater restoration of the first mine unit. The proposed amount included costs for groundwater restoration, decommissioning and surface reclamation, equipment removal and disposal, building demolition and disposal, wellfield building and equipment removal and disposal, well abandonment, wellfield surface reclamation, soil excavation and disposal, topsoil replacement and revegetation, soil surveying and analyses, and other miscellaneous

reclamation costs. The decommissioning cost estimate also included operational costs, such as environmental sampling, that would need to be included during groundwater restoration and surface reclamation (LCI, 2010a). The staff found that the decommissioning cost estimate was consistent with the outline in Appendix C of the SRP (NRC, 2003) and was acceptable to the staff because the estimate contained the appropriate items and reasonable costs (NRC, 2011f). However, LCI based this estimate on the licensee beginning construction and operations immediately, and LCI could not begin construction until the BLM approved LCI's Plan of Operations. Therefore, LCI needed to submit a revised cost estimate based on actual operations, which was no more than installing/maintaining monitoring wells and exploration.

LCI provided WDEQ with a revised estimate on October 7, 2011, parts of which were copied to the NRC and once approved by the WDEQ, submitted to the NRC for review and approval (LCI, 2012b). LCI's revised surety estimate of \$1,747,878 included a total contingency of 25% in following WDEQ guidance (WDEQ, 2010). This contingency exceeded third party costs that LCI used to calculate the subtotal restoration and reclamation costs and was based on the guidance provided in the WDEQ Land Quality Division (LQD) Guideline 12, "Standardized Reclamation, Performance Bond Format and- Cost Calculation Methods." LCI used actual costs obtained from vendors/contractors or estimated costs based on experience in situations where Guideline 12 did not address a specific cost that LCI determined relevant to decommissioning an ISR facility (LCI, 2012b).

LCI stated (LCI, 2012b) that the surety estimate represented the reclamation liability that will be incurred during the first year following issuance of the Permit to Mine from the WDEQ and issuance of the License by the NRC (NRC, 2011e). LCI stated that the surety estimate is relatively small because little activity is ongoing. LCI would not generate source or byproduct material during the first year, so there was no need to calculate costs for groundwater restoration, disposal of byproduct material, or soil cleanup. LCI stated that the most significant costs for reclaiming the site at the end of the first year were abandonment of the underground injection control (UIC) Class I wells, also referred to as deep disposal wells, plugging of wells, and demolition of the processing plant. The licensee stated that there would be no true groundwater restoration because there will no injection during the first year of operations (LCI, 2012b).

LCI included the cost for plugging the Class I UIC well in the southwest corner of the project. LCI stated that third party contractor Petrotek, Inc. provided the estimate for plugging this well. The cost estimates for plugging the existing and planned wells and revegetation were derived from WDEQ Guideline 12 (Appendix L in the technical report) (LCI, 2008; LCI, 2010a; LCI, 2012b). LCI and the WDEQ jointly calculated labor costs, including employee benefits. The licensee stated that the WDEQ and NRC reclamation and restoration requirements are essentially the same. Therefore, LCI did not break down the surety calculation by agency. LCI stated that the surety estimate assumes no salvage value despite the fact that during the time covered by the estimate there will be no generation of source or byproduct material and, therefore no contamination of materials/equipment (LCI, 2012b).

The NRC staff completed a detailed review of LCI's submission and identified deficiencies that required additional information to meet acceptance criteria in NUREG-1569 and regulatory requirements of 10 CFR 40, Appendix A, Criterion 9 (NRC, 2012d). The staff recommended that the licensee insert additional commitments in the surety to meet acceptance criterion in SRP Section 6.5.3, which recommends that licensees include certain statements in the cost

estimate submission. The staff found that the licensee should at least state that the licensee will do the following (NRC, 2012d):

- update the surety value annually as necessitated by changes in the facility and its operations to meet acceptance criterion (1),
- revise the surety arrangement within three months of the NRC approval of a revised closure plan if estimated costs exceed the amount of the existing financial surety to meet acceptance criterion (9),
- submit for NRC approval an updated surety to cover any planned expansion or operational change not included in the annual surety update at least 90 days prior to beginning associated construction to meet acceptance criterion (7),
- provide the NRC with copies of surety-related correspondence to meet acceptance criterion (12)

The NRC staff could not confirm the basis for many of the unit cost estimates because the licensee's submission did not explicitly state the method used in its cost estimate and references provided with the unit costs in LCI's estimate do not explicitly cite Guideline 12 as a source (NRC, 2012d). The staff recommended that the licensee specify whether it expressed the cost in current dollars or if the licensee adjusted it for inflation to meet acceptance criterion (5) in SRP Section 6.5.3. Further, the staff finds that the licensee did not identify the percentages applied for each area as recommended in SRP Appendix C, Section (V)." The staff recommended that the licensee revise or justify the labor costs used as recommended in SRP Appendix C, Section (V).

The cost estimate provides hourly rates for various labor categories in LCI's submission of the labor cost associated with groundwater restoration (LCI, 2012b). It was not clear to the NRC staff if the hourly rates include overhead costs for labor because the licensee did not provide a separate overhead percentage (NRC, 2012d). The licensee's submission includes a 29 percent contingency. The cost estimate indicates that this contingency accounts for "miscellaneous items," such as project design, contractor profit and mobilization, pre-construction investigation, project management, onsite monitoring, site security and liability assurance, and long-term administration; and "unknown costs," per WDEQ's Guideline 12. However, based on the detail provided, the NRC staff finds that it is not clear if the 29 percent contingency includes labor overhead. NRC staff requested that the licensee revise or justify the labor costs in the cost estimate by identifying the overhead percentage applied for labor (NRC, 2012d).

Lastly, the licensee did not provide a financial assurance mechanism as listed in 10 CFR 40, Appendix A, Criterion 9 (NRC, 2012d). Licensees are required to establish financial surety arrangements in the form of one of the approved mechanisms listed in Criterion 9 prior to the commencement of operations. The cost estimate submission provided by LCI did not include a financial assurance mechanism. The NRC staff requested the financial assurance mechanism to ensure that the NRC staff reviews it prior to commencement of operations (NRC, 2012d).

In response to the NRC staff's request for additional information (NRC, 2012d), the licensee revised the surety bond estimate and made all changes and commitments requested by the NRC staff to meet the acceptance criteria in SRP Section 6.5.3 and to follow the recommendations in SRP Appendix C (LCI, 2012f). The licensee cited WDEQ-LQD's Guideline 12 where applicable and made slight changes in the surety amount to reflect these adjustments. The licensee stated that the surety bond estimate was in current dollars at the



time the licensee submitted it to and approved by the WDEQ-LQD. The licensee stated that the labor costs include a 25 percent overhead factor for benefits and that LCI based it on LCI's current hiring information. The licensee enclosed a resolution that the Ur-Energy, Inc. Board of Directors signed, which describes the surety mechanism, a trust fund, along with the signed Collateral Trust Agreement (LCI, 2012f).

Based on the information provided in the licensee's submission and the staff's detailed review of the updated decommissioning cost estimate for the Lost Creek Project, the staff concludes that the amount of the proposed financial assurance and its methods of estimation are acceptable and consistent with 10 CFR Part 40, Appendix A, Criterion 9, which requires that financial assurance arrangements be established by each operator. As maintaining adequate financial assurance is an important aspect of the facility, compliance with the applicable regulations will be required through the following amended standard license condition (LC 9.5), which adds the word "approved" before the words "planned expansion" in the first line of the fourth paragraph, and deletes the requirement for the licensee to submit the initial surety estimate for NRC review and approval within 90 days of license issuance and that the surety instrument be submitted for NRC review and approval 90 days prior to commencing operations (change highlighted):

Financial Assurance. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR Part 40, Appendix A, Criterion 9, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination, which includes offsite disposal of radioactive solid process or evaporation pond residues, and ground-water restoration as warranted. The surety shall also include the costs associated with all soil and water sampling analyses necessary to confirm the accomplishment of decontamination.

Proposed annual updates to the financial assurance amount, consistent with 10 CFR Part 40, Appendix A, Criterion 9, shall be provided to the NRC 90 days prior to the anniversary date. The financial assurance anniversary date for the Lost Creek Project will be the date on which the first surety instrument is submitted to the NRC. If the NRC has not approved a proposed revision 30 days prior to the expiration date of the existing financial assurance arrangement, the licensee shall extend the existing arrangement, prior to expiration, for 1 year. Along with each proposed revision or annual update of the financial assurance estimate, the licensee shall submit supporting documentation, showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15-percent contingency of the financial assurance estimate, changes in engineering plans, activities performed, and any other conditions affecting the estimated costs for site closure.

Within 90 days of NRC approval of a revised closure (decommissioning) plan and its cost estimate, the licensee shall submit, for NRC review and approval, a proposed revision to the financial assurance arrangement if estimated costs exceed the amount covered in the existing arrangement. The revised financial assurance instrument shall then be in effect within 30 days of written NRC approval of the documents.

At least 90 days prior to beginning construction associated with any approved planned expansion or operational change that was not included in the annual

financial assurance update, the licensee shall provide, for NRC review and approval, an updated estimate to cover the expansion or change. The licensee shall also provide the NRC with copies of financial-assurance-related correspondence submitted to the State of Wyoming, a copy of the State's financial assurance review, and the final approved financial assurance arrangement. The licensee also must ensure that the financial assurance instrument, where authorized to be held by the State, identifies the NRC related portion of the instrument and covers the aboveground decommissioning and decontamination, the cost of offsite disposal of solid byproduct material, soil, and water sample analyses, and groundwater restoration associated with the site. The basis for the cost estimate is the NRC-approved site closure plan or the NRC-approved revisions to the plan. Reclamation or decommissioning plan cost estimates and annual updates should follow the outline in Appendix C, "Recommended Outline for Site-Specific In Situ Leach Facility Reclamation and Stabilization Cost Estimates," to NUREG 1569, "Standard Review Plan for In Situ Leach Uranium Extraction License Applications—Final Report."

The licensee shall continuously maintain an approved surety instrument for the Lost Creek Project, in favor of the State of Wyoming.

## **11.0 Dryer Addition**

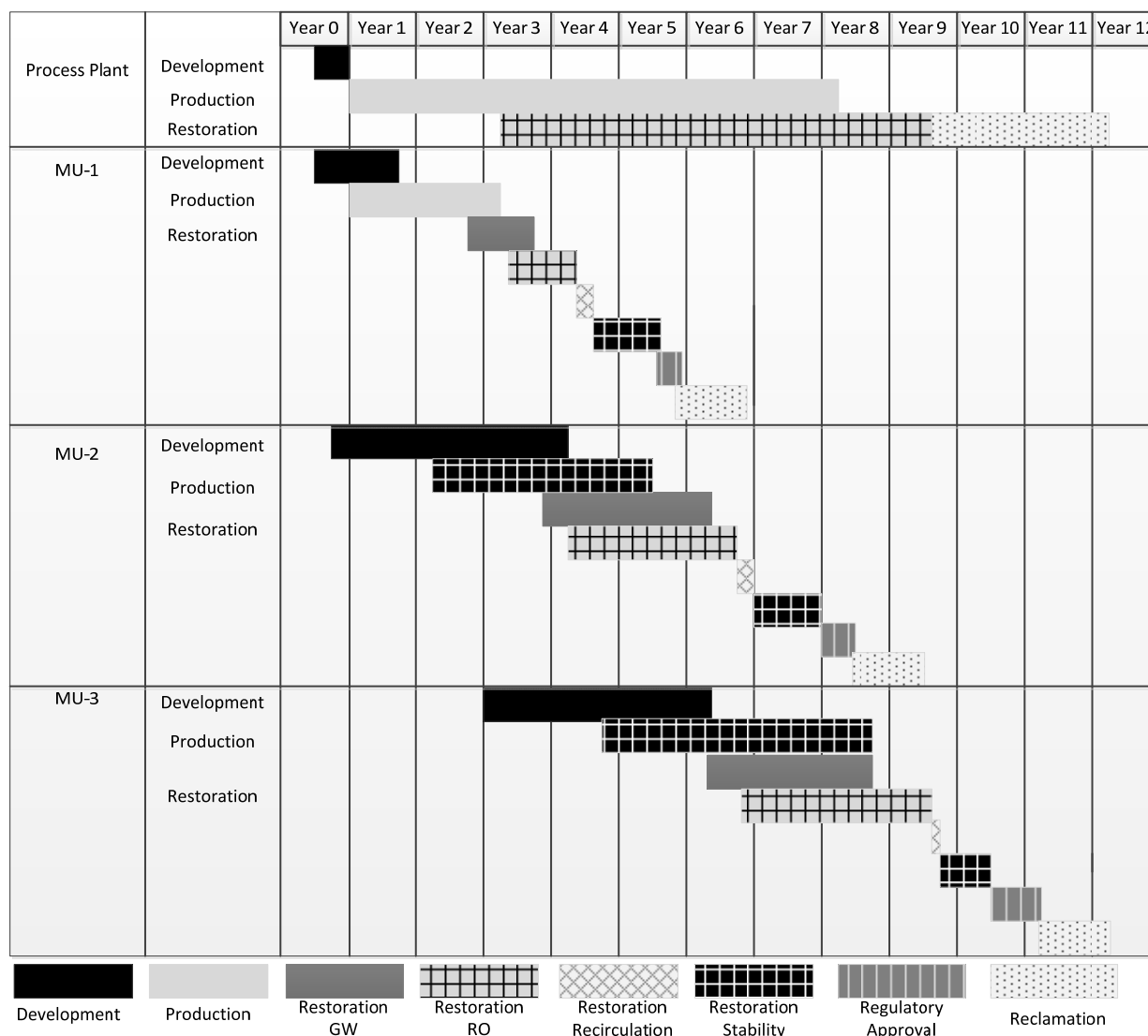
As discussed in the NRC staff's SER completed in review of the initial license (NRC, 2011f), the licensee's technical report did not include plans for the processing plant to contain a dryer, thus the product of the ISR would be yellowcake slurry that would be shipped offsite to a licensed facility for further processing (LCI, 2008; LCI, 2010a). The licensee submitted a letter of intent dated January 6, 2010, that stated LCI planned to submit an amendment application after receiving the license to add a dryer in the processing plant (LCI, 2010e). The licensee submitted a request to amend LCI's Source Material License SUA-1598 to operate two yellowcake rotary vacuum dryers within its processing plant and subsequent shipment of vacuum dried yellowcake as an additional alternative to processing yellowcake slurry (LCI, 2012a). The request included a Vacuum Dryer Supplement that described changes to sections in the technical and environmental reports. The supplement also included revised technical report Figures 1.5-2b and 5.7-1 and technical report Plate 3.1-1, and a dryer flow diagram for technical report Section 3.3 (LCI, 2012a).

This Vacuum Dryer Supplement addresses the minor facility and operational changes vacuum drying of yellowcake will entail (LCI, 2012a). The licensee submitted a revised technical report Figure 1.7-2 (LCI, 2012e) entitled "Lost Creek Development, Production, and Restoration Schedule," which is depicted in SER Figure 11-1. The licensee noted that the schedule did not change from the schedule in the staff's SER (NRC, 2011d), the licensee condensed the number of total mine units from six to three pursuant to a request from the WDEQ – LQD (LCI, 2012e). The licensee stated that the total area and timing of the disturbance have not changed, but the names of the affected areas did change. Additionally, the licensee stated that the revised schedule is provided as an alternate schedule as required in 10 CFR 40.42(f) because reclamation cannot be completed within the two-year time limitation described in 10 CFR 40.42(d).

Based upon the review conducted by the staff as indicated above, the information provided in the application meets the applicable acceptance criteria of SRP Section 1.3 and the requirements of 10 CFR 40.31, which describes the general requirements for the issuance of a specific license.

## 11.1 Operations

Subsequent to issuance of the NRC Source Material License SUA-1598 (NRC, 2011e), the licensee established a Safety and Environmental Review Panel (SERP) (LCI, 2012a). The SERP has reviewed and approved all facility design changes submitted to the NRC, to include the addition of two rotary vacuum dryers. As described in TR Section 3.1, the original proposed design included three process circuits.



**Figure 11-1. Revised Lost Creek Project Schedule**

NRC Source Material License SUA-1598 (NRC, 2011e) allows three major processing circuits in the processing plant: ion exchange (IX), elution, and precipitation/filtration. Equipment located in the plant will include IX and elution vessels, precipitation tanks, filter presses, storage tanks, and the associated piping, pumps, and valves required to be able to move the solutions throughout the plant. The licensee's application to amend the license adds a fourth process circuit, the dryer circuit, which will give LCI the option of producing dried yellowcake as a final product in addition to the option of yellowcake slurry production (LCI, 2012a). Allowing both options will enable the licensee to continue production uranium operations regardless of whether or not the vacuum dryers are operational because yellowcake slurry could still be shipped to a licensed facility for processing. The licensee submitted a revised technical report Plate 3.1-1 (also a revised environmental report Plate 2-1) that illustrates the amended processing plant layout.

The staff's SER (NRC, 2011d), which resulted in the issuance of NRC Source Material License SUA-1598, found that the licensee planned a processing plant with ventilation in the process equipment area that will consist of an exhaust system that draws in fresh air and sweeps the plant air output to the atmosphere. The licensee plans to install general building ventilation capable of providing approximately six air changes per hour. The licensee plans to use tank ventilation systems for the IX tanks, wastewater tanks, elution tank, and permeate tank. The licensee plans to use specific ventilation systems for the resin shaker screens, elution columns, restoration columns, and the transfer bay (NRC, 2012d). The preceding three processes in the plant culminate in the product having gone through a filter press to wash the impurities off the yellowcake slurry (LCI, 2012a). The present license authorizes the yellowcake slurry to transfer from the filter press to a slurry vessel to await transport to an offsite facility that has drying capabilities. The addition of a dryer circuit to the Lost Creek Project processing plant allows the licensee to dry the yellowcake slurry onsite. The yellowcake will transfer from the wash stage and go to the slurry storage vessel or directly to the dryer circuit (LCI, 2012a).

The licensee proposes to have two separate drying systems (LCI, 2012a). Two separate drying systems allow the licensee to have flexibility to vary the output of dried product in the case of increased production rates or changes in scheduled maintenance. The dryers will be a standard rotary vacuum design. The licensee will install a separate ventilation system in the dryer room from the rest of the processing plant to prevent the licensee from circulating any dry yellowcake particulates into other areas of the plant. The dryer circuit ventilation design provides the dryer room with negative pressure, forcing airflow into the room. Manufacturers design vacuum dryers to have little or no emissions (LCI, 2012a). The licensee included a "Dryer Flow Diagram" that illustrates the vacuum drawn through the dryer passes through a bag filter, a condenser, vacuum pumps with a water seal and a condensate tank. There will not be a discharge stack associated with the dryers and final venting from the vacuum pump will be back into the dryer room (LCI, 2012a).

Each rotary vacuum dryer will have a working capacity of approximately 110 cubic feet that allows for a maximum dryer capacity of approximately 2267 kilograms (kg) (5,000 lb) of yellowcake per drying batch (LCI, 2012a). According to the licensee, this amount equates to approximately seven 55-gallon drums of final product. LCI estimates each drying cycle to be between 10 and 12 hours. The licensee states that all of the equipment installed in the drying circuit will have various instrumentation that the licensee will monitor through the control system. Each part of the drying equipment has specific operating parameters that the licensee will monitor based on manufacturer's recommendations. The licensee states that the critical

parameters to monitor are vacuum pressure, steam temperature, oil pressure, and oil temperature. The licensee states that if vacuum pressure declines below 33.9 kilopascals (kPa) (10 inches Hg) during the drying cycle, the control system will notify the operator. The licensee states that the oil heater will shut down if the dryer operator cannot address the loss of pressure and it falls below the primary minimum vacuum setting of 13.5 kPa (4 inches Hg). LCI commits to testing and documenting the loss of vacuum alarm before drying each batch. The licensee states the yellowcake slurry will consist of between 40 and 70 percent solids and it will transfer to the dryer circuit from either the filter press or a yellowcake slurry vessel. The licensee commits to conducting the drying process in accordance with the checking and logging safety requirements contained in 10 CFR Part 40, Appendix A, Criterion 8, and will include installation of appropriate yellowcake dryer condition alarms (LCI, 2012a).

The staff finds that the licensee has described the major components of the plant in sufficient detail and provided drawings showing the location and layout of the proposed dryers and thus, meets SRP Section 3.2.3 acceptance criterion (1) (NRC, 2003). The controls and monitoring features planned for the dryers in the processing plant are similar to those in use in the ISR industry. The staff concludes that the licensee has proposed monitoring parameters that are important to operation of the facility. Because the information in the application describes the controls and monitoring features that the licensee will use at the facility to protect radiological health and safety, the application is consistent with SRP Section 3.2.3 (NRC, 2003). LCI described plans for eliminating or mitigating the hazards in accordance with SRP Section 3.2.3 acceptance criteria (5) and (7). For these reasons, these aspects of the proposed facility are acceptable to the NRC.

## **11.2 Effluent Controls**

The licensee stated (LCI, 2012a) that the highly improbable, but significant accidents involving a yellowcake rotary vacuum dryer could potentially have much more serious consequences than those situations involving wet yellowcake slurry as addressed in technical report Section 4.1.2.1 (LCI, 2008; LCI, 2010b). The licensee refers to NUREG/CR-6733 (NRC, 2001) and stated that the fire and explosion analysis maintains that doses to the public from dryer accidents will remain below the 100 mrem/yr public dose limit for normal operations (LCI, 2012a). The licensee stated that the resulting dose could exceed the 10 mrem/yr constraint on air emissions of radioactive material to the environment in 10 CFR 20.1101, which represents a reportable event according to 10 CFR 20.2203. The licensee stated that NUREG/CR-6733 analysis concludes airborne concentrations resulting from the yellowcake dryer accident scenarios could result in doses to workers in excess of occupational and toxicity limits. The licensee plans instituting several requirements to prevent these types of accidents and exposures. The various controls include:

- Monitoring and logging procedures as defined in 10 CFR Part 40, Appendix A, Criterion 8
- Alarms indicating: low vacuum, high oil temperature, low and/or high oil pressure, and furnace failure

The licensee commits to developing and training personnel on an emergency plan for dryer accidents, following the manufacturer's recommendations for maintenance and operation of the dryers, and requiring the use of respirators in the dryer room during and after packaging and until such time air quality samples confirm airborne concentrations of uranium are below limits

and ALARA (LCI, 2012a). The licensee provided technical report Figure 4.1-3, Ventilation Diagram (LCI, 2012d) that illustrates locations of various types of ventilation, such as point source ventilation, point source ventilation with fans, and duct fans.

The licensee stated that the additional wastewater generated by the drying circuit would be minimal because the licensee plans to capture all the liquid from the precipitation, filter press, and dryer and use the liquid wastewater fresh eluant make-up (LCI, 2012d). According to the licensee, recycling of the wastewater serves to reduce chemical consumption and water consumption. Wastewater will consist primarily of drum wash down and condensate tank waste. The licensee will release any wastewater not recycled to the onsite holding ponds, before being deep well injected in the UIC Class I wells (LCI, 2012e).

The staff reviewed the proposed effluent control systems for airborne and liquid releases of radioactive materials from the addition of two rotary vacuum dryers for the Lost Creek Project in accordance with Sections 4.1.3 and 4.2.3 of the SRP (NRC, 2003). The licensee described the release points and sources of airborne uranium from the dryers at the Lost Creek Project. The licensee provided (LCI, 2012c) information on the radiological impact from normal and accidental releases, and stated that it will provide worker training and spill control procedures to deal with these accidental situations. The licensee has committed to meeting 10 CFR Part 20 occupational dose limits and public dose limits and to maintaining these doses ALARA. The licensee provided an illustration that demonstrates that adequate ventilation systems are planned for the addition of the two dryers in the processing plant to meet SRP Section 4.1.3 acceptance criterion (3) (NRC, 2003).

The staff reviewed the aspects of liquid effluents to be generated by the addition of the two rotary vacuum dryers at the Lost Creek Project in accordance with the procedures in Section 4.2.2 and acceptance criteria in SRP Section 4.2.3 (NRC, 2003). The licensee has acceptably described the common liquid effluents generated at the facility. Appropriate control methods, i.e., deep well injection and surface storage ponds, have been identified, thus the staff finds the licensee met SRP Section 4.2.3 acceptance criterion (1) and meets the requirements of 10 CFR Parts 20 and 40.

### **11.3 Radiation Safety Controls And Monitoring**

The licensee committed to posting the dryer room as an airborne radiation area during and after packaging and until such time that the Health Physics staff has inspected the room to verify that it has been adequately washed down and can demonstrate by air quality measurements that the airborne concentration of uranium is less than the W class DAC for U-238 (LCI, 2012c). The licensee stated that the RSO might establish a lower or higher ALARA airborne concentration standard depending on conditions at the site. The licensee has committed to requiring that the dryer operator wear a breathing zone sampler to determine the potential for exposure during all packaging operations. The stated that the provisions of technical report Section 5.7.3 are applicable, in general, to ISR operations regardless of whether or not yellowcake rotary vacuum drying is present (LCI, 2012c).

The licensee expanded area surveys to the yellowcake drying area as one of the survey areas of concern where work with uranium is performed (LCI, 2012c). The licensee provided a revised technical report Figure 5.7-1, "Locations of In-Plant Radiologic Sampling," which illustrates sampling locations of direct gamma, radon progeny, airborne uranium particulates,

personal survey meters, and gamma dosimeters. The licensee stated that it would apply administrative and engineering controls to the maximum extent to reduce need for use of respirators as "a last line of defense against airborne particulates." However, the licensee stated that it would require workers to wear respiratory protection while in the rotary vacuum dryer room of the processing plant unless air quality sampling confirms airborne concentrations of uranium are below standards and are ALARA because of the potentially severe inhalation consequences of a dryer accident (LCI, 2012c).

The staff observed that the licensee does not plan to conduct effluent monitoring for the yellowcake vacuum dryer apparently, because no emissions and no exhaust are expected. The licensee stated that vacuum dryer technology results in no particulate emissions (LCI, 2012c). The staff agrees that yellowcake vacuum effluent releases are expected to be very low. Notwithstanding the information in NUREG-1910 (NRC, 2009) that no uranium particulate releases result from yellowcake dryer operations, the staff notes that the licensee needs to demonstrate that other potential airborne uranium releases are not occurring from the processing facilities, such as yellowcake packaging operations and maintenance activities, that could result in uranium surface contamination that exceeds 10 CFR Part 20, Appendix B, Table 2, effluent concentrations or the applicable 10 CFR 20.1301 public dose limits in the unrestricted areas.

As discussed in the SER that resulted in the issuance of Source Material License SUA-1598 (NRC, 2011d), the licensee will also need to show that its operations relating to uranium particulate releases are ALARA. The staff notes that with the exception of uranium packaging operations, operations frequently occur while the processing facility doors are open and ventilation systems are exhausting air from the buildings. These potential pathways could result in airborne radioactivity outside the facility. The staff determined that the licensee has not adequately discussed how the licensee will monitor the facility for airborne releases for these sources. The staff notes that licensees have flexibility in meeting the requirements of 10 CFR 40.65 and 10 CFR 20.1301, and the licensee's sampling program as described in the technical report Section 5.7.7 (LCI, 2008; LCI, 2010a) could be part of the licensee's compliance strategy. However, as discussed in the previous SER for the Lost Creek Project (NRC, 2011d), the licensee must inform the NRC of the precise manner in which effluents will be quantified. For these reasons, the staff imposed LC 12.10 in Source Materials License SUA-1598 (NRC, 2011d; NRC, 2011e). The staff has reasonable assurance that the licensee will measure and quantify effluents from the Lost Creek Project based, in part, on the in-plant and exterior monitoring programs. This reasonable assurance determination is contingent upon the licensee's fulfillment of the LC 12.10 in Source Materials License SUA-1598 (NRC, 2011e).

#### **11.4 Transportation Accidents**

The licensee committed to following DOT and NRC transportation regulations in the shipment of dried or yellowcake slurry (LCI, 2008; LCI, 2010a; LCI, 2012c). The licensee stated in Supplement to technical report Section 7.4.7, Transportation Accidents, that NUREG/CR-6733 (NRC, 2001) documents the annual risk as 11 percent of a transportation accident associated with shipments of dried yellowcake from a Wyoming ISR facility producing 1.3 million pounds of yellowcake per year to a conversion plant in Illinois (LCI, 2012c). The applicant committed to following the risk mitigation and cleanup of any yellowcake accident in accordance with the provisions of described in technical report Section 7.4.7 (LCI, 2008; LCI, 2010a; LCI, 2012c).

The staff reviewed potential accidents that could occur at the Lost Creek project in accordance with acceptance criteria in SRP Section 7.5.3 (NRC, 2003). The licensee cites information in NUREG-0706 and NUREG/CR 6733 as the bases for the accident consequences at the Lost Creek project. The staff concludes that these accident consequences analyses are applicable to the Lost Creek project.

Based on the information provided in the application and the detailed review conducted by the staff as indicated above, the licensee's designs, plans, and training are acceptable and are in compliance with 10 CFR 40.32(c), which requires that the applicant's proposed equipment, facilities, and procedures be adequate to protect health and minimize danger to life or property. NRC staff could not determine that SOP's have been developed for emergency response to accidents, and a requirement to develop SOP's was imposed in LC 10.4 of Source Material License SUA-1598 (NRC, 2011d; NRC, 2011e).

## **11.5 Conclusions**

The staff has completed its review of the effects of adding two rotary vacuum dryers and subsequent shipment of dried yellowcake as an additional option to shipping yellowcake slurry to a processing facility. The review followed the procedures identified in SRP and the acceptance criteria in SRP Sections 1.3, 3.23, 4.1.3, 4.2.3, 5.7.1.3, 5.7.2.3, 5.7.3.3, 5.7.6.3, 5.7.7.3, and 7.5.3 (NRC, 2003). LCI has acceptably described the design, controls, instrumentation, monitoring, and all likely significant effects of accidents from transportation of the dried yellowcake. Adequate response and remediation procedures have been identified or referenced, and the facility personnel will be qualified to implement them. The addition and operation of two rotary vacuum dryers are approved and will be allowed in the following new LC 10.18:

Emission controls (dryer). The licensee shall maintain effluent control systems as specified in Supplement TR Sections 3.0, 4.1.2.1, 5.7.3, 5.7.6, 5.7.10, and 7.4.7 of the licensee's approved license application, with the following exceptions:

If any of the yellowcake emission control equipment fails to operate within specifications set forth in the standard operating procedures, the drying and packaging room shall immediately be closed-in as an airborne radiation area and heating operations shall be switched to cooldown, or packaging operations shall be temporarily suspended. Packaging operations shall not be resumed until the vacuum system is operational to draw air into the system.

All these cessations, corrective actions, and restarts must be reported to the appropriate NRC regional office as indicated in Criterion 8A, in writing, within ten days of the subsequent restart.

## **12.0 Request to Remove License Condition 12.6**

License condition 12.6 requires the licensee to provide the NRC staff a copy of the solid byproduct material disposal agreement prior to commencement of operations. LCI provided a copy of its disposal agreement to the NRC (LCI, 2013a), but requested the agreement be maintained as confidential pursuant to 10 CFR 2.390(a) because the agreement contains commercial and financial information. The licensee provided the required affidavit to maintain confidentiality (LCI, 2013a).



The staff reviewed the terms of the waste disposal agreement in accordance with review and acceptance criteria in SRP Sections 3.1.2 and 3.1.3 to ensure that the site will be in compliance with 10 CFR Part 40, Appendix A, Criterion 2, which precludes long-term disposal of byproduct material onsite and ensures that the proliferation of small waste disposal sites is avoided. The staff finds that the licensee has met SRP Section 3.1.3 acceptance criterion (11) by having a solid waste disposal agreement for byproduct material disposal at an NRC or NRC Agreement State licensed disposal facility. The staff finds the licensee met the preoperational requirements in LC 12.6, and therefore, the staff will delete LC 12.6 from the license..

### **13.0 Conclusions and License Conditions**

The proposed revision to Source Materials License SUA-1598 is consistent with NRC guidance and meets the requirements of 10 CFR 40.32(c) and 10 CFR Parts 20.2202 and 20.2203. The following license conditions of Source Materials License SUA-1598 have been added or changed to the license and read as follows:

- 9.2 The licensee shall conduct operations in accordance with the commitments, representations, and statements contained in the license application dated March 31, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML081060525), which is supplemented by the submittals dated December 12, 2008 (ML090080451), January 16, 2009 (ML090360163), February 27, 2009 (ML090840399), August 5, 2009 (ML092310728), April 22, 2010 (ML102100263, ML102420249), May 14, 2010 (ML101600528), June 17, 2010 (ML101720161), and June 24, 2010 (ML101820155), November 11, 2010 (ML103210590), November 16, 2010 (ML103280186), December 3, 2010 (ML103490862), September 13, 2011 (ML112580267), November 8, 2011 (ML11319A196), January 6, 2012 (ML120470353), February 10, 2012 (No. ML12048A678), February 17, 2012 (ML12053A326), March 5, 2012 (120670278), July 27, 2012 (ML12219A076), July 31, 2012 (ML12219A133), November 8, 2012 (ML13029A734), and November 29, 2012 (ML12335A016). The approved application and supplements are, hereby, incorporated by reference, except where superseded by specific conditions in this license. The licensee must maintain the approved license application onsite.

Whenever the word “will” or “shall” is used in the above referenced documents, it shall denote a requirement. The use of “verification” in this license with respect to a document submitted for U.S. Nuclear Regulatory Commission (NRC) staff review means a written acknowledgement by NRC staff that the specified submitted material is consistent with commitments in the approved license application, or requirements in a license condition or regulation. A verification will not require a license amendment.

#### **9.4 Change, Test, and Experiment License Condition**

- A) The licensee may, without obtaining a license amendment pursuant to 10 CFR 40.44, and subject to conditions specified in (B) of this condition:
- i Make changes in the facility as described in the license application (as updated);
  - ii Make changes in the procedures as described in the license application (as updated); and

- iii Conduct tests or experiments not described in the license application (as updated).
- B) The licensee shall obtain a license amendment pursuant to 10 CFR 40.44 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would:
  - i Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated);
  - ii Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a facility structure, equipment, or monitoring system (SEMS) important to safety previously evaluated in the license application (as updated);
  - iii Result in more than a minimal increase in the consequences of an accident previously evaluated in the license application (as updated);
  - iv Result in more than a minimal increase in the consequences of a malfunction of an SEMS important to safety previously evaluated in the license application (as updated);
  - v Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated);
  - vi Create a possibility for a malfunction of an SEMS important to safety with a different result than previously evaluated in the license application (as updated);
  - vii Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (FSER), environmental impact statement (EIS), environmental assessment (EA) or technical evaluation reports (TERs) or other analysis and evaluations for license amendments.
  - viii For purposes of this paragraph as applied to this license, SEMS important to safety means any SEMS that has been referenced in a staff SER, TER, EA, or EIS and supplements and amendments thereof.
- 9.5 Financial Assurance. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR Part 40, Appendix A, Criterion 9, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination, which includes offsite disposal of radioactive solid process or evaporation pond residues, and ground-water restoration as warranted. The surety shall also include the costs associated with all soil and water sampling analyses necessary to confirm the accomplishment of decontamination.

Proposed annual updates to the financial assurance amount, consistent with 10 CFR Part 40, Appendix A, Criterion 9, shall be provided to the NRC 90 days prior to the anniversary date. The financial assurance anniversary date for the Lost Creek Project

will be the date on which the first surety instrument is submitted to the NRC. If the NRC has not approved a proposed revision 30 days prior to the expiration date of the existing financial assurance arrangement, the licensee shall extend the existing arrangement, prior to expiration, for 1 year. Along with each proposed revision or annual update of the financial assurance estimate, the licensee shall submit supporting documentation, showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15-percent contingency of the financial assurance estimate, changes in engineering plans, activities performed, and any other conditions affecting the estimated costs for site closure.

Within 90 days of NRC approval of a revised closure (decommissioning) plan and its cost estimate, the licensee shall submit, for NRC review and approval, a proposed revision to the financial assurance arrangement if estimated costs exceed the amount covered in the existing arrangement. The revised financial assurance instrument shall then be in effect within 30 days of written NRC approval of the documents.

At least 90 days prior to beginning construction associated with any approved planned expansion or operational change that was not included in the annual financial assurance update, the licensee shall provide, for NRC review and approval, an updated estimate to cover the expansion or change. The licensee shall also provide the NRC with copies of financial-assurance-related correspondence submitted to the State of Wyoming, a copy of the State's financial assurance review, and the final approved financial assurance arrangement. The licensee also must ensure that the financial assurance instrument, where authorized to be held by the State, identifies the NRC related portion of the instrument and covers the aboveground decommissioning and decontamination, the cost of offsite disposal of solid byproduct material, soil, and water sample analyses, and groundwater restoration associated with the site. The basis for the cost estimate is the NRC-approved site closure plan or the NRC-approved revisions to the plan. Reclamation or decommissioning plan cost estimates and annual updates should follow the outline in Appendix C, "Recommended Outline for Site-Specific In Situ Leach Facility Reclamation and Stabilization Cost Estimates," to NUREG 1569, "Standard Review Plan for In Situ Leach Uranium Extraction License Applications—Final Report."

The licensee shall continuously maintain an approved surety instrument for the Lost Creek Project, in favor of the State of Wyoming.

- 9.7 The licensee shall follow the guidance set forth in NRC Regulatory Guides 8.22, "Bioassay at Uranium Mills" (as revised), and 8.30, "Health Physics Surveys in Uranium Recovery Facilities" (as revised), or NRC-approved equivalent.

The licensee shall follow the guidance set forth in Regulatory Guide 8.31, "Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Recovery Facilities Will Be as Low as Is Reasonably Achievable" (as revised), or NRC approved equivalent, with the following exception:

The licensee may identify a qualified designee(s) to perform daily inspections in the occasional absence of the RSO and health physics technician(s) (HPT). The qualified designee(s) will have health physics training as specified in the licensee's training program. The qualified designee(s) may perform daily inspections on weekends,

holidays, and times when both the RSO and HPT(s) must both be absent (e.g. illness or offsite training). A designee(s) shall not perform daily inspections for more than two consecutive days except in the event of a federal or company holiday, whereby no more than three consecutive days will be exceeded. Reports will be reviewed by the RSO or HPT as soon as practical, but not later than 3 hours from the beginning of the next work day following an absence, weekend, or holiday. The licensee will also have the RSO or HPT available by telephone while the qualified designee(s) is performing the daily inspections.

Notwithstanding the License Condition (LC) 9.4 change process, no additional exceptions to the guidance will be implemented without written NRC verification that the criteria in LC 9.4 do not require a license amendment.

- 10.2 Facility Throughput. The Lost Creek processing facility throughput shall not exceed an average daily flow rate equivalent to 6,000 gallons per minute or a maximum instantaneous flow rate of 6,300 gallons per minute, excluding restoration flow. The annual production of yellowcake slurry and/or dried yellowcake shall not exceed two million pounds equivalent of dried yellowcake product.
- 10.7 The licensee shall maintain an inward hydraulic gradient in each individual production area, starting when lixiviant is first injected into the production zone and continuing until initiation of the stabilization period.
- 10.16 Any area with exposure rates that exceed 2 millirem in any 1 hour must be immediately treated as a restricted area in accordance with 10 CFR 20.1301(a)(2).
- 10.18 Emission controls (dryer). The licensee shall maintain effluent control systems as specified in Supplement TR Sections 3.0, 4.1.2.1, 5.7.3, 5.7.6, 5.7.10, and 7.4.7 of the licensee's approved license application, with the following exceptions:

If any of the yellowcake emission control equipment fails to operate within specifications set forth in the standard operating procedures, the drying and packaging room shall immediately be closed-in as an airborne radiation area and heating operations shall be switched to cooldown, or packaging operations shall be temporarily suspended. Packaging operations shall not be resumed until the vacuum system is operational to draw air into the system.

All these cessations, corrective actions, and restarts must be reported to the appropriate NRC regional office as indicated in Criterion 8A, in writing, within ten days of the subsequent restart.

- 10.19 The licensee will continue to collect additional meteorological data on a continuous basis at a data recovery rate of 90 percent until the data collected is determined by the NRC to be representative of long-term conditions. Justification of the similarity or validity of the data will include analysis of the statistical data presented to illustrate confidence in the representativeness of the data. The data collected shall include, at a minimum, temperature, precipitation, wind speed, wind direction, and an annual wind rose. The submittal shall include a summary of the stability classification.

- 11.3 Establishment of Background Water Quality. Prior to injection of lixiviant in each production area, the licensee shall establish background groundwater quality data for the ore zone, and overlying and underlying aquifers. The background water quality will be used to define the background groundwater protection standards in 10 CFR Part 40, Appendix A, Criterion 5B(5) for the ore zone aquifer and surrounding aquifers. Water quality sampling shall provide representative preoperational groundwater quality data and restoration criteria as described in Section 5.7.8.1 of the approved license application.

The data for each production area shall consist, at a minimum, of the following sampling and analyses:

- A) Ore Zone. Samples shall be collected from production and injection wells at a minimum density of one production or injection well per 4 acres. A minimum of six wells will be required for the baseline data per mine unit. The data for subhorizons may be combined if the licensee demonstrates that the grouping of data is statistically valid. Wells selected for the baseline data will be the same ones used to determine when restored groundwater meets the NRC's groundwater protection standards in 10 CFR Part 40, Appendix A, Criterion 5B(5).
- B) Perimeter Monitoring Wells. Samples shall be collected from all perimeter monitoring wells that will be used for excursion monitoring in the HJ Horizon. Perimeter wells will be installed for a mine unit in accordance with information presented in Section 3.2.2.2 of the approved license application. In no case will the perimeter monitoring wells be installed outside of the exempted aquifer as defined by the UIC permit area issued by the Wyoming Department of Environmental Quality. If the production patterns include multiple subhorizons within the HJ Horizon, the above requirements will be applicable to all subhorizons.
- C) Overlying and Underlying Aquifers. Samples shall be collected from all monitoring wells in the first overlying and first underlying aquifer at a minimum density of one well per 4 acres of production area.
- D) Sampling and Analyses. Four samples shall be collected from each well to establish background levels. Consecutive sampling events shall be at least 14 days apart. The samples shall be analyzed for parameters listed in Table 6.2-1 of the approved license application. The licensee can reduce the list of parameters analyzed in the third and fourth sampling events. The parameters that can be deleted from analysis are those that measure below the minimum analytical detection limits (MDL) during the first and second sampling events, provided the MDLs meet the data quality objectives for the sampling.
- E) Background Water Quality. For the perimeter monitoring wells (LC 11.3(B)) and monitoring wells in the overlying and underlying aquifers (LC 11.3(C)), the background levels shall be the mean values on a parameter-by-parameter per well-by-well basis in accordance with Section 6.2.2 of the approved license application. For the ore zone monitoring wells, the background levels shall be established on a

parameter-by-parameter basis using either the wellfield or well-specific mean value. The restoration target value (RTV) for each parameter shall be established using the mean value plus a statistically valid factor to account for spatial variability in the data.

12.6 [DELETED by Amendment: 1]

~~Prior to commencement of operations, the licensee shall submit a copy of the solid byproduct material disposal agreement to the NRC.~~

12.13 [DELETED by Amendment: 1]

~~The applicant will submit to the NRC for review and approval a revised decommissioning, decontamination, and reclamation plan within 90 days of receipt of license. The revised plan will include soil cleanup criteria for radionuclides other than radium based on the radium benchmark dose method, as well as procedures to monitor for beta-gamma contamination on equipment, structures, and material released for unrestricted use. The soil cleanup criteria, based on the radium benchmark dose methodology for U and other radionuclides, will demonstrate that residual radioactivity in soil meets the criteria in 10 CFR Part 40, Appendix A, Criterion 6(6).~~

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