

U.S. Nuclear Regulatory Commission  
Office of Nuclear Material Safety and Safeguards  
Division of Fuel Cycle Safety, Safeguards, and Environmental Review

FINAL ENVIRONMENTAL ASSESSMENT  
AMENDMENT 7 TO SOURCE AND BYPRODUCT MATERIALS  
LICENSE SUA-1601 REGARDING  
LICENSE CONDITION 11.3 (A) AND (B)  
Strata Energy, Inc. Ross Project  
Crook County, Wyoming

Docket No.: 40-9091

July 2017

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## ABBREVIATIONS AND ACRONYMS

|       |   |
|-------|---|
| CFR   | <i>Code of Federal Regulations</i>          |
| CPP   | central processing plant                    |
| DM    | deep monitoring or underlying aquifer       |
| EA    | Environmental Assessment                    |
| FONSI | Finding of No Significant Impact            |
| GEIS  | Generic Environmental Impact Statement      |
| ISR   | in situ uranium recovery                    |
| LQD   | Land Quality Division                       |
| NRC   | Nuclear Regulatory Commission               |
| NSR   | non-significant revision                    |
| OZ    | ore zone                                    |
| SEIS  | Supplemental Environmental Impact Statement |
| SER   | Safety Evaluation Report                    |
| UCL   | upper control limit                         |
| UIC   | underground injection control               |
| WDEQ  | Wyoming Department of Environmental Quality |

## UNITS OF MEASURE

|    |           |
|----|-----------|
| ac | acres     |
| ft | ft        |
| ha | hectares  |
| km | kilometer |
| m  | meter     |
| mi | mile      |

# 1 INTRODUCTION

Strata Energy Inc. (Strata) submitted a request to amend the Source and Byproduct Materials License (SUA-1601) for its Ross uranium recovery (Ross) project to the U.S. Nuclear Regulatory Commission (NRC) for review and approval (Strata 2015a). Specifically, Strata is requesting that NRC approve modifications to License Condition 11.3 (A) and (B) which pertain to requirements for the minimum density of baseline wells for a wellfield and distance to and spacing of the perimeter wells for a wellfield.

The Ross project is an in situ uranium recovery (ISR) facility located in Crook County, Wyoming near Oshoto, Wyoming. The Ross project was licensed by the NRC in 2014 (NRC 2014a) and the license has been amended six times (NRC 2017a). The first mine unit, Mine Unit 1, began operation in December 2015 (NRC 2015a). The second mine unit, Mine Unit 2, began operations in December 2016 (NRC 2017b). Strata's Ross project is planned to have a total of four mine units.

As part of its overall review of Strata's amendment request (Strata 2015a), the NRC staff has prepared this final Environmental Assessment (final EA). This final EA includes an evaluation of the potential environmental impacts of the revisions to License Condition 11.3 (A) and (B). In addition to an environmental review, the NRC staff is also conducting a detailed safety analysis of Strata's amendment request to determine whether the request meets the requirements of Title 10 of the *Code of Federal Regulations* (CFR) Part 40, "Domestic Licensing of Source Material." The NRC staff's safety analysis is documented in a separate Safety Evaluation Report (SER). The NRC decision whether or not to grant the license amendment will be based on the analyses documented in both this final EA and the SER.

In addition to the NRC staff's review and approval of this amendment request, Strata also had to file a similar request with the Wyoming Department of Environmental Quality's (WDEQ) Land Quality Division (LQD). The conclusion of the WDEQ review is noted within the final EA.



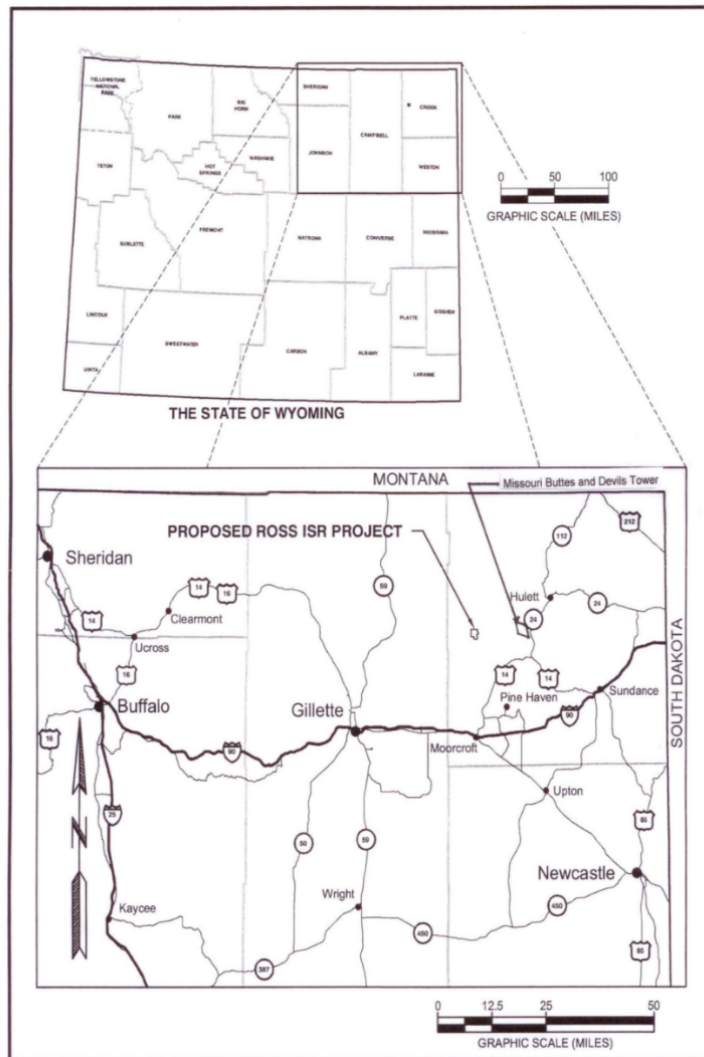
## 1.1 Site Location and Description

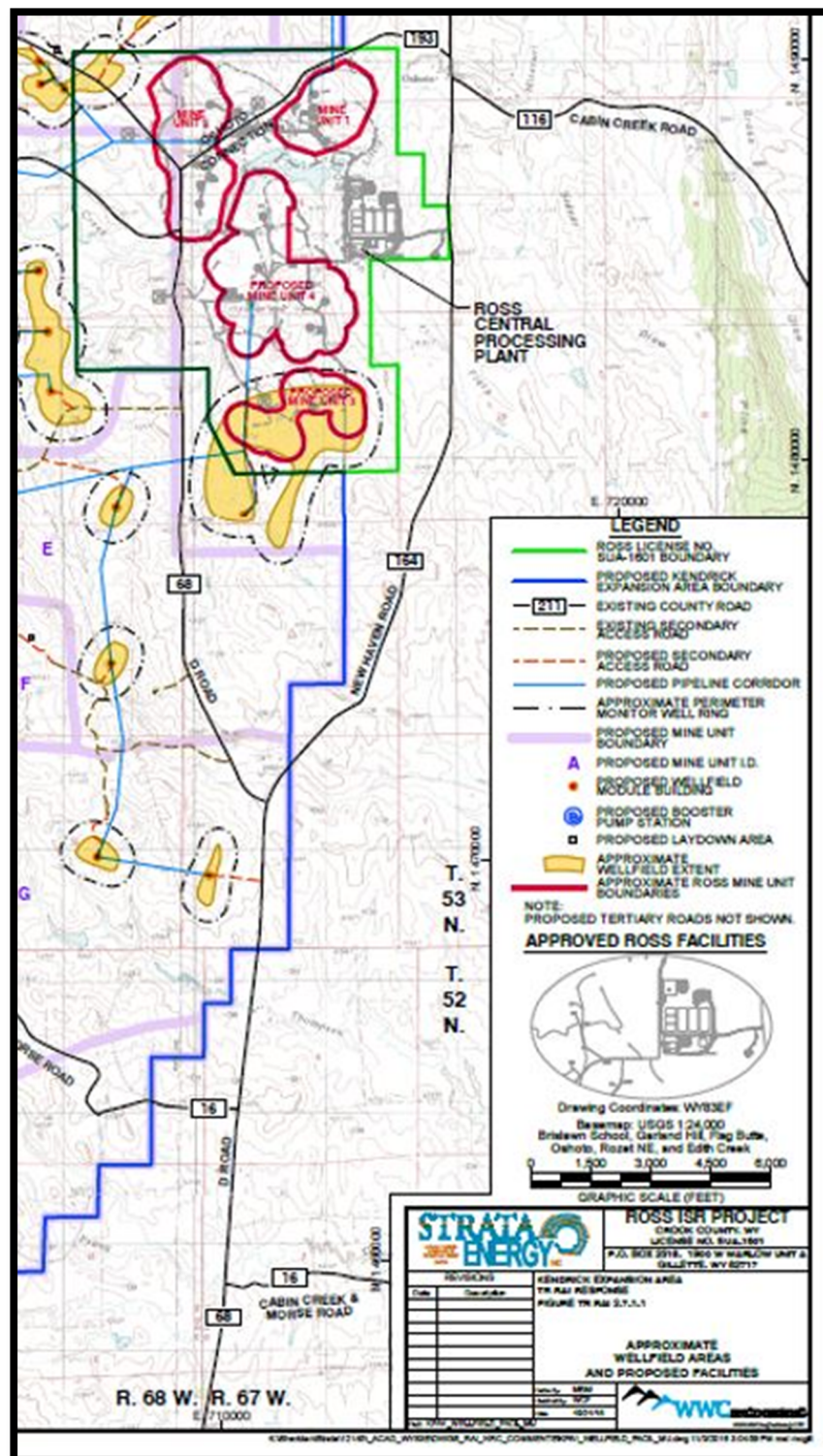
The Ross project encompasses approximately 696 ha [1,721 ac] in Crook County, Wyoming. See Figure 1. Nearby towns include Pine Haven, 27 km [17 mi] southeast; Moorcroft, 35 km [22 mi] south; Sundance, 50 km [30 mi] southeast; and Gillette, 53 km [33 mi] southwest. The Ross project is located on private and State lands adjacent to the unincorporated ranching community of Oshoto, Wyoming. There are no residences within the Ross project area. There are 11 residences within 3 km [2 mi] of the Ross project area; the closest residence is approximately 210 m [690 ft] north-northeast of the site boundary. The subsurface minerals are owned by the U.S. Government and the State of Wyoming. (NRC 2014b).

## 1.2 Uranium Recovery Process

At full development, the Ross project will consist of four mine units (wellfields), 15-25 wellfield modules (header houses), 1,400 to 2,200 recovery and injection wells, and 140-250 monitoring wells. Figure 2 shows the locations of each wellfield. Wellfields are areas over the ore zone(s) where the injection and recovery wells are located. Wellfield modules are groups of specific wells within a wellfield area, and are connected by piping to a module building or “header house.” Each wellfield is surrounded by a perimeter ring of monitoring wells (NRC 2014b).

Figure 1. General Location of Ross (NRC 2014b)





During the in situ uranium-recovery process, an oxidant-charged solution, called lixiviant, is injected into an ore-zone aquifer (or uranium “ore body”) through injection wells. Lixiviant uses native ground water (from the ore-zone aquifer itself), carbon dioxide, and sodium carbonate/bicarbonate, with an oxygen or hydrogen peroxide oxidant. As this solution circulates through the ore zone, the lixiviant oxidizes and dissolves the mineralized uranium, which is present in a reduced chemical state. The resulting uranium-rich solution, the “pregnant” lixiviant, is drawn to recovery wells by a pump, and then transferred to the central processing plant (CPP) via a network of buried pipes. At the CPP, the uranium is extracted from the solution using an ion-exchange (IX) process. The resulting “barren” solution (i.e., uranium-depleted) is then recharged with complexing and oxidizing agents before being re-injected to recover additional uranium from the particular wellfield. (NRC 2014b). Currently Strata sends the uranium-laden resins offsite for processing into “yellowcake” at another licensed facility until the dryers are installed onsite at the Ross CPP in accordance with the license application.

During production, the uranium-recovery solutions continually move through the aquifer from outlying injection wells to internal recovery wells on a production unit basis. The production units are arranged in a variety of geometric patterns depending upon the ore-body’s configuration, the aquifer’s permeability, and the operator’s operational experience. Wellfields are often designed with five-spot or seven-spot production unit patterns, with each recovery (i.e., production) well located inside a ring of four or six injection wells, respectively. A typical wellfield may have 60 production units that commonly share injection wells. (NRC 2014b).

Monitoring wells are constructed in the ore body within the ore-zone aquifer to establish the wellfield baseline conditions prior to operations. Monitoring wells are also constructed around the ore body within the ore-zone aquifer, the overlying aquifer, and the underlying aquifer for the operational (i.e., excursion) monitoring program. These monitoring wells are screened in appropriate stratigraphic horizons to detect lixiviant, should it migrate out of the ore zone (i.e., production zone), or to establish the baseline water quality in the ore zone for restoration purposes after the operations are completed. (NRC 2014b).

Once uranium recovery is completed and aquifer restoration has been performed, Strata will seek approval of the ground-water restoration from the NRC. The NRC’s approval will be given when the ground-water quality at the point of compliance does not exceed the ground-water protection standards set forth in 10 CFR Part 40, Appendix A, Criterion 5B(5). Following NRC approval of the ground-water restoration, the facility and wellfields will be decontaminated and decommissioned in accordance with NRC-approved rules as well as in accordance with an NRC-approved decommissioning plan and/or restoration action plan. Once all of Strata’s decommissioning efforts have been completed, the NRC will affirm the decommissioning, and the site can then be released for unrestricted public use. (NRC 2014b).

### **1.3 Proposed Action**

The Proposed Action is to amend License Condition 11.3 (A) and (B) of Strata's Ross license. Strata's amendment request consists of modifying: (a) the minimum density requirement in a wellfield baseline monitoring program and (b) the distance to and spacing of wells on the perimeter monitoring well ring (Strata 2015a).

### **1.4 Purpose of and Need for the Proposed Action**

Strata (2015a) submitted its license amendment request related to License Condition 11.3 (A) and (B) to provide flexibility in the placement and monitoring of wells in the ore body and the deep monitoring (DM) unit.

License Condition 11.3 (A) establishes that the ore-zone baseline wells be installed at a density of one well per two acres of wellfield production area. Strata stated in its amendment request that based on its experience with Mine Unit 1 wellfield, the density of wells should be one per four acres. (Strata 2015a).

License Condition 11.3 (B) requires Strata to surround its wellfields with perimeter monitor wells spaced 400 feet (ft) apart and at a distance of approximately 400 ft from the edge of the wellfield. Based on an analysis originally provided in the Ross license application, Strata is requesting that the monitor wells be spaced 300 to 500 ft from the wellfield production areas and between the perimeter monitoring wells. Strata requests this change to provide flexibility in placement of wells to avoid certain natural features and infrastructure. (Strata 2015a).

During its safety review of the amendment request, the NRC staff provided Strata with its draft revisions to License Condition 11.3 (A) and (B) (NRC 2017c). In response, Strata accepted the NRC staff's revision to License Condition 11.3 (A) (Strata 2017a). For License Condition 11.3 (B), the NRC staff requested supplemental information to clarify Strata's basis and proposed commitments (NRC 2017d) and Strata provided (Strata 2017b). Following the submission of the supplemental information, the NRC staff and Strata discussed additional changes to License Condition 11.3 (B) (Strata 2017a). The specific changes that comprise the Proposed Action are detailed in Section 4 (Environmental Impacts of the Proposed Action) of this final EA.

### **1.5 Scope of the Environmental Analyses**

The environmental impacts of construction, operation, aquifer restoration, and decommissioning on water resources at the Ross project were previously evaluated by the NRC and documented in Section 4.5.1 of the Ross Supplemental Environmental Impact Statement (SEIS)

(NRC 2014b). The Ross SEIS tiered from the Generic Environmental Impact Statement on In Situ Uranium Recovery (ISR GEIS, NUREG-1910) (NRC 2009).

Strata's license amendment request involves ground-water monitoring and the placement of wells. Therefore, the only resource affected by this amendment request is ground-water quality. No additional land disturbance would occur as a result of this license amendment request. The NRC staff is incorporating by reference information and analyses presented in the Ross SEIS as appropriate.

## **2 ALTERNATIVES TO THE PROPOSED ACTION**

The alternatives considered in this final EA are the Proposed Action (Modified License Conditions 11.3 (A) and (B), as requested with supplemental information by Strata), and the No-Action Alternative.

Under the No-Action alternative, the NRC would not approve the license amendment request. The No-Action alternative would result in Strata operating the Ross project as currently licensed. The impacts would be the same as those already considered in Section 4.5.1 of the Ross SEIS and therefore will not be discussed further in this final EA. The environmental impacts on ground-water quality from the Proposed Action are discussed in Section 4 (Environmental Impacts of the Proposed Action) of this final EA.

## **3 AFFECTED ENVIRONMENT**

This section provides a brief description of ground water at the Ross project. A more detailed description of ground water can be found in Section 3.5.3 of the Ross SEIS (NRC 2014b) and in the Ross SER (NRC 2014c).

The proposed activities affect the ground-water quality in specific sandstones within the Fox Hills/Lance Aquifer. The Fox Hills/Lance aquifer is one of the regional aquifers found within the Powder River Basin of Wyoming (Rankl and Lowry 1990). The other regional aquifers include the Fort Union/Wasatch and Madison aquifers (Anna 1986, Feathers et al., 1981). In general, the potentiometric surface of the older (deeper) regional aquifers decreases in elevation (Downey 1986). However, each regional aquifer is typically defined by its own unique ground-water flow characteristics as each is separated from another by fine grained lithologies of substantial thickness.



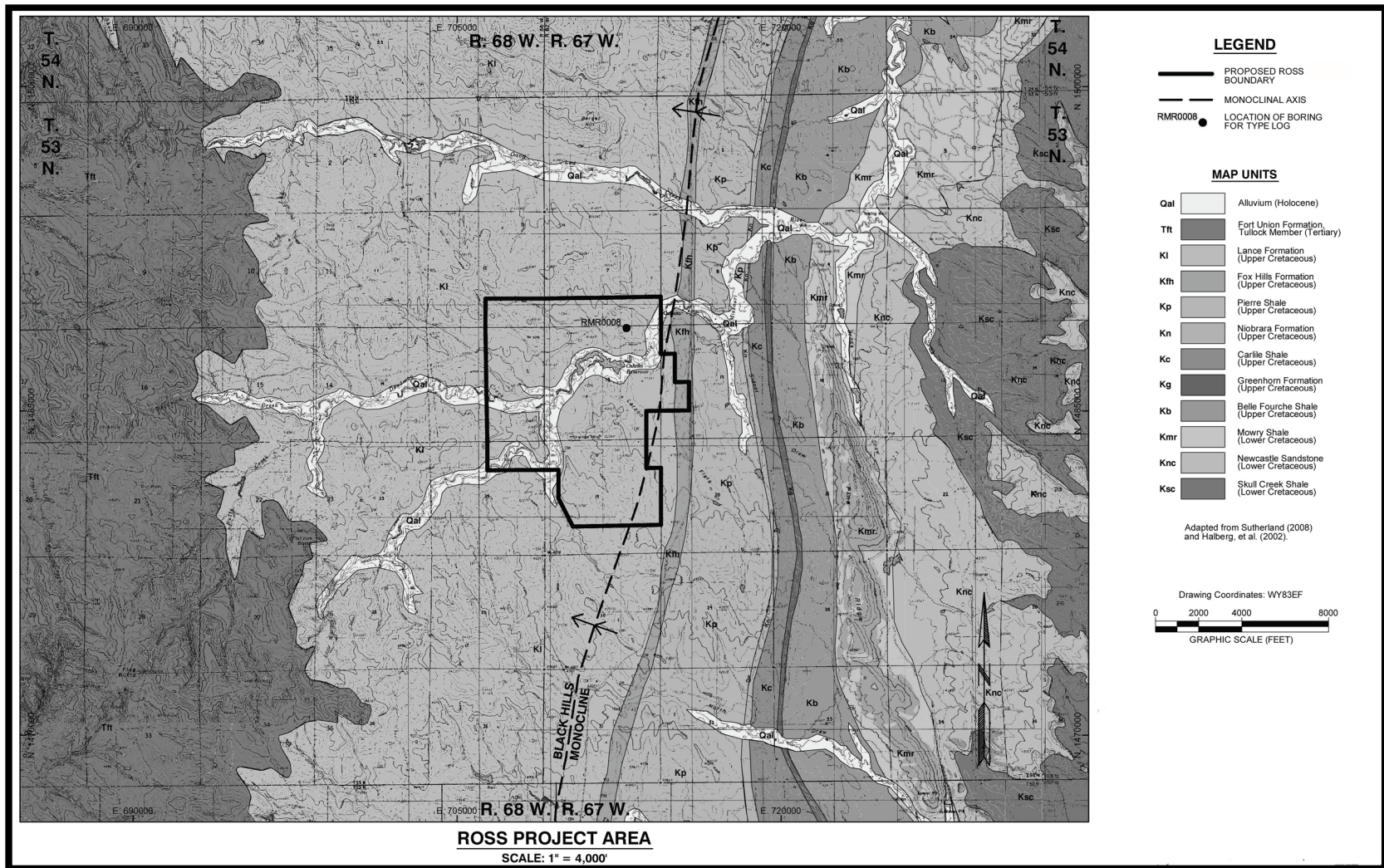


Figure 3. Surface Geology of Ross Project Area (NRC 2014b)

The Ross area is located along the eastern margin of the Power River Basin. See Figure 3. The only regional aquifer found at depths less than 1000 ft below ground surface in this area is the Fox Hills/Lance Aquifer because the younger aquifers (e.g., Fort Union/Wasatch aquifer) have been eroded. The Pierre Shale effectively isolated the Fox Hills/Lance Aquifer from the deeper aquifers. (Strata 2011).

Immediately east of the Ross area, the Fox Hills and Lance formations have been eroded, exposing the Pierre Shale at the ground surface. Consequently, the eastern extent of the Fox Hills/Lance Formation is defined by those outcrops. To the west, the depth to the base of the Fox Hills/Lance Aquifer increases due to the shallow westerly dip of the formations. In addition, the thickness of the aquifer increases in the western direction as the erosion of the Lance formation is less severe. In fact, the contact between the Lance Formation with the overlying Fort Union Formation is mapped approximately 2 miles west of the Ross area. (Strata 2011).

The specific sandstones targeted for the ISR operations are found in a 200-ft interval within the lower Lance Formation and upper Fox Hills Formation. Strata has designated these sandstones as the Ore Zone (OZ) Aquifer. (Strata 2011). The proposed amendment request does not change ISR operations within the OZ Aquifer.

As part of the ground-water protection program, Strata is required to (1) maintain an inward gradient during operations to prevent the migration of fluids from a wellfield and (2) monitor the water quality in the surrounding aquifers to ensure the effectiveness of controlling the fluid migration from a wellfield as described above (NRC 2014a). For the Ross project, the monitoring requirements include the aquifer immediately overlying the OZ Aquifer, which is designated as the Shallow Monitoring aquifer, the aquifer immediately underlying the OZ Aquifer, which is designated as the DM Unit, and the perimeter ring wells in the OZ Aquifer surrounding a wellfield (NRC 2014a, c).

In addition to the monitoring required for ensuring effectiveness of controlling fluid migration from a wellfield during its operation, Strata is also required to establish representative baseline quality of the ore zone subject to ISR operations. The baseline quality data is used to determine the effectiveness of restoration of the OZ Aquifer ground water after operations are completed.

## **4 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION**

This section addresses the potential environmental effects to ground-water quality as a result of the changes to License Condition 11.3 (A) and (B) for both the Proposed Action and Alternative 1. As discussed in Section 1.5 of this final EA (Scope of Environmental Analysis), ground-water quality is the only resource that would be affected by the Proposed Action or Alternative 1. There would be no new land use disturbance as a result of the license condition changes. The amendment request, if granted, would affect aspects of the (1) monitoring program for the OZ Aquifer and the DM Unit and (2) baseline monitoring requirements.

License Condition 11.3 requires Strata to install monitoring wells in the ore body around the perimeter of each wellfield and in the underlying and overlying aquifers. The monitoring well ring and wells in the overlying and underlying aquifers would be used to detect horizontal and vertical excursions of uranium-recovery solutions during ISR operations. The data collected from the wells in the ore body would be used to calculate ground-water protection standards. During operations, Strata would sample groundwater from the monitoring wells and compare the analytical values to the NRC-specified standards to determine whether an excursion of any solution (such as lixiviant) into the surrounding aquifers has occurred. (NRC 2014b).

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#### *License Condition 11.3*

Establishment of Background Water Quality. Prior to injection of lixiviant in a wellfield, the licensee shall establish background water quality data for the ore zone, overlying and underlying aquifers. The background water quality sampling shall provide representative baseline data and establish ground water protection standards and excursion monitoring upper control limits, as described in Section 5.7.8 of the approved license application and this license condition.

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#### **4.1 License Condition 11.3 (A) – Density of Ore Zone Baseline Wells**

License Condition 11.3 (A) currently requires a minimum density of one baseline monitoring well per two acres of wellfield production area. Strata, in its Ross license application, originally proposed a minimum density of one well per four acres. However, based on the NRC staff review of the hydrogeologic setting, the NRC set the minimum density as one baseline monitoring well per two acres because the Ross project was the first commercial operation to be conducted in the Lance/Fox Hills Aquifer and, based on the existing data, the production aquifer exhibited potential heterogeneities on a two-acre scale. The data presented in the Ross license application was from a former research and development facility that had operated in the Ross area during the 1970s. The pumping tests conducted by Strata for the initial licensing action did not further refine the scale of heterogeneities. (Strata 2011).

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#### *License Condition 11.3 (A)*

Ore Zone. To establish a Commission-approved background concentration pursuant to Criterion 5B(5)(a) of 10 CFR Part 40 Appendix A, samples shall be collected from production and injection wells at a minimum density of one production or injection well per two acres of wellfield production area, or, if a wellfield production area is sufficiently isolated from the other wellfield production areas in the Wellfield, a minimum of two wells. Wells selected for the baseline data will be the same ones used to measure restoration success and stabilization.

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The proposed action would amend the language of License Condition 11.3 (A) to read (changes underlined):

*Ore Zone. To establish a Commission-approved background concentration pursuant to Criterion 5B(5)(a) of 10 CFR Part 40 Appendix A, samples shall be collected from production and injection wells at a minimum density of one production or injection well per four acres of wellfield production area. If a portion of a wellfield production area is isolated by distance to other production areas within a wellfield or isolated hydraulically, as determined by the pumping tests, a minimum of one well in each of the isolated areas will be required for the baseline data if the isolated area is less than four acres in area. Wells selected for the baseline data will be the same ones used to measure restoration success and stabilization.*

The NRC imposed the minimum density of one well per two acres when initially licensing Ross, but anticipated that, with operational experience, the licensee could submit an amendment request to change this minimum density requirement, provided that its experience in the Lance Formation demonstrates that such a change is justified (NRC 2013).

In its initial license amendment request, Strata (2015a) requested that License Condition 11.3 (A) be modified to reduce the minimum density of the baseline monitoring wells in the ore zone aquifer from one well per two acres to one well per four acres.

Section 4.1 of the SER outlines Strata's rationale for its requested license condition modification (NRC 2017c). The NRC staff imposed the minimum density of one well per two acres when it issued the initial license because of the limited subsurface data for the initial Ross application. With the data from the first two mine units (Strata 2016a, 2015c), Strata (2015a) now provides a rationale that a minimum density of one well per four acres would provide sufficient data. Strata points to the normal distribution of concentrations in baseline sampling results and statistically similar (homogeneous) quality of ground water on either side of hydraulic barriers.

As explained in the Ross SEIS Section 4.5.1.3 (NRC 2014b), the Commission-approved background concentrations are used to assess the aquifer-restoration success after the operations are completed (i.e., the concentrations post-restoration are compared to the background concentrations). The Commission-approved background concentrations should be representative of conditions in the aquifer prior to operations.

Based on the wellfield packages submitted by Strata (2016a, 2015c), the NRC staff determined that depending upon the configuration of the wellfield, the modification initially requested by Strata would potentially allow hydraulically-isolated areas of a wellfield to go unmonitored (see SER Section 5.1). Without representative samples from each hydraulically-isolated area within a wellfield, there would not be any background or baseline information for that hydraulically-isolated area and therefore no means to evaluate the effectiveness of restoration efforts. Without any means of measuring aquifer restoration, there would exist the possibility that ground water might not be restored to pre-operational conditions and that contamination would remain in the aquifer and possibly spread beyond the production zone.

Therefore, Strata and the NRC staff discussed revising the license condition language to change the density from one well per two acres to one well per four acres, with a stipulation that if there is a hydraulically-isolated area within a wellfield, a monitoring well must be placed within each isolated area even if the area is less than four acres. On March 9, 2017, the NRC staff provided Strata with draft license condition language different from what Strata initially requested (NRC 2017d). On March 29, 2017, Strata accepted the NRC staff's changes to License Condition 11.3 (A) (Strata 2017a).

The NRC staff's analysis focuses on whether the data from Mine Unit 1, and to a limited extent Mine Unit 2, provided by Strata in support of its license amendment application, are sufficient justification for granting the request. The SER (Section 5.1) documents the NRC's evaluation of the data provided from Mine Units 1 and 2. To ensure that Strata is able to monitor hydraulically-isolated areas within the wellfield, the NRC staff added a stipulation that Strata monitor each hydraulically-isolated area within a wellfield, even if it is less than four acres. By requiring all hydraulically-isolated areas to be monitored, the NRC staff can ensure that the necessary data is available to measure the effectiveness of aquifer restoration in the future. Therefore, the Proposed Action's amendment to License Condition 11.3 (A) would not result in any significant impact to ground-water quality, since Strata would continue to have the necessary background data, including from the hydraulically-isolated areas, to establish baseline conditions and measure the effectiveness of restoration.

#### **4.2 License Condition 11.3 (B) – Perimeter Monitoring Well Ring Distances and Spacing**

License Condition 11.3 (B) describes the requirements for the installation of perimeter monitoring wells to be sampled for the excursion monitoring program. In its Ross license application, Strata stated that a 400- to 600-ft distance between perimeter monitoring wells was sufficient to detect an excursion based on modeling predictions (Strata 2011). During its safety review of the Ross license application, the NRC staff requested additional information on Strata's justification for the 600-ft spacing (NRC 2012), since the 600-ft distance exceeded the range of 300 to 500 ft recommended by guidance in NUREG/CR-6733 and NUREG-1569 (Center 2001, NRC 2003). In response to NRC staff's request for additional information, Strata

instead committed to the 400-ft distance requirement for the distance to and spacing of the perimeter wells (Strata 2012).

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*License Condition 11.3(B)*

Perimeter Monitoring Wells. Samples shall be collected from all perimeter monitoring wells that will be used for the excursion monitoring program. The perimeter wells will be installed for a wellfield in accordance with information presented in Section 3.1.6 of the approved license application. In no case will the perimeter monitoring wells be installed outside of the exempted aquifer as defined by the Class III UIC permit issued by the Wyoming Department of Environmental Quality.

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The Proposed Action would amend the language of License Condition 11.3 (B) to read (changes underlined):

*Perimeter Monitoring Wells. Samples shall be collected from all perimeter monitoring wells that will be used for the excursion monitoring program. The perimeter wells will be installed for a wellfield in accordance with information presented in Section 3.1.6 of the approved license application, as amended by the submittal dated December 21, 2015 (ML16004A032), with the following stipulations: the distance between the nearest production unit and perimeter well will be between 300 and 500 ft and the spacing between perimeter wells will be between 300 and 500 ft provided the maximum angle from the closest unit to two nearest wells is less than 75 degrees. In the event a perimeter well exceeds the 400-foot spacing from the nearest production unit, the UCLs for that perimeter well will be calculated in accordance with commitments in the submittals dated March 29, 2017 (ML17089A275) and April 5, 2017 (ML17095A893). In no case will the perimeter monitoring wells be installed outside of the exempted aquifer as defined by the Class III UIC permit issued by the Wyoming Department of Environmental Quality.*

Strata's initial (2015a) license amendment request asked for License Condition 11.3 (B) to allow for a variable distance and spacing of 300 to 500 ft between wells. Strata requested the modification to provide greater flexibility in locating wells to avoid natural and infrastructure features (Strata 2015a).

In December 2015, Strata submitted a request for a non-significant revision (NSR) to WDEQ for its Permit to Mine (No. 802) (Strata 2015c). Similar to its license amendment request to the NRC, Strata requested that Section 4.1.1 of its Mine Plan be revised to allow a variable perimeter monitoring well spacing and offset distance of 300 to 500 ft from the wellfields and between the perimeter monitoring wells. In January 2016, WDEQ approved the NSR for variable spacing (WDEQ 2016).

### Distance between Production and Perimeter Wells

In Section 5.2 of the SER, the NRC staff initially determined that Strata's requested spacing between the production unit and perimeter wells of up to 500 ft was unacceptable because it would reduce the licensee's ability to detect a horizontal excursion due to the poor baseline ground-water quality and higher upper control limits for the excursion parameters, resulting in longer detection times for excursions. The NRC staff found that a distance greater than 400 ft to a perimeter well was not acceptable because of the increased time to detect an excursion.

The NRC's safety analysis, as documented in Section 5.2 of the SER (NRC 2017c), noted that the poor baseline water quality at the Ross project results in a higher threshold (i.e., trigger) for the excursion parameters being monitored. Evaluating the impact of the baseline water quality on the time of an excursion detection, the NRC staff determined that allowing wells to go beyond the currently permitted distance of 400 ft would not provide adequate and timely identification of excursions.

The NRC staff proposed draft license condition language that would limit the distance to 300 and 400 ft between the production and perimeter wells (NRC 2017d). Strata did not agree to the proposed license condition language (Strata 2017a). In response, Strata committed to determining a "lower" well-specific upper concentration limit (UCL) that would result in detection of an excursion on the same timeframe as a well that would have been located at a distance of 400 ft using the standard UCL (Strata 2017a). As documented in Section 5.2 of the SER, the NRC staff reviewed Strata's responses and determined that a lower well-specific UCL for wells at distances greater than 400 ft would address the issue of timely detection of excursions at those wells (NRC 2017c). The Proposed Action requires, in the case of a perimeter well located more than 400 ft from the nearest production unit, that Strata develop UCLs in accordance with new license commitments. As part of its safety review, the NRC evaluated Strata's methodology for determining well-specific UCLs, which will be incorporated into license commitments.

Therefore, the NRC does not expect the Proposed Action to result in a noticeable impact on ground-water quality, since the licensee could identify excursions in wells 500 ft apart in the same timeframe as it could in wells 400 ft apart. Thus, the potential impacts would be similar to those in Section 4.5.1.2 of the Ross SEIS (SMALL for confined aquifers above and below the ore zone).

### Spacing Between Perimeter Wells

As discussed in Section 5.2 of the SER, the NRC staff determined that due to the lack of heterogeneities at the Ross site, spacing between perimeter wells that result in a maximum angle formed by lines drawn from any production or injection well to the nearest two monitoring wells of 75 degrees is acceptable. For distances greater than 400 ft from a production or injection well, a 500-ft spacing between perimeter wells would result in an angle less than 75 degrees. Strata proposes to maintain a distance to the wells equal to the spacing between the wells, resulting in a maximum angle of 53 degrees. Therefore, the NRC staff determined in the SER that the 500-ft distance between perimeter wells is acceptable since it would maintain an angle less than or equal to 75-degrees, as recommended by NUREG/CR-6733.

Because of the lack of heterogeneities at the Ross site, any excursion would be expected to flow out radially; thus, increasing the distances between the perimeter wells to up to 500 ft would not be expected to diminish Strata's ability to detect a horizontal excursion in a timely manner. Strata would be able to identify the excursion and take the necessary mitigative actions. Therefore, there would be no significant environmental impact from this aspect of the Proposed Action.

### Summary

Section 4.3.3.2.2.2 of the ISR GEIS states that the impact of horizontal excursions could be MODERATE to LARGE if a large volume of contaminated water leaves the ore zone and moves downgradient and impacts an area outside the ore zone which is being used for consumption (NRC 2009). Horizontal excursions at Ross were addressed in Section 4.5.1.2 of the Ross SEIS. The Ross SEIS identified measures to mitigate potential horizontal excursions once they were identified, such as computer-based control systems and groundwater models. However, those mitigation measures are not useful if the wells are too far from the production area for timely detection of horizontal excursions.

The NRC staff determined that the maximum spacing between the production unit and perimeter wells of 500 ft, along with additional assurance that Strata-determined UCLs would allow detection of an excursion in the same timeframe as a well located 400 ft away, would maintain Strata's ability to timely identify horizontal excursions.

The NRC staff also found that allowing a spacing of up to 500 ft between perimeter wells, provided that the maximum angle from the closest unit to the two nearest wells is less than 75 degrees, would ensure that Strata maintains the ability to identify horizontal excursions in a timely manner.

Based on the above, the Proposed Action would not result in significant impacts to ground-water quality.

### **4.3 Cumulative Impacts**

This section evaluates the cumulative effects that result from the incremental impact of the Proposed Action on the environment, when added to other past, present, and reasonably foreseeable future actions.

The NRC prepared a cumulative impacts analysis in the Ross SEIS. The NRC incorporates by reference the cumulative impacts analysis of ground-water quality provided in Section 5.7.2 of the Ross SEIS (NRC 2014b). The cumulative impact assessment considered the event where metals migrated downgradient, outside of the ore zone, and the NRC determined the impacts were SMALL. The conclusion was based on the chemistry of the aquifer and the conclusion that the metals would precipitate out in the oxygen-deficient environment onto the aquifer rock walls.

The incremental impact to ground-water quality from the revision to License Condition 11.3 (A) and (B) as a result of this license amendment request would not change the NRC's assessment of cumulative impacts to groundwater quality in the Ross SEIS, determined to be SMALL, which remains bounding for this assessment.

Since the publication of the Ross SEIS, Strata has submitted several license amendment requests. The amendments to the license since publication of the Ross SEIS include Amendment 1 (incorporating the Atomic Safety and Licensing Board ruling in the initial licensing proceeding into License Condition 10.12), Amendment 2 (revising the baseline list of constituents), Amendment 3 (2015 Surety update), Amendment 4 (removal of License Condition 12.8), Amendment 5 (2016 surety update) and Amendment 6 (revising the Designee duties). These previous amendments met the criteria for a categorical exclusion under 10 CFR 51.22 and thus do not individually or cumulatively have a significant effect on the human environment.

Another Strata request was to expand the Ross project to include the Kendrick project area (Strata 2015d). However, in December 2016, Strata requested that the NRC suspend its review until the market conditions for uranium improved (Strata 2016c). The Ross SEIS's analysis of cumulative impacts considered the expansion of the Ross site, including the proposed Kendrick area.

Finally, Strata submitted a license amendment request to amend License Condition 11.3 (C), related to the DM unit monitoring program (Strata 2015e, 2017c). The NRC staff will prepare a separate SER and EA for that request. To approve the proposed amendment to License Condition 11.3 (C), the NRC staff would have to determine that it has reasonable assurance that the requested amendment would be protective of the underlying aquifer. If approved as requested, the amendment to License Condition 11.3 (C) could result in the reduction and

possible elimination of monitoring of the underlying aquifer. The isolation of the underlying aquifer is assured because Strata is required by license condition to properly abandon all boreholes. Because the Proposed Action involves the required monitoring within the OZ Aquifer and the OZ Aquifer is hydraulically distinct from the underlying aquifer except if improperly abandoned boreholes exist, Proposed Action would have a negligible cumulative impact when added to the reduction or elimination of the monitoring of the underlying aquifer.

Chapter 6 of the Ross SEIS describes the environmental monitoring and reporting that would be required of Strata pursuant to conditions of its NRC license, other permits (e.g., WYDEQ Permit to Mine), and other applicable environmental regulations (NRC 2014b). Strata would still be responsible for maintaining any related permits and licenses.

## **5 CONSULTATIONS AND PERSONS CONTACTED**

The NRC staff provided a copy of the draft EA to the WDEQ/LQD for review and comment on June 14, 2017 (NRC 2017f). WDEQ/LQD responded on July 6, 2017 that they had reviewed the draft EA and did not have any comments (WDEQ 2017).

The NRC staff has determined that neither the Proposed Action nor the No-Action Alternative would result in any additional land disturbance or authorize any additional activities than those already assessed in the Ross SEIS. Therefore, no additional consultation is required under either Section 106 of the National Historic Preservation Act or Section 7 of the Endangered Species Act.

## **6 RECOMMENDATION AND CONCLUSION**

The NRC evaluated the potential impacts to ground-water quality from the Proposed Action and determined that the changes would maintain Strata's ability to develop appropriate baseline and restoration data and continue the timely and accurate identification of ground-water excursions. Therefore, the NRC staff concludes that preparation of an Environmental Impact Statement is not warranted. Accordingly, the NRC staff has determined that a Finding of No Significant Impact (FONSI) is appropriate. The FONSI will be issued in a *Federal Register* after the final EA is published.

## **7 LIST OF PREPARERS**

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