STRATA ENERGY INC

A WHOLLY-OWNED SUBSIDIARY OF PENINSULA ENERGY LIMITED

December 21, 2015

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Re: Strata Energy Ross In Situ Recovery Project
Source Materials License SUA-1601, Docket No. 040-09091
Request to Amend License Condition 11.3

To Whom It May Concern:

Strata Energy, Inc. (Strata) recently completed activities associated with the preparation of the Mine Unit 1 (MU1) Wellfield Data Package required by License Condition (LC) 10.13. As part of this effort, Strata installed 25 ore zone (OZ) or interior baseline wells in order to characterize the water quality and host aquifer hydraulic characteristics. These baseline wells were used to establish Commission-approved background and were installed at a density of "one production or injection well per two acres of wellfield production area" as required in LC 11.3 A). The MU1 water quality and host aquifer hydraulic characteristics and other data as discussed in the following demonstrate that an appropriate OZ baseline well density for the Ross project is one well per four acres of wellfield production area. Therefore, Strata requests that NRC staff amend LC 11.3 A) of SUA-1601 to allow a minimum density of one production or injection well per four acres of wellfield production area.

In addition, LC 11.3 B) requires that Strata install perimeter monitor (PM) wells in accordance with Section 3.1.6 of the approved license application. Section 3.1.6 states that the wellfields will be surrounded by perimeter monitor wells spaced 400 feet apart and at a distance of approximately 400 feet from the edge of the wellfield. Section 3.1.6 also discussed the results of excursion simulations which indicated that 400-600-foot spacing of PM wells could successfully detect potential excursions of mining solutions. Strata believes that host aquifer hydraulic characteristics determined during installation and testing of Mine Unit 1 support amending the required PM well spacing. Strata is requesting that LC 11.3 B) be amended to allow a variable PM well spacing and offset distance of 300 to 500 feet from the wellfield production areas and between the PM wells. This additional flexibility in well spacing will allow Strata to avoid natural features, historic sites, existing infrastructure, and environmentally sensitive areas while ensuring the ability to provide timely detection of horizontal excursions.

The following provides a technical discussion to support the requested amendment. Specific language for License Condition 11.3 A) and 11.3 B) is also included.

NMSS01

DISCUSSION

I. The Mine Unit 1 Pre-operational Sampling Results Demonstrate a Lack of Heterogeneity in Ore Zone Groundwater Quality

The Mine Unit 1 (MU1) wellfield data package presents the pre-operational sampling results from 25 ore zone (OZ) aquifer wells. Based on the MU1 wellfield pattern area of approximately 35 acres, this sampling was conducted at a density of one well per 1.4 acres, which is a higher density than either the current LC 11.3 requirement of one well per 2 acres or the proposed minimum density of one well per 4 acres. Even at this relatively high density, the MU1 sampling results demonstrate a lack of heterogeneity in the OZ aquifer on a mine unit scale. This lack of heterogeneity is demonstrated by the data distribution and lack of outliers in the OZ sampling results.

The MU1 wellfield data package demonstrates that most of the OZ aquifer constituents that could be evaluated for data distribution (i.e., those with a sufficient number of detectable concentrations), were adequately described by a normal distribution. This is illustrated in Table 1 of Attachment 12 of the MU1 wellfield data package (ML15209A703), which summarizes the target restoration value (TRV) calculations. This table shows that 19 of 35 parameters had a sufficient number of detectable concentrations to evaluate the data distribution. Of these 19 parameters, 13 (68 percent) were adequately described by a normal distribution. This supports the conclusions that these data were derived from the same population and there is not significant heterogeneity in OZ groundwater quality on a mine unit scale.

The outlier evaluation in the MU1 wellfield data package further demonstrates the lack of heterogeneity. Not only were there relatively few outliers in the OZ well sampling results, but the frequency of outliers was the same or less than that in other monitoring intervals. Attachment 9, Table 1 of the MU1 wellfield data package summarizes the outlier evaluation. It shows that 13 outliers were removed from the OZ data set. These 13 values represent only 0.27 percent of the 4,850 pre-operational groundwater quality laboratory analyses for MU1 (the total number of laboratory analyses and number of outliers for each monitoring interval may be obtained from Table 1, Attachment 7 of the MU1 wellfield data package).

By comparison, Attachment 9 of the MU1 wellfield data package shows that the number of outliers removed from the perimeter monitoring (PM) wells was nine outliers out of 3,686 total analyses, which represents nearly the same frequency (0.24 percent) as that in the OZ aquifer. For the shallow monitoring (SM) interval, 19 outliers were removed from 2,716 total analyses. The frequency of outliers in the SM interval was 0.7 percent or approximately 3 times greater than that in the OZ aquifer. For the deep monitoring (DM) interval, 33 outliers were removed from 2,716 analyses, which represent a frequency of 1.2 percent or approximately 5 times greater than that in the OZ aquifer. Based on the outlier frequency, there is equal or less heterogeneity in the OZ aquifer compared to the other monitoring intervals, including those with a required pre-operational monitoring density of one well per four acres (i.e., the DM and SM intervals).

In summary, Strata is required by LC 10.13 to evaluate potential heterogeneities in the chemical signature of groundwater in the OZ aquifer. This was done in the MU1 wellfield data package through evaluation of the data distribution and through screening for potential outliers. The pre-operational sampling results in the MU1 wellfield data package demonstrate that most constituents are adequately described by a normal distribution and there are relatively few outliers when compared to other monitoring intervals. These results support the conclusion that there is a lack of heterogeneity in the OZ aquifer on a mine unit scale.

II. The MU1 Pre-operational Sampling Results Demonstrate a Lack of Groundwater Quality Heterogeneity Associated with Hydraulically Isolated Wells

The Safety Evaluation Report (SER, ML14002A107) for the Ross ISR Project indicates that one of the primary reasons that NRC prescribed a minimum density of one well per two acres in LC 11.3 A) is the concern that hydraulically isolated wells may have differing groundwater quality from other OZ aquifer wells. This is described on pp. 40-41 of the SER:

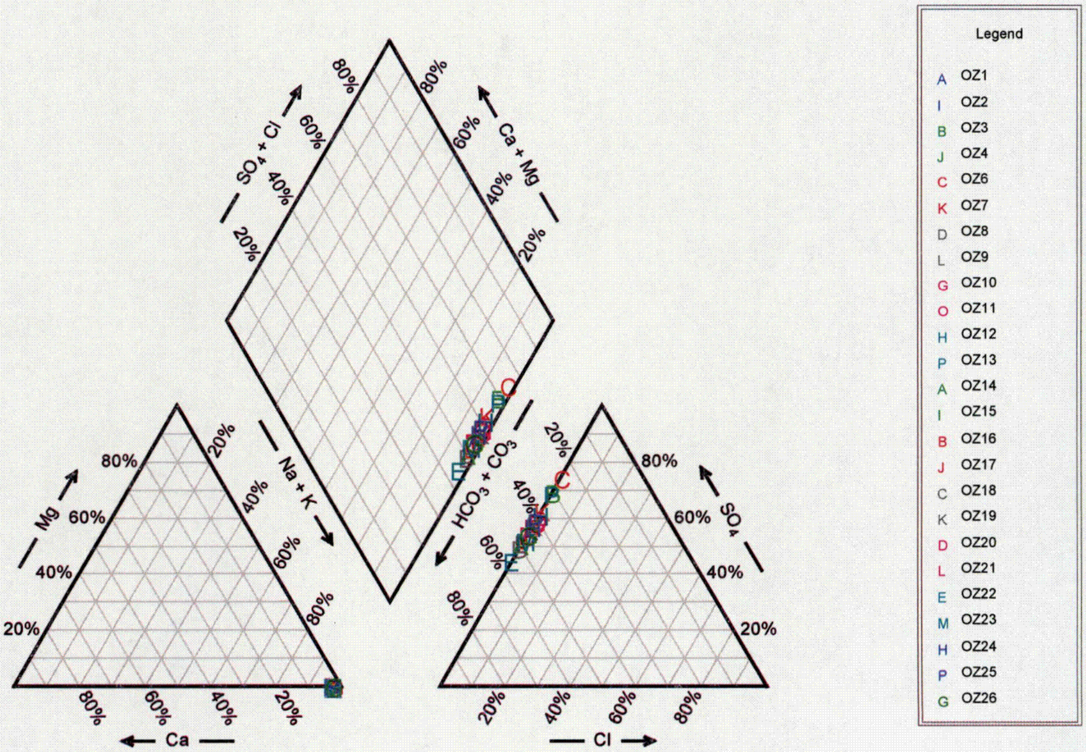
> "In addition to hydraulic isolation, staff has inferred that changes in water quality can also be associated with the hydraulically isolated wells (for further discussion, see SER Sections 2.4.3 and 2.5.3). Therefore, staff will include a license condition, which would limit the minimum density of baseline wells for the ore zone aquifer to one well per 2 acres (see SER Section 5.7.8.4). Staff is reasonably assured that, with that license condition, preferred migration paths and variability in the baseline water quality due to the heterogeneities of the host formation will be identified ..."

The MU1 wellfield data package evaluates groundwater quality at a hydraulically isolated well (MU1-OZ23) and demonstrates that there is not significant variability in the baseline groundwater quality at this well compared with the other OZ wells. Figure 1-3 in the MU1 wellfield data package shows the low permeability zone along the southern periphery of MU1 that was identified through aquifer testing. Well MU1-OZ23 lies south of this zone and is hydraulically isolated from the other OZ wells (i.e., it did not respond to pumping during the first aquifer test, during which a well north of the low permeability zone [MU1-OZ02] was pumped). The hydraulic isolation of MU1-OZ23 is analogous to the situation evaluated on pp. 72-73 of the SER, in which two hydraulically isolated monitoring wells in the Nubeth R&D Project had "abnormal" water quality compared to the remaining Nubeth wells. The following describes how this is not the case for MU1-OZ23. Further, the following section describes how additional evaluation of the Nubeth data shows that the hydraulically isolated Nubeth wells also had consistent water quality with that in the OZ aquifer in MU1.

Attachment 7, Table 1 and Attachment 9, Table 1 in the MU1 wellfield data package show that there are no outliers identified in any of the sample results from MU1-OZ23. This demonstrates the lack of statistical evidence that the water quality in MU1-OZ23 is different from that in the remaining OZ aquifer in MU1.

Water chemistry comparisons are provided in Figure 1 that further illustrate that the water quality in MU1-OZ23 is consistent with the remaining OZ wells. Comparisons were performed for major ions, including chloride and carbonate, which are mentioned on p. 73 of the SER as specific parameters identified as having "abnormal" concentrations in the Nubeth R&D Project. Figure 1 shows that the water quality in MU1-OZ23 is within the range of concentrations found in other MU1 OZ wells. The comparisons in Figure 1 demonstrate that the water quality in a hydraulically isolated well (MU1-OZ23) is consistent with that in the other OZ wells in MU1. All data used to prepare Figure 1 are found in Attachment 7, Table 1 of the MU1 wellfield data package.

Figure 1. Water Quality Comparison between MU1-OZ23 and Other MU1 OZ Wells



III. Heterogeneity and Anisotrophy Can be Evaluated at an Interior Baseline Well Spacing of One per Four Acres

In developing LC 11.3 A), NRC Staff referred to Nubeth's R&D operations where a hydrologic barrier was identified within the ore zone during pre-operational testing. In the case of the Nubeth R&D, aquifer testing was conducted over a very limited area (roughly 200 feet by 200 feet) within the immediate vicinity of the R&D site. Therefore, it is unclear whether the hydraulic barrier identified by Nubeth is local to the R&D site or whether it extends over a larger area. In order to define the size and shape of the hydrologic barrier that affected the R&D site, additional wells further from the R&D site would have been required and not necessarily a higher density of observation wells.

Strata's commercial scale wellfields are much larger than the R&D site and will be surrounded by perimeter monitor wells as well as interior monitor wells. Strata's experience with MU1 suggests that rather than placing additional wells close together, conducting the aquifer testing over a larger area is the key to defining the heterogeneities in a mine unit. For example, in the aquifer test work conducted in MU1, Strata identified a low permeability area along the southeastern side of the mine unit. The extent of this low permeability area was largely defined by the perimeter monitor (PM) wells rather than the interior wells. Significantly, the PM wells have a much greater spacing than one well every two acres. Also, just as significantly, Strata found that within MU1 the aquifer on either side of the low permeability area was relatively homogeneous. For example, within the portion of the wellfield north and west of the low permeability area, 25 interior OZ observation wells were monitored during the aquifer pumping test. At the interior OZ observation wells, the average transmissivity was calculated at 65.9 square feet per day while the minimum and maximum calculated transmissivities ranged from 59.1 to 75.7 square feet per day. Given the relatively small difference in calculated transmissivities between the interior monitor wells, the increased density of interior monitor wells did not significantly improve the hydrologic understanding of the aquifer.

IV. Further Evaluation of the Nubeth Data Cited in the SER Demonstrates That the Historical Sampling Results Are Consistent with MU1 Pre-operational Water Quality

As described previously, the SER cites "abnormal" concentrations of certain parameters, specifically chloride and carbonate, in two Nubeth monitor wells as a basis for the one well per two acre OZ well density requirement in LC 11.3. The specific wells include M2 (also referred to as 5X) and M3 (also referred to as 121X), as noted on pp. 72-73 of the SER:

> "In its November 1978 Quarterly Report (Stoick, 1979a), the former licensee documents that groundwater levels at two monitoring wells, wells M2 and M3, were hydraulically isolated from the R&D injection and production well operations. Both wells are located 30.5 meters [100 feet] north of the nearest injection wells. The former licensee notes

> that certain parameters, specifically carbonate and chloride, were "abnormal" from the beginning (Stoick, 1979a).
>
> Starting in the following quarterly report, the former licensee draws a line on the map for the wellfield between monitoring wells M2 and M3 and the injection wells (Stoick, 1979a). The line is labeled 'Hydrologic Barrier in "B" Zone', which, as discussed in SER Section 2.3.3, is the ore zone.
>
> This report from the former R&D operations is within the same host formation as the proposed Ross operations and suggests to staff that the local-scale heterogeneities may affect groundwater flow within the ore zone aquifer. Therefore, staff will include a license condition that requires the licensee to have a minimum density of one well per two acres for the baseline data rather than the minimum density of one well per three to four acres as proposed by the applicant (see SER Section 3.1.4). Staff is reasonably assured that the suggested density of wells will identify any preferred migration paths and or variations in quality within the ore zone aquifer."

Since the data from Nubeth monitor wells M2 and M3 provides a basis for the minimum OZ well density, Strata compared the historical Nubeth data to the MU1 sampling results to see if the historical values were "abnormal" in the context of OZ aquifer natural variability across an entire mine unit. The results of the evaluation demonstrate that what appeared to be "abnormally high" values for certain constituents in M2 and M3 are actually well within the range of the MU1 OZ aquifer sampling results except for a few early samples from monitoring well M3, which are clearly not representative of the long-term historical water quality from that well.

The Nubeth R&D Project was conducted over an area less than one acre. Because of the scale of the Nubeth R&D Project compared to a typical mine unit, relatively minor variations in water quality appeared to have an exaggerated significance, since the natural variability in the OZ aquifer was not captured by the small pilot study. This is demonstrated by Figure 2, which compares all available historical sampling results from M2 and M3 with the MU1 OZ well sampling results for three parameters. Chloride and carbonate were selected for this analysis since they are cited in the SER as the specific parameters of concern. In addition, dissolved uranium was evaluated. Note that the uranium concentrations in the Nubeth reports were reported as mg/L U_3O_8, so a conversion factor of 0.848 was applied to these values to compare uranium concentrations as mg/L U. The M2 and M3 sampling results are summarized in Table 1. These were obtained from the August 1978 First Quarterly Report (ML12135A358), the January 1979 Second Quarterly Report (referenced on p. 56 of the SER), and the 1980 Activity and Restoration Report (ML13274A287) for the Nubeth R&D Project.

Figure 2. Water Quality Comparison between Nubeth M2, M3 and MU1 OZ Wells

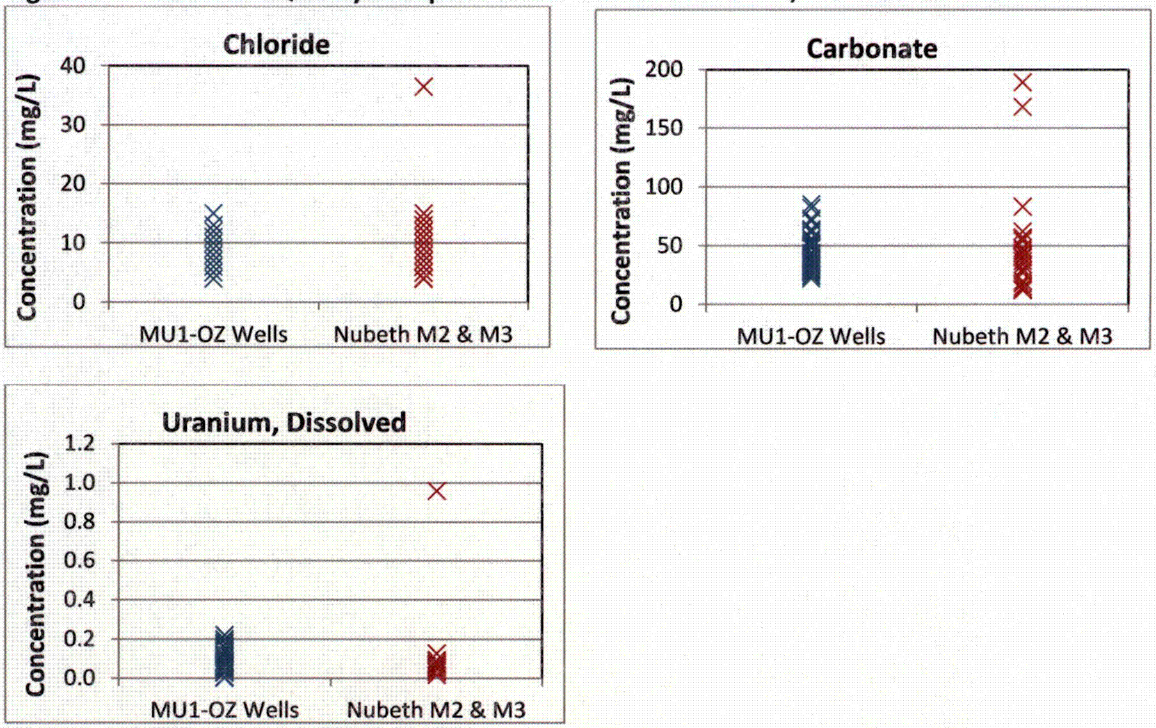


Table 1. Historical Nubeth Water Quality Results from Wells M2 (5X) and M3 (121X)

Well	Sample Date	Chloride (mg/L)	Carbonate (mg/L)	Uranium (diss.) (mg/L as U_3O_8)	Uranium (diss.) (mg/L as U)
M2 (5X)	4/6/1978	11	37	0.10	0.085
	4/17/1978	6	46	0.077	0.065
	5/1/1978	4.1	57	0.068	0.058
	5/15/1978	4	46	0.087	0.074
	6/12/1978	10	40	0.11	0.093
	8/16/1978	6	40	0.064	0.054
	9/19/1978	11	54	0.02	0.017
	10/9/1978	9	41	0.06	0.051
	10/25/1978	7	34	0.09	0.076
	11/8/1978	7	57	0.06	0.051
	11/22/1978	8	56	0.08	0.068
	12/6/1978	7	44	0.09	0.076
	5/1/1979	7	27	0.10	0.085
	6/1/1979	7	30	0.09	0.076
	7/1/1979	7	29	0.09	0.076
	9/1/1979	7	27	0.08	0.068
	4/24/1980	5	40	0.035	0.030
M3 (121X)	8/17/1978	36.5	168	1.13	0.958
	9/14/1978	12	62	0.05	0.042
	10/10/1978	14	189	0.05	0.042
	10/25/1978	15	83	0.04	0.034
	11/8/1978	15	56	0.15	0.127
	11/22/1978	14	13	0.10	0.085
	12/8/1978	13	48	0.09	0.076
	5/1/1979	13	18	0.11	0.093
	6/1/1979	13	18	0.09	0.076
	7/1/1979	11	12	0.09	0.076
	9/1/1979	11	15	0.10	0.085
	4/24/1980	9	20	0.10	0.085

The results in Figure 2 demonstrate that except for one high sample result each for chloride and dissolved uranium (and two for carbonate), all of the historical M2 and M3 sample results generally fall within the range of the MU1 pre-operational OZ water quality. In order to further evaluate the few data points outside of the range, Figure 3 presents time series plots of each of the three parameters for M3. This figure shows that the initial chloride, carbonate and uranium measurements in M3 are abnormally high compared to the other measurements. This is most apparent in the dissolved uranium concentration, which was over 10 times greater than the long-term average concentration in this well.

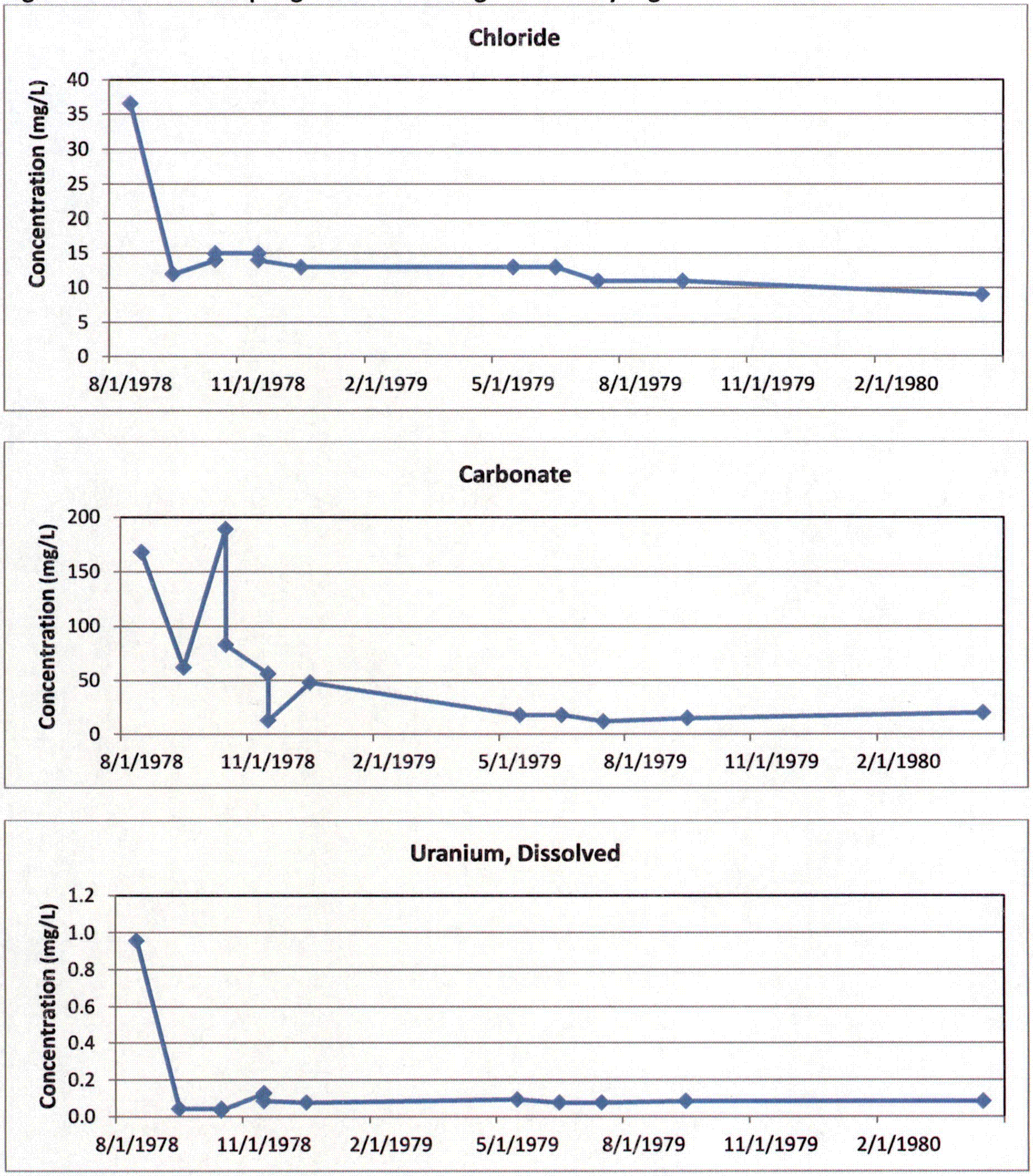
Figure 3 demonstrates that the initial one to three samples from M3 were not representative of the true groundwater quality at this location. The abnormally high values are likely attributed to incomplete well development or insufficient purging of water in the well casing prior to sample collection. In any event, such abnormally high values would be screened and removed as outliers if they were used to establish Commission-approved background in a wellfield data package. The results of this evaluation demonstrate that what were previously identified as "abnormal" constituent concentrations in the Nubeth pilot project are actually within the range of typical OZ aquifer water quality except for the initial sampling results from the M3 monitor well, which are not representative of the long-term water quality in that well. When all of the Nubeth sampling results are evaluated in the context of the scale of a full mine unit, there does not appear to be any historical evidence of anomalous water quality conditions associated with hydraulically isolated wells.

V. Ore Zone Baseline Well Density of One per Four Acres is Adequate to Identify Potential Barriers and Preferred Flow Migration Paths

Under an operational scenario, the low permeability area identified in MU1 hydrologically divides the mine unit into two areas. For example, if a well pattern were installed across the low permeability area it would not be possible to effectively move fluids between the wells. Since the low permeability area traverses across the entire southeast portion of the mine unit, it is conceivable that it could represent a safety risk if its location was not accounted for when the wellfield was designed and developed. In the case of MU1, Strata has not only identified the location of the low permeability area but also has installed perimeter monitor wells on both sides of the low permeability area to monitor in the event of an excursion.

Aquifer testing in MU1 has demonstrated that the general location of significant flow barriers within the wellfield can be identified without a high density of interior monitor wells. Unless placed strategically to further define a larger flow barrier, a high density of interior monitor wells would only be useful in identifying small localized flow barriers which may only affect a few well patterns. Within MU1 no localized flow barriers were identified. From an operational standpoint, localized flow barriers could cause difficulties in wellfield operations since they may affect flow across one or more well patterns. However, since the wellfields will be surrounded

Figure 3. M3 Sampling Results Showing Abnormally High Initial Measurements



by fully penetrating perimeter monitor wells, these local flow barriers are not likely to represent a safety risk because any potential excursion would be identified in the perimeter monitor well. Therefore, a blanket increase in the density of the interior monitor wells is not likely to improve Strata's ability to define heterogeneities that might impact groundwater flow paths.

VI. The MU1 Pre-operational Sampling Results Demonstrate that Representative Samples Will Be Collected if a Reduced OZ Well Density Is Used

The SER states that the minimum OZ well density of one well per two acres is needed to "ensure representative samples are collected" (p. 78) and "to properly establish Commission approved background concentration under Criterion 5B(5)(a)" (p. 271). In order to evaluate the potential impact of reducing the OZ well density on TRV calculations, hypothetical background values were calculated using the MU1 pre-operational sampling results, and these were compared to the actual MU1 Commission-approved background values. The analysis demonstrates that a reduced OZ well density of one well per four acres will result in background values that are approximately equal to or, in some cases, conservatively lower than the background values calculated using a greater density of wells.

The method of calculating hypothetical background values using the MU1 pre-operational sampling results is as follows. First, three 9-well subsets of the MU1 OZ wells were randomly selected using a random number function in Microsoft Excel. Based on an approximate 35-acre wellfield pattern area in MU1, this represents a density of one well per four acres. Then upper tolerance limits (UTLs) were calculated for all parameters for each subset using the same procedures as used for the MU1 wellfield data package. The calculated UTLs were then compared to the 10 CFR Part 40, Appendix A, Table 5C values, if applicable, and hypothetical background values were calculated as the higher of the UTL or Table 5C value. The results are presented in Table 2 which provides the MU1 Commission-approved background followed by hypothetical background for each parameter and for each subset of wells.

The results of the hypothetical background evaluation can be summarized as follows. For most constituents, for which UTLs were calculated using ProUCL assuming a normal or lognormal distribution (e.g., total alkalinity, laboratory conductivity, total dissolved solids, major ions and dissolved uranium), the hypothetical background values are similar to the MU1 Commission-approved background. This is because UTLs were calculated for the same confidence level (95 percent) and coverage (99 percent), which resulted in k factors that accounted for the reduced sample size. Some of the hypothetical background values were higher than the MU1 Commission-approved background and some were lower, depending on the average concentration and standard deviation of the randomly selected data sets. However, the results show that the hypothetical UTLs are similar to the originally proposed UTLs for these constituents, demonstrating that using one OZ well per four acres of wellfield area does not significantly impact the determination of Commission-approved background for most constituents.

Table 2. Hypothetical Background for Randomly Selected 9-Well MU1 Data Sets

Parameter	Units	MU1 Background[1]	Hypothetical Background[2, 3]		
			Case 1	Case 2	Case 3
Alkalinity, Total as $CaCO_3$	mg/L	630	656	651	625
Ammonia as N	mg/L	0.7	0.8	0.7	0.7
Fluoride	mg/L	0.5	0.5	0.5	0.5
Silica as SiO2	mg/L	9.6	10.5	10.3	9.7
Conductivity, Laboratory	µmhos/cm	3,545	4,177	3,712	3,046
pH, Laboratory	s.u.	9.4	9.5	9.3	9.4
Nitrate/Nitrite as N	mg/L	1.0	0.1	0.1	1.0
Total Dissolved Solids, TDS	mg/L	2,485	2,957	2,615	2,115
Calcium	mg/L	11	12	11	10
Magnesium	mg/L	5	5	3	4
Potassium	mg/L	16	21	15	11
Sodium	mg/L	849	984	883	730
Bicarbonate	mg/L	714	744	748	719
Carbonate	mg/L	78	73	66	77
Chloride	mg/L	17	24	18	13
Sulfate	mg/L	1,343	1,915	1,416	1,027
Aluminum, dissolved	mg/L	0.2	0.1	0.1	0.2
Arsenic, dissolved	mg/L	0.005	0.05	0.05	0.05
Barium, dissolved	mg/L	0.5	1.0	1.0	1.0
Boron, dissolved	mg/L	0.5	0.5	0.5	0.5
Cadmium, dissolved	mg/L	0.002	0.01	0.01	0.01
Chromium, dissolved	mg/L	0.01	0.05	0.05	0.05
Copper, dissolved	mg/L	0.01	0.01	0.01	0.01
Iron, dissolved	mg/L	0.08	0.06	0.05	0.08
Mercury, dissolved	mg/L	0.001	0.002	0.002	0.002
Manganese, dissolved	mg/L	0.03	0.02	0.02	0.03
Molybdenum, dissolved	mg/L	0.02	0.02	0.02	0.02
Nickel, dissolved	mg/L	0.01	0.01	0.01	0.01
Selenium, dissolved	mg/L	0.005	0.01	0.01	0.01
Uranium, dissolved	mg/L	0.23	0.25	0.25	0.27
Vanadium, dissolved	mg/L	0.03	0.03	0.02	0.02
Zinc, dissolved	mg/L	0.01	0.01	0.01	0.01
Radium-226, dissolved	pCi/L	260	260	260	77
Radium-228, dissolved	pCi/L	2.0	1.7	2.0	1.6
Gross Alpha	pCi/L	717	717	717	453

[1] Originally proposed in Table 6-4 and Attachment 12 of MU1 wellfield data package.
[2] Calculated using randomly selected 9-well subsets of MU1 OZ well sampling results.
[3] Case 1 = Wells MU1-OZ3, 6, 8, 11, 13, 14, 15 and 25.
Case 2 = Wells MU1-OZ6, 11, 15, 20, 23, 24, 25 and 26.
Case 3 = Wells MU1-OZ4, 10, 12, 14, 16, 17, 18, 20 and 22.

For constituents with a very low detection frequency (typically dissolved metals and trace elements), the hypothetical background values are equal or less than the MU1 Commission-approved background. This is because UTLs were calculated for these constituents using non-parametric methods (i.e., the highest detectable concentration). Since the randomly selected subsets did not always include the highest detectable concentrations in the full data set, the hypothetical background for these constituents were lower in some cases than the MU1 Commission-approved background. In cases where either the highest detectable concentration was included in the randomly selected subset or the Table 5C value was higher than the originally calculated UTL, the hypothetical background values are the same as the MU1 Commission-approved background.

Finally, for constituents that are reasonably described by a lognormal distribution, but where it has been determined that 95 percent UTLs are not representative of the background population in that they are several times higher than the largest detectable concentration (i.e., dissolved radium-226 and gross alpha in the case of the MU1 wellfield data package), the hypothetical background values are equal to or less than the MU1 Commission-approved background. Similar to the dissolved metals and trace elements, the UTLs were calculated as the highest detectable concentration for these constituents, and a smaller data set may result in a lower maximum detectable concentration.

For all constituents, reducing the number of OZ wells to a minimum density of one well per four acres will result in Commission-approved background that is approximately the same as or conservatively lower than background values calculated using larger data sets. This evaluation supports the conclusion that Commission-approved background may be properly calculated using a reduced density of OZ wells.

VII. Perimeter Monitor Well Spacing and Offset Distances from 300 to 500 feet Enable Timely Detection of Horizontal Migration of Fluids[1]

Strata's perimeter monitor well spacing is currently fixed at 400 feet from the wellfield in LC 11.3 B). The fixed perimeter monitor well spacing and offset is problematic as other spatial constraints exist within the license boundary. These include historic and cultural sites, water bodies, wetlands, and existing infrastructure such as roads and pipelines, which make it difficult to maintain a constant offset and spacing distance around the wellfields. These constraints were clearly in evidence during development of MU1 and Strata would like to prevent similar occurrences in the future. In order to avoid areas where Strata is not allowed access or cannot physically construct monitor wells, additional flexibility in the monitor well spacing and offset is necessary. To improve operational flexibility, Strata is requesting variable monitor well spacing and offset between 300 and 500 feet. As described in the following paragraphs, variable

[1] The term 'spacing' as used in this analysis refers to the distance between the wellfield and perimeter monitor well ring and the term 'offset' refers to the distance between perimeter monitor wells as established in the Ross ISR Project NRC License Application, Technical Report, Chapter 5.

perimeter monitor well spacing ranging from 300 to 500 feet has been supported by modeling conducted by Strata, is typical of other ISR facilities, and is a typical spacing evaluated in NUREG/CR-6733.

As part of the license application Strata modeled perimeter monitor well spacing and determined that monitor wells spaced between 200 and 600 feet from the active wellfield were adequate to enable timely detection of horizontal migration of fluids. As noted in the Technical Report at 5-82; "Simulations of excursions from a wellfield were modeled, points recording the modeled heads were located at 200 feet, 400 feet, and 600 feet from the active wellfield in both the downgradient and upgradient directions. The local wellfield imbalance was simulated for 30 days and resulted in nearly an 18 and 14-foot increase in water level 400 feet upgradient and downgradient from the wellfield, respectively. Similarly, nearly a 10 and 12-foot head change was apparent 600 feet both upgradient and downgradient from the wellfield, respectively. Results of the simulation run for the upgradient and downgradient scenarios are presented on Figures 5.7-11 and 5.7-12. Most importantly, the simulations indicate that a head change or hydraulic anomaly would rapidly become apparent in the perimeter wells, well before any geochemical influences would be detected."

A spacing and offset of 300 to 500 feet is typical of other ISR facilities in the region. Attachment 1 provides a comparison of the well spacing at 13 facilities (including Ross). All of the ISR facilities in Attachment 1 have a perimeter monitor well spacing and offset ranging from 300 to 500 feet. At most of the facilities, the offset distance between the perimeter monitor wells is similar to the spacing between the perimeter monitor well and the wellfield pattern area. Monitor well spacing and offset of 300 to 500 feet was also considered a typical perimeter monitor well spacing for the analyses conducted in Section 4.3.3 of NUREG/CR-6733 (NRC 2001).

Strata is proposing to offset the monitor wells at approximately the same distance as the wells are spaced from the wellfield. As described in Section 4.3.3.3 of NUREG/CR-6733, by maintaining monitor well offset distances at approximately the same distance as the wells are spaced from the edge of the wellfield, the maximum angle formed by lines drawn from any production or injection well to the nearest two monitor wells is 53 degrees. Analyses included in Section 4.3.3.2 suggests that with such monitor well spacing, the lateral spreading of a horizontal excursion plume would reasonably be expected to be greater than the monitor well spacing. NRC guidance referenced in NUREG/CR-6733 advises that the maximum angle formed by the lines drawn from any production or injection well to the nearest two monitor wells should be less than 75 degrees. In Strata's case, a maximum angle of approximately 53 degrees will be maintained between any production or injection well to the nearest two perimeter monitor wells in most scenarios. This spacing and offset is appropriate and provides a high degree of confidence that any potential excursion would be detected.

The more homogeneous the aquifer, the more likely it is that an excursion plume will act in the way that it was modeled in NUREG/CR-6733. As described above, the MU1 Wellfield Data Package presented a high degree of homogeneity within the wellfield. Therefore, Strata's proposed variable well spacing and offset is appropriate, and offers much needed operational flexibility with the same or perhaps enhanced ability to timely detect lateral solution migration.

Strata requests that NRC amend LC 11.3 A) and LC 11.3 B) of SUA-1601 as follows:

Current License Condition 11.3 A) with Strikethrough and Revised Text in red:

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~~ four 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.

Current License Condition 11.3 B) with Strikethrough and Revised Text in red:

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 no closer than 300 feet and no further than 500 feet from the wellfield with similar offset distances between perimeter monitor wells ~~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.

To support Strata's request, attached please find the following information:

- ISR FACILITY COMPARISONS (Attachment 1)
- Completed Form 313, as required by 10 CFR 40 (Attachment 2)
- Supplement to Form 313 (Sections 5-11) (Attachment 3)

Please contact me if you have any questions. You can reach me at (307) 686-4066 or mgriffin@stratawyo.com.

Sincerely,
Strata Energy, Inc.

Michael Griffin
Vice President of Permitting, Regulatory and Environmental Compliance

cc: Mr. John Saxton, NRC Project Manager – **via email**

References:

NRC (U.S. Nuclear Regulatory Commission), 2001, NUREG/CR-6733, A Baseline Risk-Informed, Performance-Based Approach for In Situ Leach Uranium Extraction Licenses, September 2001.

ATTACHMENT 1

ISR FACILITY COMPARISONS

Attachment 1 Comparisons Between Ross and Other ISR Properties

Facility	Licensee	License No.	Uranium Host Formation	Age	Depositional Environment of Host Aquifer(s)	Ore Zone Baseline Well Density (one well per X acres)	Perimeter Monitor Well Ring Maximum Spacing/Offset Distance (feet)	Source
Ross	Strata Energy	SUA-1601	Lance and Fox Hills	Late Cretaceous	Marine and Marginal Marine Fluvial	2	400/400	(1)(2)
Willow Creek	Uranium One USA	SUA-1341	Wasatch	Eocene	Terrestrial Fluvial	3	300/300 downgradient 500/500 sides & upgradient	(3)(4)
Crow Butte	Crow Butte Resources dba Cameco	SUA-1534	Basal Chadron Sandstone	Eocene	Terrestrial Fluvial	4	300/400	(5)(6)
Smith-Highland	Power Resources dba Cameco	SUA-1548	Fort Union and Wasatch	Eocene	Terrestrial Fluvial	3	300/300 downgradient 500/500 sides & upgradient	(7)(8)
Gas Hills	Power Resources dba Cameco	SUA-1548	Wind River	Eocene	Terrestrial Fluvial	3	300/300 downgradient 500/500 sides & upgradient	(7)(8)
North Butte	Power Resources dba Cameco	SUA-1548	Wasatch	Eocene	Terrestrial Fluvial	3	300/300 downgradient 500/500 sides & upgradient	(7)(8)
Ruth	Power Resources dba Cameco	SUA-1548	Wasatch	Eocene	Terrestrial Fluvial	3	300/300 downgradient 500/500 sides & upgradient	(7)(8)
Moore Ranch	Uranium One Americas	SUA-1596	Wasatch	Eocene	Terrestrial Fluvial	3	500/500	(9)(10)
Nichols Ranch	Uranerz Energy Corp.	SUA-1597	Wasatch	Eocene	Terrestrial Fluvial	4	500/500	(11)(12)
Hank Unit	Uranerz Energy Corp.	SUA-1597	Wasatch	Eocene	Terrestrial Fluvial	4	500/500	(11)(12)
Lost Creek	Lost Creek ISR	SUA-1598	Battle Springs	Eocene	Terrestrial Fluvial	4	500/500	(13)(14)
Dewey-Burdock	Powertech USA	SUA-1600	Lakota and Fall River	Early Cretaceous	Terrestrial Fluvial (Lakota) Marine and Marginal Marine (Fall River)	4	400/400	(15)(16)
Reno Creek	AUC	N/A	Wasatch	Eocene	Terrestrial Fluvial	4	400/400	(17)

Sources:

(1) NRC (U.S. Nuclear Regulatory Commission), Materials License SUA-1601, Amendment 2. Dated July 15, 2015. NRC Adams Accession No. ML15181A273.

(2) Strata Energy, Ross ISR Project USNRC License Application - Technical Report, December 2010. NRC Adams Accession No. ML110120063.

(3) NRC, Materials License SUA-1341, Amendment No. 3, Dated October 21, 2014. NRC Adams Accession No. ML14212A173.

Attachment 1 (continued)

(4) WDEQ-LQD (Wyoming Department of Environmental Quality, Land Quality Division), Uranium One's Willow Creek (Christensen Ranch) Unit 10B Well Field Data Package, Permit No. 478, TFN 5 5/381, March 7, 2013.

(5) NRC, Materials License SUA-1534, Amendment 26, Dated March 6, 2012. NRC Adams Accession No. ML110320374.

(6) NRC, Safety Evaluation Report (Revised), License Renewal of the Crow Butte Resources ISR Facility, Materials License SUA-1534, August 2014. NRC Adams Accession No. ML14149A433.

(7) Cameco Resources, Materials License SUA-1548, License Renewal Application Technical Report, February 2012. NRC Adams Accession No. ML12163A067.

(8) Cameco Resources, North Butte Mine Unit 2 Wellfield Data Package, February 2014.

(9) NRC, Materials License SUA-1596, Amendment No. 2, Dated November 23, 2010. NRC Adams Accession No. ML103120221.

(10) NRC, Safety Evaluation Report for the Moore Ranch ISR Project, Wyoming, Materials License SUA-1596, September 2010. NRC Adams Accession No. ML101310291.

(11) NRC, Materials License SUA-1597, Amendment No. 3, Dated August 28, 2014. NRC Adams Accession No. ML14212A457.

(12) NRC, Safety Evaluation Report for the Nichols Ranch ISR Project, Materials License SUA-1597, July 2011. NRC Adams Accession No. ML102240206.

(13) NRC, Materials License SUA-1598, Amendment No. 3, Dated July 15, 2015. NRC Adams Accession No. ML14162A069.

(14) NRC, Safety Evaluation Report for the Lost Creek Project, Materials License SUA-1598, August 2011. NRC Adams Accession No. ML112231724.

(15) NRC, Safety Evaluation Report for the Dewey-Burdock Project (Revised), Materials License SUA-1600, April 2014. NRC Adams Accession No. ML14043A347.

(16) NRC, Final SEIS for the Dewey-Burdock Project, January 2014. NRC Adams Accession No. ML14024A477.

(17) NRC, Draft Materials License for the Reno Creek ISR Project, Dated July 8, 2015. NRC Adams Accession No. ML15154B634.

ATTACHMENT 2

ROSS URANIUM PROJECT SUA-1601 SOURCE MATERIALS
LICENSE AMENDMENT REQUEST
NRC FORM 313

NRC FORM 313 (10-2015)
10 CFR 30, 32, 33, 34 35, 36, 37, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE

APPROVED BY OMB: NO. 3150-0120 **EXPIRES: 12/31/2015**

Estimated burden per response to comply with this mandatory collection request: 4.3 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the FOIA, Privacy, and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW. *AMENDMENTS/RENEWALS THAT INCREASE THE SCOPE OF THE EXISTING LICENSE TO A NEW OR HIGHER FEE CATEGORY WILL REQUIRE A FEE.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

MATERIALS SAFETY LICENSING BRANCH
DIVISION OF MATERIAL SAFETY, STATE, TRIBAL AND RULEMAKING PROGRAMS
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA,

SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PA 19406-2713

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING,

SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
1600 E. LAMAR BOULEVARD
ARLINGTON, TX 76011-4511

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S.NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [x] B. AMENDMENT TO LICENSE NUMBER SUA-1601
- [ ] C. RENEWAL OF LICENSE NUMBER

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include ZIP code)*

Mike Griffin
P.O. Box 2318
Gillette, WY 82717

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Ross ISR Project
2929 New Haven Road
Oshoto, WY 82721

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Mike Griffin

BUSINESS TELEPHONE NUMBER: (307) 686-4066

BUSINESS CELLULAR TELEPHONE NUMBER:

BUSINESS EMAIL ADDRESS: mgriffin@stratawyo.com

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
   a. Element and mass number; b. chemical and/or physical form; and c. maxiximum amount which will be possessed at any one time.
6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.
7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.
8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.
9. FACILITIES AND EQUIPMENT.
10. RADIATION SAFETY PROGRAM.
11. WASTE MANAGEMENT.
12. LICENSE FEES (Fees required only for new applications, with few exceptions*) *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY ______ AMOUNT ENCLOSED $ ______

13. CERTIFICATION. *(Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.*

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35 , 36, 37, 39, AND 40, AND THAT ALL INFORMATION CONTANED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.
WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A C RIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER -- TYPED/PRINTED NAME AND TITLE	SIGNATURE	DATE
Mike Griffin, VP--Permitting, Regulatory and Environmental Compliance		12-21-15

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		
APPROVED BY				DATE	

ATTACHMENT 3
ROSS URANIUM PROJECT SUA-1601 SOURCE MATERIALS
LICENSE AMENDMENT REQUEST
NRC FORM 313 ATTACHMENT
ITEMS 5 THROUGH 11

<u>Applicant</u>
Strata Energy, Inc.
1900 W. Warlow Dr., Bldg. A,
Gillette, Wyoming 82716

5. Radioactive Material:

a) Element and Mass Number:
    Uranium- Unat (U238, U234, and U235)

b) Chemical and/or Physical Form:
    Chemical form is $U0_4$,
    Solution of 0 to 50 grams/liter
    Dried-Yellowcake-50%to 80%U

c) Maximum Amount which will be possessed at any one time:
    Unlimited

6. PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED:
Fuel for electricity generation from nuclear power plants.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE:
Individual: Nikolas Roche
Training: Master's Degree in Health Physics from Colorado State University; three (3) weeks of specialized training in information directly relevant to Uranium Recovery facilities; two (2) years of experience working at a UR facility at Cameco's Smith Ranch-Highland site (20i122013); currently Radiation Safety Officer for Strata Energy, Inc. (2015 present).

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS:
This information is provided in detail in Section 5 of the approved License Application and supplemental submissions.

9.. FACLITIES AND EQUIPMENT:
This information is provided in detail in Section 3 of the approved License Application and supplemental submissions.

10. RADIATION SAFETY PROGRAM:
This information is provided in detail in Section 5 of the approved License Application and supplemental submissions.

11. WASTE MANAGEMENT:
This information is provided in detail in Section 4 of the approved License Application and supplemental submissions.