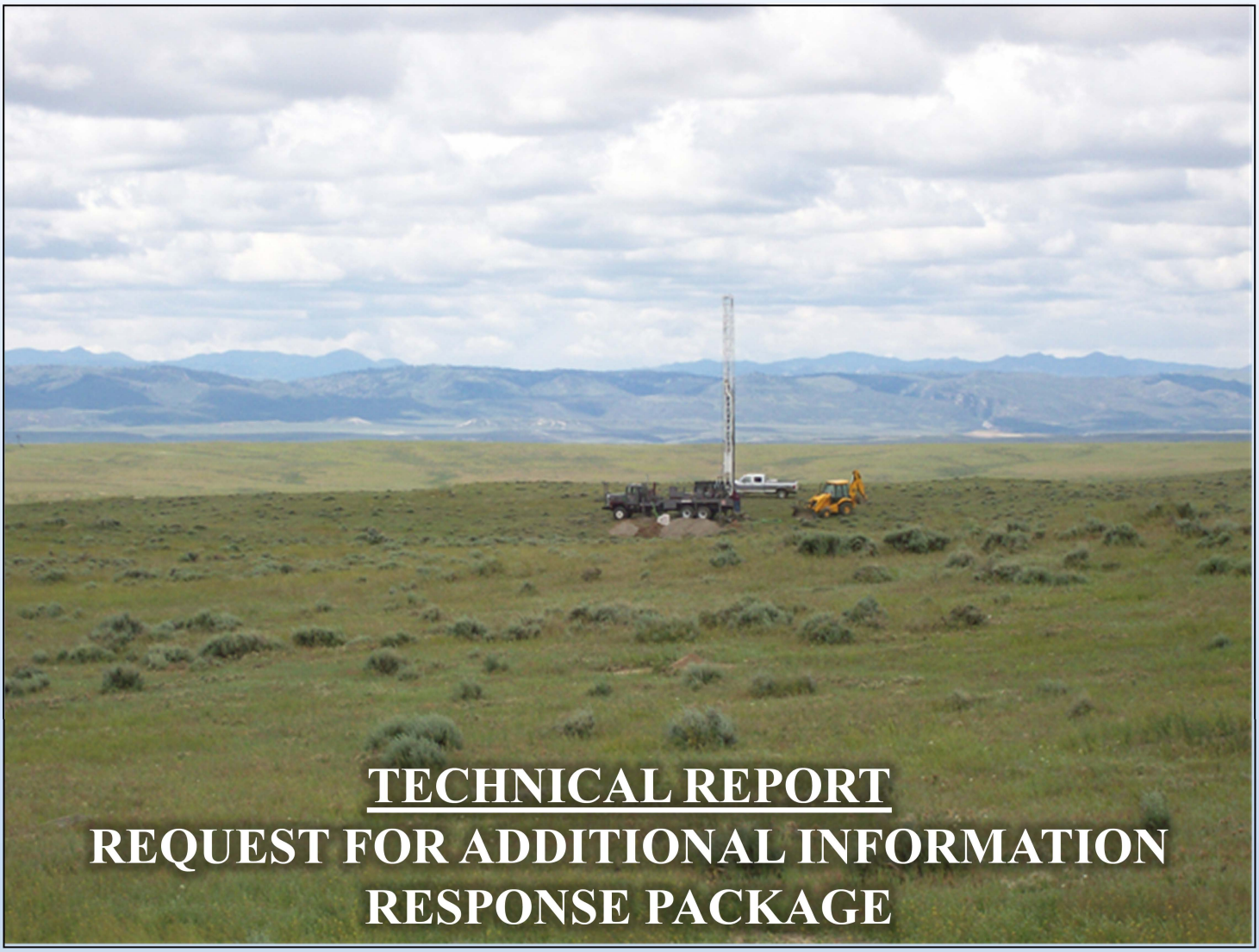
USNRC APPLICATION
SUA-1341 License Amendment
Ludeman Project
Converse County, WY



TECHNICAL REPORT
REQUEST FOR ADDITIONAL INFORMATION
RESPONSE PACKAGE

June 2013

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Proposed Activities

RAI-1

Description of Deficiency
The organizational structure provided in the TR appears to be inconsistent throughout the document.

Basis for Request
Section 1 of the TR states: "Uranium One USA Inc. (Uranium One) is submitting this Technical Report (TR) to the …"

Section 1.3 of the TR states: "This License Application which includes the TR and ER have been prepared and submitted by Uranium One Americas, Inc., a Nevada corporation." The header on every page of the TR and ER says Uranium One Americas.

Section 5.1, Figure 5-1 is titled, "Uranium One USA, Inc. Organizational Chart"

The licensee for SUA-1341 is Uranium One USA Inc. The Ludeman license amendment to SUA-1341 was not submitted by Uranium One USA, Inc. License amendments must be submitted by the licensee identified on the license.

Formulation of RAI
Uranium One should revise Sections 1 and 5 of the TR, and all other applicable sections of the TR, to provide a consistent management structure for the Ludeman facility.

RAI-1 Response

Text and figures concerning organizational structure have been revised throughout the application to clarify and provide a consistent management structure. Revisions to specific sections are provided below:

Section 1 of the TR now reads:

"Uranium One Americas, Inc. the parent company of Uranium One USA, Inc (Uranium One) is submitting this Technical Report (TR) to the United States Nuclear Regulatory Commission (NRC) as part of a combined source and 11e.(2) byproduct material license application to construct and operate an in situ leach uranium recovery (ISR) facility at the proposed Ludeman Project site in Converse County in the State of Wyoming. An NRC combined source and 11e.(2) byproduct material license is required to recover uranium by ISR extraction techniques, under the provisions of the Atomic Energy Act of 1954

(AEA), as amended by the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) as well as Title 10 U.S. Code of Federal Regulations (CFR), Part 40, "Domestic Licensing of Source Materials." This section summarizes the proposed activities including the nature of the facilities, equipment, and procedures to be used in the proposed project.

The proposed Ludeman Project is owned by Uranium One Americas, Inc., and will be operated by Uranium One USA, Inc. (Uranium One)."

TR Section 1.3 now reads:

"This License Application which includes the TR and ER have been prepared and submitted by Uranium One Americas, Inc., a Nevada corporation. The immediate parent company of Uranium One Americas, Inc. is Uranium One Investments Inc., a Canadian corporation. The ultimate parent company of Uranium One Americas, Inc. is Uranium One Inc., located in Toronto, Ontario, Canada, with a primary listing on the Toronto Stock Exchange (TSX) and a secondary listing on the Johannesburg Stock Exchange (JSE Limited), but expect to go private in the third quarter of 2013."

TR Section 5 now reads:

"President Uranium One Americas, Inc & Uranium One USA, Inc.

The President of Uranium One , Americas is responsible for management of all company projects and operations in the U.S. In this role, the President has the responsibility and authority for the radiation safety and environmental compliance programs at these operations. The President is responsible for ensuring that Uranium One personnel comply with industrial safety, radiation safety, and environmental protection programs as established in the Uranium One program. The President is also responsible for compliance with all regulatory license conditions/stipulations, regulations and reporting requirements. The President has the responsibility and authority to terminate immediately any activity that is determined to be a threat to employees or public health, the environment, or potentially a violation of state or federal regulations.

Mine Manager

The Mine Manager is directly responsible for all uranium production activities at the Uranium One facilities. The Mite Manager is authorized to immediately implement any action to correct or prevent hazards. The Mine Manager has the responsibility, duty, and the authority to suspend, postpone or modify, immediately if necessary, any activity that is determined to be a threat to employees, public health, the environment, or potentially a

violation of state or federal regulations. The Mine Manager cannot unilaterally override a decision for suspension, postponement or modification of the operation if that decision is made by the Manager Satellite SHE or the Safety Supervisor/RSO. The Mite Manager reports directly to the President Uranium One Americas, Inc..

Director of Safety, Health, and Environment (SHE)

The Director of SHE is responsible at the corporate Americas level for developing and managing the safety, health and environmental programs, policies, standards and practices at all uranium production and exploration projects in the United States. This includes ensuring that operations comply with applicable safety, health, and environmental regulations and permits, including those under the authority of the WDEQ and USNRC. The Manager Site SHE reports directly to the Director of SHE. The Director of SHE reports directly to the President, Uranium One Americas Inc.

Manager of Site Safety, Health, and Environment (SHE)

The Manager of Site SHE is responsible for the development and implementation of all safety, health, and environmental programs at the Uranium One Satellite operations. This includes the compliance with, and maintenance of, all operational licenses and permits including the radiation protection requirements of the NRC. This individual also assists and guides the Radiation Safety Officer (RSO), if and when necessary, with associated routine and special responsibilities. The Manager Site SHE has oversight for the development, review, approval, implementation and adherence to radiation safety programs, environmental and groundwater monitoring programs and associated quality assurance programs. The Manager Site SHE has both the responsibility and authority to suspend, postpone or modify any work activity that is unsafe or potentially in violation of USNRC's regulations or license conditions, including the ALARA program. The Manager Satellite SHE reports to the Director of SHE and has a secondary reporting function to the Mine Manager. The RSO and the Environmental Specialist report directly to the Manager Satellite SHE.

Corporate Radiation Safety Officer (CRSO)

The Corporate Radiation Safety Officer is responsible at the corporate Americas level for developing and managing the radiation safety programs, policies, standards and practices at all uranium production and exploration projects in the United States. This includes ensuring that operations comply with applicable radiation safety regulations, licenses and permits, including those under the authority of the USNRC. The Corporate Radiation Safety Officer reports directly to the Director of SHE and coordinating responsibilities with the site.

Satellite Operations Supervisor

The Satellite Operations Manager is responsible for all uranium production activity at the proposed Ludeman Project site. All site operations, maintenance, construction, and support groups report directly to the Satellite Operations Supervisor and environmental health and safety have coordinating reporting responsibilities as shown in Figure 5-1. In addition to production activities, the Satellite Operations Manager is also responsible for implementing any industrial and radiation safety and environmental protection programs associated with proposed Ludeman operations. The Satellite Operations Manager is authorized to immediately implement any action to correct or prevent hazards. The Satellite Operations Manager has the responsibility and the authority to suspend, postpone or modify, immediately if necessary, any activity that is determined to be a threat to employees, public health, the environment, or potentially a violation of state or federal regulations. The Satellite Operations Manager cannot unilaterally override a decision for suspension, postponement or modification if that decision is made by the RSO. The Satellite Operations Manager reports directly to the Mine Manager.

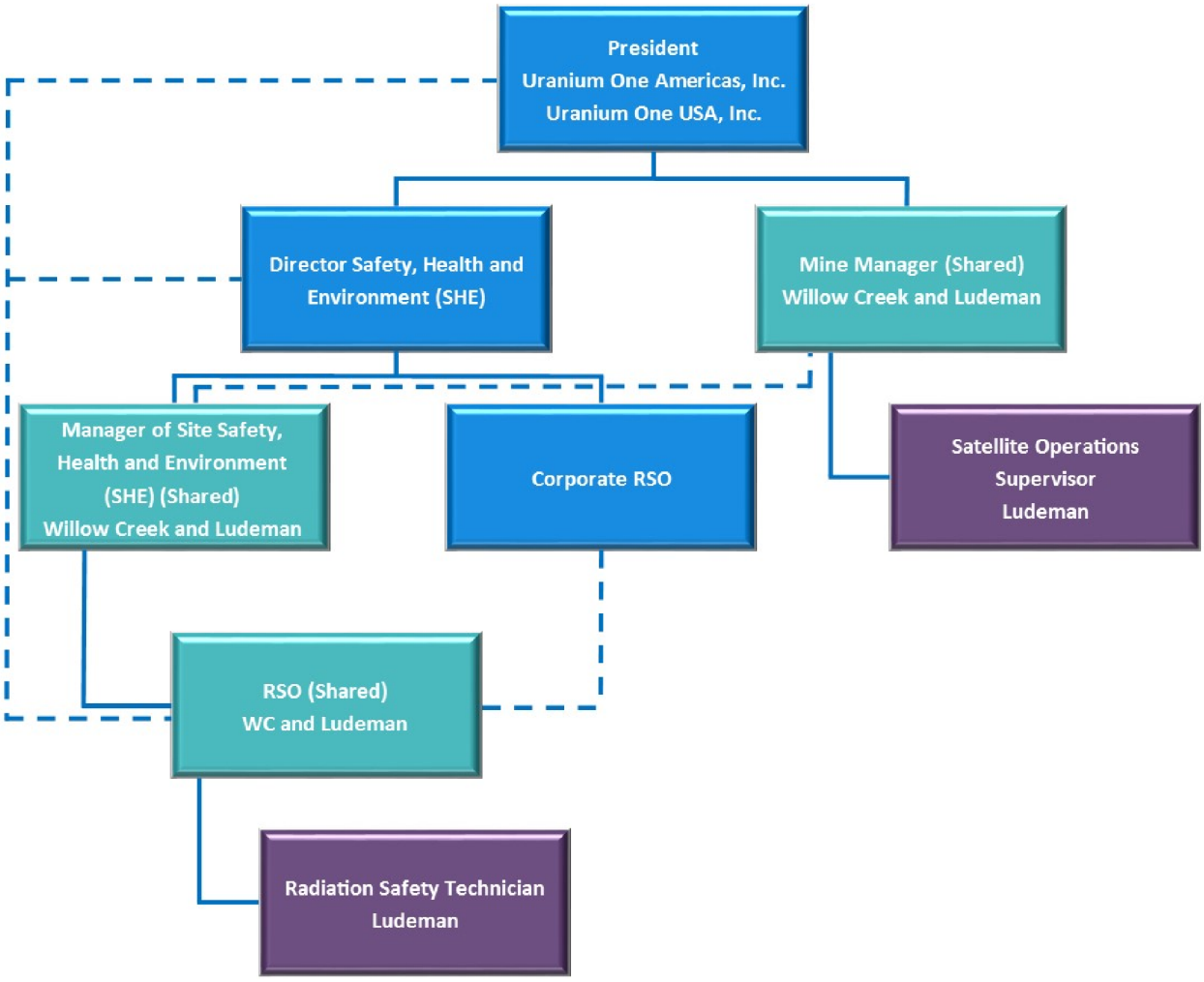
Radiation Safety Officer

The Radiation Safety Officer (RSO) has direct responsibility for the development, review, implementation and adherence to the Radiation Safety Programs and associated Quality Assurance Programs for the Willow Creek and the proposed Ludeman operations. The RSO is responsible for the collection and interpretation of all safety monitoring data, and the proper recording and reporting of such. The RSO conduct routine training programs for the supervisors and employees with regard to the proper application of radiation protection procedures. This individual is also responsible for the implementation of, and adherence to, all regulatory license and reporting requirements. The RSO, with assistance from the Radiation Safety Technician(s) (RST's), or other qualified designee(s), personally inspects facilities to verify compliance with all applicable health physics and radiation safety requirements. The RSO has both the responsibility and authority to suspend, postpone or modify any work activity that is unsafe or potentially a violation of USNRC's regulations or license conditions, including the ALARA program. The /RSO reports directly to the Manager Site SHE. The Radiation Safety Technicians(s) report directly to the /RSO.

Radiation Safety Technician

One or more Radiation Safety Technicians (RST) will assist the RSO with the implementation of the radiological and industrial safety programs. The RST is responsible for the orderly collection and interpretation of all monitoring data, to include data from radiological safety and environmental programs. RSTs will also be responsible for implementing and verifying that sampling and monitoring data is collected and

evaluated in compliance with appropriate and defined QA/quality control (QC) Standard Operating Procedures (SOPs). The RST reports directly to the RSO."



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Uranium One Americas
Ludeman Project Organizational Chart

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	EGS	6/20/13	1
1	For Submittal	RMD	6/20/13	

Path: O:\WY_Projects\8201-2013-1\02_Infrastructure\Project_MXD\Ludeman_Organizational_Chart.mxd

Site Characterization

RAI-2

Description of Deficiency
The TR does not identify the restricted areas for the Ludeman Project.

Basis for Request
Section 2.1.3 (3) of the SRP identifies this topic as a component of the staff's review. Staff has reviewed the application and has not been able to identify the restricted areas for the Ludeman Project. It is possible that this may be described elsewhere in the document, but staff has not identified a general discussion of this topic in Section 2.1. Uranium One has briefly discussed fencing satellite facilities, but it is not clear to the staff if the satellite facilities are considered restricted areas. Additionally, it is not clear to the staff if well fields are considered restricted areas.

Formulation of RAI
Identify the restricted areas in Section 2 of the TR, or direct the staff to where it can be found in the document.

RAI-2 Response

The following language was added to TR Section 5.

"Although the Proposed Action covers a total of 18,850 acres, not all lands will be affected by the proposed operations. Potentially affected lands during the proposed project's 13 year life span include:

- Disturbed lands will total approximately 909 acres or approximately 4.8 percent of the proposed project area;
- Controlled areas will be fenced to limit access to project associated operations and is estimated to encompass 1,287 acres or approximately 6.8 percent of the proposed project area. Anticipated controlled areas include all fenced areas around the, wellfields, surge/evaporation ponds, and DDWs. Restricted areas may be located within controlled areas;
- Restricted areas will control access to protect individuals from exposure to radiation and 11e.(2) byproduct materials including selected areas within the satellite plant buildings, 11e.(2) byproduct storage areas, surge/evaporation ponds,

DDW buildings, and/or areas exceeding 2 mrem per hour (dose to member of the general public); and

Unrestricted areas are within the proposed project area to which access is neither limited nor controlled by the Proposed Action. These areas encompass approximately 17,563 acres or around 93.1 percent of the proposed project area."

RAI-3

Description of Deficiency

The information provided in the TR is not consistent with the acceptance criteria in SRP Section 2.5.3

Basis for Request

The information provided is not consistent with SRP Section 2.5.3 acceptance criterion (1), which states that the on-site meteorology program should be designed in accordance with Regulatory Guide 3.63, "Onsite Meteorological Measurement Program for Uranium Recovery Facilities—Data Acquisition and Reporting" (NRC, 1988). The regulatory guide states that meteorological measurement instruments should be physically located on or near the site that are capable of measuring meteorological information representative of the site vicinity and licensed operations. The location of the meteorological instruments should represent as closely as possible the long-term meteorological characteristics of the area. The base of the instrument tower should be sited at approximately the same elevation as the facility operation, and in an area where natural or fabricated obstructions (e.g., trees, buildings) will have little or no influence on meteorological measurements.

Section 2.5.1 of the TR sates that the combination of the Douglas Airport and GCC sites will be substituted as the nearest representative data sets for the site specific analysis because these two sites exhibit terrain similar to the project area and are located in the same region. Further, the TR states that Douglas Airport is 15 mi southeast of the Ludeman site, and the GCC meteorological station is 14 mi from the center of the proposed Ludeman project area. TR Section 2.5.3.3 also indicates that the GCC site is a few hundred feet higher in elevation than the proposed Ludeman Project area. The staff's examination of TR Figure 2.5-1 indicates there are several miles between the proposed Ludeman licensed area and the GCC's meteorological station. The staff's examination of the site on a topography map (e.g., Google Earth®) indicates that obstructions, such as higher elevation features, occur between the GCC and the proposed licensed area.

Additionally, Uranium One states in TR Section 2.5.3.3 that because the proposed Ludeman Project will not be processing and drying uranium that airborne release of uranium particulates that could adversely affect on and off-site air quality will not be a factor during the proposed Ludeman operations. However, Uranium One states in TR Sections 5.7.1.1.1 and 7.3 that MILDOS-Area was used to model the dose from facility operations resulting from releases of radon gas and plans to use this model to estimate

the radon gas released to the environment, which will be reported in the Semiannual Radiological Effluent and Environmental Monitoring Reports in compliance with 10 CFR Part 40.65. Meteorological data are fundamental parameters used in calculations by MILDOS, and therefore must be representative of the site.

Formulation of RAI

Provide on-site meteorological data as recommended in Regulatory Guide 3.63 or provide sufficient justification for the use of non-site specific data.

A. *Rationale for using substitute data instead of on-site data must include a description of the topography and verification that there are no obstructions to affect meteorological conditions.*
B. *The justification provided in TR Section 2.5.3.3 that the proposed Ludeman facilities will not be processing and drying of uranium is not a sufficient justification for not collecting on site meteorological data.*

RAI-3 (A) (B) Responses

A suitable surrogate site with similar meteorological conditions could not be identified for the proposed project. Thus, Uranium One will commit to installing an on-site meteorological station to collect a baseline data representative of the proposed project area conditions. The citing of the met station will take the proposed wellfields, satellite plant and any other features or facilities that could qualify as emission sources in the MILDOS modeling.

RAI-4

Description of Deficiency

The information provided in the TR is not consistent with the information needs described in Regulatory Guide 3.63.

Basis for Request

Regulatory Guide 3.63, Section C.1, states, that quarterly and annual wind direction, wind speed, and atmospheric stability data should be compiled in joint frequency and joint relative frequency (i.e., decimal frequency) form for heights representative of effluent releases and those stability categories should be established to conform as closely as possible to those of Pasquill. Uranium One followed the format suggested in the regulatory guide to report the seasonal and annual JFD for each stability class in TR Figures 2.5-15 through 17, and provided the JFD by stability class for GCC in TR Table 2.5-5. Although Uranium One states in TR Section 2.5.3.2 that 70 percent of all winds at GCC fall into stability class D, Uranium One did not report the relative frequency of each stability class. Uranium One should report results summarizing the relative frequency of each stability class that represents the 100 percent of the annual data collected (e.g., Class A 1%, Class B 10%, Class C 30%, etc.).

Formulation of RAI

Provide the relative frequency of each stability class for the Douglas Airport and GCC meteorological stations, and describe how these stability classes were determined

RAI-4 Response

The sigma-theta (σ_θ) method was used to determine the Pasquill-Gifford stability class at GCC, where σ_θ refers to the standard deviation of the horizontal wind azimuth angle in degrees. This method is also referred to as the σ_A method (EPA 2000). It is a lateral turbulence based method which uses the standard deviation of the wind direction in combination with the scalar mean horizontal wind speed. Wind speed and direction data are recorded hourly at a height of 10 meters. To minimize the effects of wind meander, the 1-hour σ_θ is defined using 15-minute σ_θ values which are in turn based on more frequent sampling of wind direction (e.g. every five seconds).

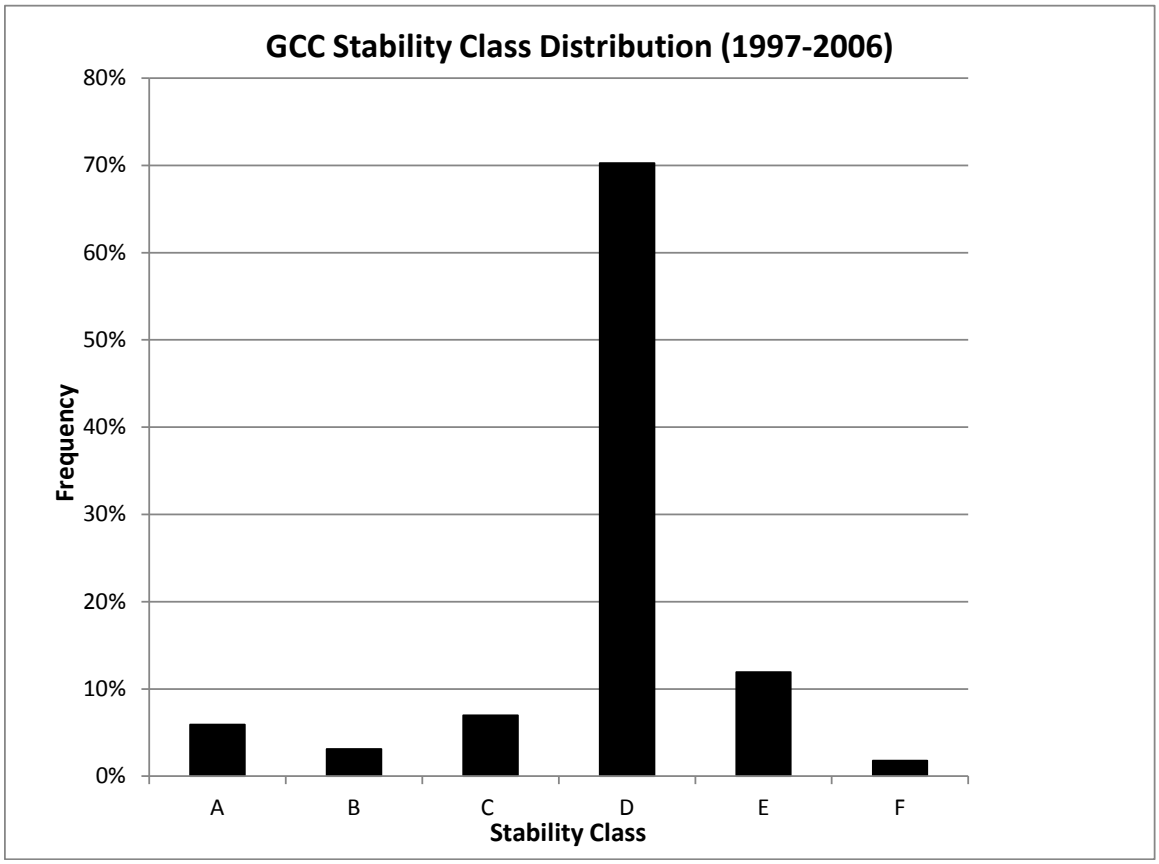
According to this method, initial stability classes are assigned based solely on standard deviation of wind direction, or σ_θ. The initial assignments are then adjusted for horizontal wind speed. The magnitude of this adjustment depends on whether the measurement is

taken during daylight or nighttime hours, a diurnal dependency that varies with the time of year.

Regulatory Guide 3.63 (NRC, 1988) states: "For obtaining an indication of the atmospheric stability, a method such as one of the following (Refs. 1-4) may be used: insolation cloud cover and wind speed (Pasquill-Gifford and similar methods), temperature lapse rate method, wind fluctuation method, split-sigma method, or Richardson Number." The σ_θ method is based on wind fluctuation and therefore qualifies as an appropriate method for the GCC site.

The figure below shows the atmospheric stability class distribution at GCC for the 10-year period from 1997 through 2006. Note that the NWS station at Douglas Airport does not log sigma theta; therefore hourly stability class cannot be determined. Note also that in keeping with the above response to TR RAI 3, the on-site stability class distribution for the Ludeman Project will be generated at the end of the baseline monitoring period.

Figure 2: GCC Stability Class Distribution



RAI-5

Description of Deficiency

The information provided in the TR does not meet the information needs described in Regulatory Guide 3.63.

Basis for Request

Regulatory Guide 3.63, Section C.2 and 3, states where instruments should be located to collect various parameter measurements and the specifications for system accuracy. Uranium One did not provide this information for the Douglas Airport meteorological station. The accuracies of all systems should be appropriate to the use to be made of the information over the range of environmental conditions expected to occur during the lifetime of facility operation and should be consistent with the current state of the art for the measurement.

Formulation of RAI

Provide instrument details for the Douglas Airport meteorological station as was provided for the GCC meteorological station in TR Table 2.5-6.

RAI-5 Response

Uranium One has provided the meteorological instrumentation specifics and instrument heights for the Douglas Airport in the table below:

Table 1: Instrumentation Data for the Douglas (WY) Airport

Parameter	Instrument	Range	Accuracy	Threshold	Height (meters)
Wind Speed	3-cup anemometer	0.5 to 130 knots	greater of 0.5 knots or 1%	0.5 knots	10
Wind Direction	wind vane	0 to 360o	2 o	0.5 knots	10
Temperature	Hygrothermometer	-40oF to +140 oF	0.5 oF	N/A	2
Precipitation	tipping bucket	0 – 8”	0.01”	0.01”	1

RAI-6

Description of Deficiency

The information in TR Section 2.6.2, does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in SRP Section 2.6.2 and acceptance criteria in SRP Section 2.6.3.

Basis for Request

As stated in SRP Section 2.6.3, the characterization of the site geology will be acceptable in the application if it includes a description of the local stratigraphy with:

(1)(d)(ii) Cross sections through the ore deposit roughly perpendicular and parallel to the principal ore trend.

(2) All maps and cross sections are at sufficient scale and resolution to clearly show the intended geologic information.

(3) In the local stratigraphic section, all mineralized horizons, confining, and other important units such as drinking water aquifers are clearly shown with their depths from the surface clearly indicated.

Uranium One provided geological cross sections for the entire license area. A geological cross section index map was provided in Figure 2.6-2 of the TR. The cross section index map did not show the location of the Luenberger Satellite wellfields or ore bodies. Based on staff's assessment, cross section, C-C', in Figure 2.6-5, appears to pass through the Leuenberger Satellite. This cross section extends from the far western boundary of the license area to the eastern boundary, spanning approximately eight miles. Only two wells logs, located 597.7 m (1902 ft) apart in Section 14, were used to define the Leuenberger site subsurface geology. These two logs indicate that mineralization is located in the 80 and 90 sands.

Formulation of RAI

The staff is unable to evaluate the site geology of the Leuenberger Satellite site based on the information provided in the application. Uranium One only provided two well logs on one cross section to describe the site geology for the entire satellite. Staff is aware that prior cross sections and exploratory borings exist for the Leuenberger site as it was previously licensed as a pilot in late 1970s. Uranium One has also provided well boring maps that show numerous borings were made to assess resources in the Leuenberger Satellite. The staff therefore requests the Uranium One provide local geological cross sections based on several well logs through the principal axes of the Leuenberger

Satellite's three ore body locations in the three proposed wellfields. These cross sections should at a minimum show the subsurface geology from the ground surface through the mineralized horizons to be targeted for extraction to the first aquifer below the mineralized horizons. Confining layers and aquifers should be clearly labeled. The potentiometric water levels of aquifers if available and any other information which can inform the local site geology of the Leuenberger Satellite should be included.

RAI-6 Response

Uranium One has evaluated additional well logs in the wellfield areas and is currently developing cross sections perpendicular and parallel to the principal ore trend. The new cross sections will be submitted to the NRC as soon as reasonably possible for their review. In addition, the cross section index map will be revised to depict the location of the proposed satellite facility and wellfields in relation to all cross sections.

RAI-7

Description of Deficiency

The information in TR Section 2.6.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

SRP Section 2.6.3 indicates that the characterization of the site geology will be acceptable in the application if it includes a description of the local stratigraphy with:

(1)(d)(ii) Cross sections through the ore deposit roughly perpendicular and parallel to the principal ore trend.

(2) All maps and cross sections are at sufficient scale and resolution to clearly show the intended geologic information.

(3) In the local stratigraphic section, all mineralized horizons, confining, and other important units such as drinking water aquifers are clearly shown with their depths from the surface clearly indicated.

Uranium One provided geological cross sections for the entire license area. A geological cross section index map was provided in Figure 2.6-2 of the TR. The cross section index map did not show the location of the North Platte Satellite wellfields or ore bodies. Based on staff's assessment, cross section, C-C', in Figure 2.6-5, which extends from the far western boundary of the license area to the eastern boundary, spanning approximately seven miles, appears to have four well logs that may pass through one North Platte ore body located in Sections 15 and 16. Another cross section, N-N' in Figure 2.6-16, passes north to south across the license area. Four well logs on this cross section are located in Section 15 and may pass through the proposed North Platte ore body location. Both cross sections C-C' and N-N' indicate the ore is located in the 70 sand which may be composed of three distinct layers. There appears to be little to no underlying confining layer separating the underlying 60 sand from the 70 sand on either cross section. In addition, the overlying 80 sand is discontinuous above the 70 sand where the ore lies. The distance between well logs on both cross sections ranged from 1000-3500 ft, which does not provide the resolution necessary for staff to assess confining layers or continuity of any formation of interest.

Cross section, I-I', in Figure 2.6-11 appeared to pass north to south through the North Platte satellite southern ore body located in Section 20. Three well logs in Section 20, located 800-1950 ft apart indicated the presence of ore in two separate 70 sands. Once again the overlying 80 sand appeared discontinuous and the underlying 60 sand did not appear to have a significant confining layer between it and the 70 sand ore zone.

Formulation of RAI

The staff is unable to evaluate the site geology of the North Platte Satellite based on the information provided in the application. Uranium One provided only a small portion of two large cross sections to describe the site geology at one ore body and a small portion of only one large cross section to describe the geology for the other ore body. Staff is aware that the North Platte site was previously assessed by Uranium Resources, Inc. as a potential uranium recovery site in the early 1980s. Therefore exploratory well logs should exist to create detailed local geological cross sections. Uranium One has also provided well boring maps that show numerous borings were made to assess resources in the North Platte Satellite. The staff therefore requests that Uranium One provide local geological cross sections based on several well logs through the principal axes of the North Platte Satellite's two ore body locations at the proposed wellfield locations. These cross sections should at a minimum show the subsurface geology from the ground surface through the mineralized horizons to be targeted for extraction to the first aquifer below the mineralized horizons. Confining layers and aquifers should be clearly defined and labeled. The potentiometric water levels of aquifers if available and any other information which can inform the local site geology of the North Platte Satellite should be included.

RAI-7 Response

See RAI-6 for response to this RAI.

RAI-8

Description of Deficiency

The information in TR Section 2.6.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

In accordance with SRP Section 2.6.3, the characterization of the site geology will be acceptable in the application if it includes a description of the local stratigraphy with:

(1)(d)(ii) Cross sections through the ore deposit roughly perpendicular and parallel to the principal ore trend.

(2) All maps and cross sections are at sufficient scale and resolution to clearly show the intended geologic information.

(3) In the local stratigraphic section, all mineralized horizons, confining, and other important units such as drinking water aquifers are clearly shown with their depths from the surface clearly indicated.

Uranium One provided geological cross sections for the entire license area. A geological cross section index map was provided in Figure 2.6-2 of the TR. The cross section index map does not show the location of the Peterson Satellite wellfields or the ore bodies. Based on staff's assessment, a small portion of cross sections, E-E', in Figure 2.6-4, and cross section, J-J', in Figure 2.6-12, appear to pass through the ore body in Section 28. Two well bores, located 2700 ft apart on J-J' indicated the presence of ore in a sand identified as the 80 sand. On cross section E-E', three well borings located 1200-2500 ft apart indicated the presence of ore in the 80 sand.

For the ore body located in Sections 34, 35 and 36, four cross sections appeared to intersect the ore body; F-F' in Figure 2.6-8, L-L' in Figure 2.6-14, N-N' in Figure 2.6-16, and M-M' in Figure 2.6-17. Cross section F-F' runs west to east and contains five well logs spaced at distances of 1800 to 2500 ft, which indicate the presence of ore in the two separate sands identified as the 90 sand. The top of the 90 sand in the west is located approximately 100 ft below ground surface. In the east, the top of the 90 sand is near the surface and outcrops above the flood plain of Sage Creek. Ore is located very near to the outcrop. The underlying and overlying sands appear to be separated by very thin confining layers. The information provided in the north to-south cross sections agree with the interpretation in the F-F' cross section.

Formulation of RAI

The staff is unable to evaluate the site geology of the Peterson Satellite based on the cross sections provided in the application. Uranium One has provided well boring maps that show numerous borings were made to assess resources in the Peterson Satellite. The staff therefore requests that Uranium One provide local geological cross sections based on several well logs through the principal axes of the Peterson Satellite two ore body locations at the proposed wellfield locations. These cross sections should, at a minimum, show the subsurface geology from the ground surface through the mineralized horizons to be targeted for extraction to the first aquifer below the mineralized horizons. Confining layers and aquifers should be clearly defined and labeled. The potentiometric water levels of aquifers if available, and any other information which can inform the local site geology of the Peterson Satellite, should be included.

RAI-8 Response

See RAI-6 for response to this RAI.

RAI-9

Description of Deficiency

The information provided in TR Section 2.6.4, Drill Holes, does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

SRP Section 2.6.3 states that the staff can find the characterization of the geology acceptable if:

> *"plugging and abandonment records are provided from State, Federal, and local sources, as appropriate, and that the applicant should provide evidence that action has been undertaken to properly plug and abandon all wells that cannot be documented in this manner."*

Uranium One reported in TR Section 2.6.4 that the proposed Ludeman license area had been extensively explored for uranium by several companies from the 1970s to the 1990s. It stated approximately 4574 rotary drill holes and 66 core holes were completed. Drill holes were reported to be plugged in accordance with Wyoming Statute WS 35-11-404 in effect at the time. Uranium One did not indicate it had made any efforts to verify the location or condition of any of these boreholes.

Formulation of RAI

The NRC staff cannot ascertain if Uranium One has undertaken an effort to identify the abandoned drill holes within the area of the proposed wellfields and ensure that all are appropriately abandoned. The staff also has received no commitment that Uranium One will plug any abandoned drill holes which are located and found not to be properly sealed. Finally staff has no commitment from Uranium One that they will commit to plug any abandoned drill holes which are located as a consequence of a suspicious water level/pressure response on pumping tests or if leakage is identified during operations. The staff requests that Uranium One provide a commitment to re-enter, plug, and abandon any improperly plugged boreholes it discovers by pumping tests or other methods.

RAI-9 Response

The following language has been added to TR Sec. 2.6:

"Exploration and delineation drill holes will be capped, sealed or plugged in accordance with WDEQ/LQD Non-Coal Rules and Regulations Chapter 8 "Exploration by Drilling" as amended. The plugging procedure requires an approved grout be emplaced in the drill hole from the bottom of the hole to within five feet of the ground surface. Grout means sealant material that is stable, has low permeability and possesses minimum shrinking properties such that it is an optimal sealing material for well plugging and drill hole abandonment. Following the installation of the grout, the drill hole shall be backfilled to the surface with dry non-slurry materials or capped with a concrete cap set at least two feet below the ground surface and then backfilled to the surface with native earthen materials to ensure the safety of people, livestock, wildlife, and machinery in the area.

Uranium One proposes to use the following procedures for plugging historic drill holes discovered during future working operations in the proposed wellfield areas:

- A search for historic holes will be conducted while working within the area of each proposed wellfield; any hole discovered will be analyzed for proper plugging and will be plugged (if necessary) in accordance with WDEQ procedures;
- If Uranium One possesses the electric log of any historic drill hole which is located within 500 feet of a proposed wellfield then Uranium One will be prepared to search for and plug such holes; and
- Uranium One will properly plug (if plugging is necessary) any historic drill hole encountered while working anywhere within the proposed project area."

RAI-10

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

SRP Section 2.6.3 (5), states that all significant mineral and energy related deposits and associated infrastructure within and near the proposed license area should be identified.

Uranium One reported no other subsurface mineral exploration or production within the license area at the same horizon as the proposed project. In their review, staff has determined that there is significant existing and proposed oil and gas activity within and near the license area.

Formulation of RAI

Uranium One reported in Appendix A-1 on page A-7, which was revised in December 2011, that there were no oil/gas exploration or development activities in or near the proposed license area. The staff has determined that, based on the August 2012 site visit and a search of the Wyoming Oil and Gas Conservation Commission database, there are several active oil and gas permits and wells, in and near the license area (see Table below). The application should be revised to include:

A. *A listing of all permitted and existing oil/gas wells in the table and any others not noted within the license area or within two km of a wellfield, including their completion depth and operating status;*
B. *a map of the locations of these permitted and existing oil/gas wells showing the length of any horizontal wells in the subsurface;*
C. *an analysis of the potential impacts arising from the proximity of geological formation(s) in which the permitted or existing oil/gas wells are completed to the geological formation(s) targeted for the proposed satellite deep disposal wells; and*
D. *a commitment to identify any change in permitted or existing oil/gas wells within the proposed license area, or within two km of a wellfield, and their potential impact on DDW operations for the life of the facility.*

RAI-10 (A) (B) Responses

To assist the NRC's determination of oil and gas activity in the vicinity of the proposed project an updated table of all permitted and existing oil/gas wells within the proposed project boundary and two kilometers of all wellfields has been inserted into the application. A new map depicting the locations of the before mentioned wells has also been inserted into the application and is shown below.

Table 2: Known Permitted and Existing Oil/Gas Wells in the Project Area and Within 2 km of the Project Boundary

Company	API	Section	Township	Range	Qtr/Qtr	Elevation	Formation	Well Class	TD	Status
Chesapeake Operating Inc.	922489	19	34	72	NWSE	5,046	Frontier	Disposal	13,670	Active Injector
Chesapeake Operating Inc.	928281	14	33	73	NENW	4,949	Morrison	Oil	10,809	Producing Oil Well
Chesapeake Operating Inc.	928283	4	34	73	NWNE	5,277	Niobrara	Oil	19,210	Producing Oil Well
Chesapeake Operating Inc.	928354	14	34	73	NWNW	5,133	Niobrara	Oil	12,166	Producing Oil Well
Chesapeake Operating Inc.	928394	35	35	74	NENW	5,340		Oil	12,900	Permit to Drill
Chesapeake Operating Inc.	928403	24	34	74	NWNE	5,367	Frontier	Oil	12,622	Producing Oil Well
Chesapeake Operating Inc.	928474	19	34	72	NWSE	5,046	TD	Oil	12,004	Producing Oil Well
Chesapeake Operating Inc.	928554	12	34	73	SWNE	5,062		Oil	12,100	Permit to Drill

This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

Data provided by source may be reflected to the Quarter-Quarter Section and not the exact geographic location.

PREPARED FOR

uranium one™ investing in our energy

LUDEMAN PROJECT
CONVERSE COUNTY, WY

TREC, Inc.
Engineering & Environmental Management
900 Werner Court
Suite 150
Casper, WY 82601
Phone (307) 265-0696
Fax (307) 265-2498
www.treccorp.com

Legend

- Ludeman Project Boundary
- Excluded Area
- Two Mile Review Boundary
- Satellite Facility
- Oil & Gas Well

DRAWN BY: CAT
CHECKED BY: WFC
APPROVED BY: RMD

Wyoming Oil and Gas Conservation Commission Permitted Wells Within Two Miles

Source: Wyoming Oil and Gas Conservation Commission, 6/11/2013

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	CAT	6/14/13	3
1	For Submittal	RMD	6/20/13	
2				

RAI-10 (C) Response

The following language regarding the potential impacts arising from the proximity of geological formation(s) in which the permitted or existing oil/gas wells are completed to the geological formation(s) targeted for the deep disposal wells has been added to TR Section 7:

"Oil and gas in this area is produced from the Morrison, Niobrara and Frontier Formations, which lay more than 1½ miles deeper than the uranium mineralization in the proposed project area. There is also one active disposal well adjacent to the project boundary completed in the Frontier Formation. The formations are well below the Lance or Tekla/Parkman Formations potentially targeted by the Class I deep disposal wells. No impacts to the Morrison, Niobrara or Frontier Formations will occur as result of ISR operations or deep disposal of 11e.(2) liquid byproduct."

RAI-10 (D) Response

The following paragraph was added to TR Sec. 2.7 and ER Sec. 3.4:

"As noted in SUA-1341 (LC 11.8), Uranium One will include in its annual report to NRC the identification of any new ground water wells or new use of existing wells, where the information is publicly available and/or known to Uranium One. This includes the proposed project area and the area within 2 km of the project."

RAI-11

Description of Deficiency

The information in TR Section 2.7.1, Surface Water Hydrology, does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One identified six sub-watersheds within the project area and buffer: (1) Little Box Elder, (2) Sand Creek, (3) North Platte River, (4) Little Sand Creek, (5) Sage Creek and (6) Running Dutchman Ditch. The text on page 2.7-2, says nine watersheds, when only six are identified.

Formulation of RAI

Please correct this discrepancy.

RAI-11 Response

The discrepancy has been corrected and the text now reads:

"There are six watersheds located within the proposed Ludeman Project area, including the 2-mile buffer area; these include: (1) Little Box Elder Creek; (2) North Platte River; (3) Sand Creek; (4) Little Sand Creek; (5) Sage Creek; and (6) Running Dutchman Ditch."

RAI-12

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One identified eight smaller drainages within the sub-watersheds in the license area which are shown in Figure 2.7.2 of the TR. The location of the satellites and wellfields were not shown on this figure.

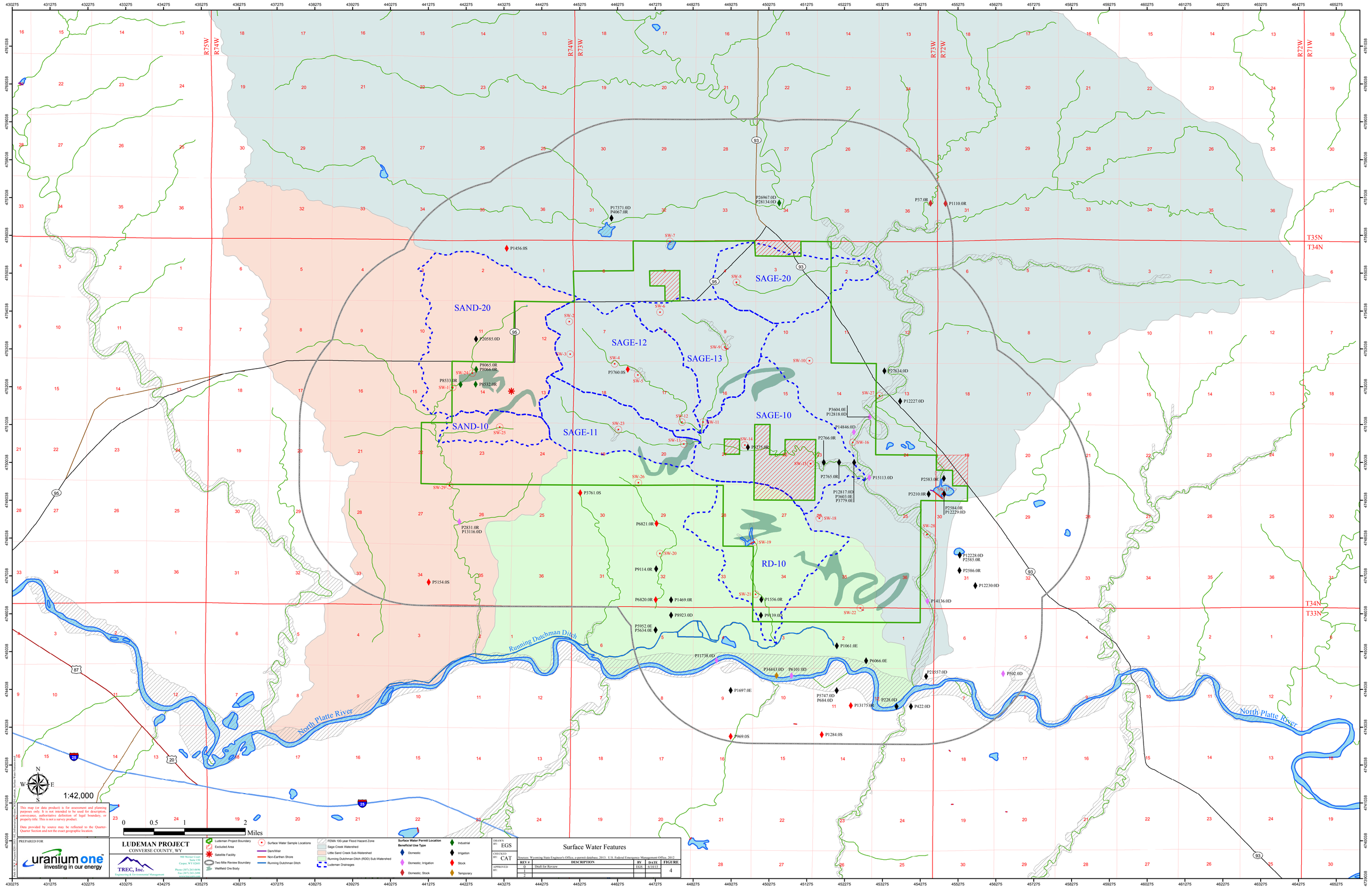
Staff was not able to assess the locations of the proposed wellfields relative to the eight smaller drainages to have reasonable assurance that the drainage channels would not impact the safety of operations.

Formulation of RAI

Provide maps showing the location of all proposed satellite wellfields relative to the eight smaller drainages.

RAI-12 Response

The following figure is now included in Section 2.7 and depicts the proposed wellfields relative to the six smaller drainages:



This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

Data provided by source may be reflected to the Quarter-Quarter Section and not the exact geographic location.

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- Ludeman Project Boundary
- Excluded Area
- Satellite Facility
- Two Mile Review Boundary
- Wellfield Ore Body
- Surface Water Sample Locations
- Dam/Weir
- Non-Earthen Shore
- Running Dutchman Ditch
- FEMA 100-year Flood Hazard Zone
- Sage Creek Watershed
- Little Sand Creek Sub-Watershed
- Running Dutchman Ditch (RDD) Sub-Watershed
- Ludeman Drainages

Surface Water Permit Location Beneficial Use Type

- Domestic
- Domestic: Irrigation
- Domestic: Stock
- Industrial
- Irrigation
- Stock
- Temporary

DRAWN BY:	EGS
CHECKED BY:	CAT
APPROVED BY:	

Surface Water Features

Sources: Wyoming State Engineer's Office, e-permit database, 2013. U.S. Federal Emergency Management Office, 2012

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	EGS	6/14/13	4
1				
2				

RAI-13

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One was unable to measure the flow of any of the eight smaller drainage channels as a consequence of their ephemeral nature. However, it provided estimates of peak flows for the all of the drainages within the license area which are reproduced in the table below. The two methods used produced an order of magnitude difference in the peak flow estimates.

Staff was unable to determine which estimates were the most suitable to assess the magnitude of the peak flows in the eight smaller drainages to provide reasonable assurance that they would not impact the safety of satellite operations.

Formulation of RAI

Uranium One should provide a discussion of which peak flow estimates should be used at each proposed satellite. Uranium One should evaluate the velocity associated with each peak flow, so staff can assess the potential for wellfield infrastructure damage.

RAI-13 Response

To clarify and eliminate conflicting data, Uranium One has elected to remove the TR-55 Graphical and USGS Peak Flow Estimates for Wyoming from the peak flow estimate discussion. The Soil Conservation Service (SCS) Unit Hydrograph Runoff Method is the most appropriate method as it best represents the characteristics of the Ludeman Project Area. The surface water runoff discussion was revised as follows:

"2.7.1.5 Surface Water Runoff

The HEC-HMS software program, developed by the U.S. Army Corp of Engineers, was used to perform the watershed and channel routing based on user specified parameters. This program utilizes the Soil Conservation Service (SCS) Unit Hydrograph Runoff Method which is an appropriate method for the large acreage, as well as, overland and river routing. This method is also applicable for areas with heterogeneous sub-basins. The Rational Method was discarded since it is more applicable to small areas and urbanized

watersheds. HEC-HMS is also listed as an approved program in both NUREG-1623 and WDEQ guidelines. HEC-HMS simulates precipitation/runoff for dendritic streams and provides a large diversity of routing methods to choose from within the program.

SCS unit hydrograph method estimates peak flow from a hydrograph for the watershed using the watershed's drainage area, stream length, average stream slope, total rainfall and curve number. This method derives a hydrograph for the given parameters and applies a precipitation run-off volume based on a SCS Type II storm and can be applicable for those areas with a time to concentration greater than ten hours. A unit hydrograph can be applied to any size watershed by changing the time to concentration and above parameters. The Kirpich Equation was used for the estimates, because the flows were mainly concentrated

The proposed project area soils are mostly made up of well drained sandy loam. The vegetative cover is grassland or range with continuous forage for grazing. The hydrologic condition is fair with 30 percent to 75 percent ground cover. The area was determined to be homogenous for soil and vegetative conditions. The hydrologic soil group was estimated to be in Class B, due to the sandy loam soils. This results in an estimated average curve number of 69 for the proposed project area.

2.7.1.5.1 SCS Unit Hydrograph

The major watersheds which flow through the proposed Ludeman Project area are Sand Creek and Sage Creek respectively. Sage Creek's main reach flows through the eastern section of the proposed project area. Sand Creek flows through the far west side of the proposed project area. Peak flows for these watersheds were estimated using a dimensionless unit hydrograph. A standard shape factor of 0.75 and the Kirpich Equation, for time to concentration, were used. The event evaluated was a 24-hour SCS type II storm.

The parameters were taken from the longest reach of the main channel and the total watershed area. It is assumed that all the tributaries have similar time to concentrations and the curve numbers are uniform across the basin. As with any hydrologic measurement the larger the area the less accurate the estimate will be.

The SCS unit hydrograph estimate for the peak flow from a 24-hour, 100-year event for Sage Creek at the confluence with the North Platte River was 5,794 cfs. For a 24-hour, 50-year event for Sage Creek the flow was 4,591 cfs.

The SCS unit hydrograph estimate for the peak flow from a 24-hour, 100-year event for Sand Creek at the confluence with the North Platte River was 4,726 cfs. For a 24-hour, 50-year event for Sand Creek the flow was 3,694 cfs."

RAI-14

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One identified several surface water impoundments within the license area. Approximately 195 individual water bodies were identified ranging from 28 ft2 to 5.1 acres. The larger ponds were described as drainages which had been impounded for livestock. Some of these stock ponds were supplied by windmills. The two largest ponds were identified as Gilbert Lake in the eastern portion of the license area which was 16 acres and 6 inches deep when surveyed in 2008. Another depression pond was located in the northern portion of the license area and was 4.8 acres and 12 in deep.

Uranium One did not appear to provide a listing of any surface water rights associated with drainages or impoundments within the license area. However, staff found this information in Addendum 2.7-A mingled with the groundwater rights. Uranium One did not provide a map showing the surface water rights in the license area.

Formulation of RAI

Uranium One should provide the surface water rights in a separate addendum from groundwater rights for a 2 mi buffer around the license area. In addition, NRC requests that Uranium One provide a map(s) identifying the surface water rights within 2 km of the proposed wellfields and surge ponds separately for the Leuenberger, North Platte and Peterson Satellites.

RAI-14 Response

The Ludeman Project operations now propose to employ a single satellite facility; thus, there is a single corresponding figure and accompanying table identifying surface water rights for the project area and 2-mile buffer. The figure referenced and presented in the response to RAI-12 identifies the updated surface water rights within the proposed project boundary and a 2-mile buffer. Uranium One will also restructure TR 2.7 addendums to better distinguish groundwater and surface rights separately.

RAI-15

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The FEMA 100 year flood zone maps showed inundation of a dammed pond on the main channel within the RD-10 drainage which crosses Peterson Wellfield 1. Uranium One did not address this flooding or its potential impact to wellfield infrastructure at the proposed Peterson Wellfield 1. Staff cannot provide reasonable assurance of the safety of the operation of Peterson Wellfield 1 without this information.

Formulation of RAI

Uranium One should discuss how the infrastructure for this proposed wellfield will be impacted by this potential flooding and any mitigation measures they intend to use to prevent or alleviate these impacts.

RAI-15 Response

Uranium One has developed comprehensive mitigation measures designed to reduce potential impacts from a wide variety of sources, including flooding. These mitigations are found in ER Section 5. Specific flood protection measures include:

"All significant structures and operations will be located outside of floodplains when possible. In particular, the satellite plant and its ancillary facilities, chemical storage, surge/evaporation ponds, etc., will all be located above the 100 year floodplain. Drainage structures will be designed to route storm water runoff away from structures, roads, and the surge/evaporation ponds. Details of the storm water management will be addressed in SWPPP(s) prepared in support of the construction and industrial WYPDES permits required by WDEQ/WQD for this project. One of the key features of the SWPPP(s) will be demonstrating how BMPs are designed to minimize exposure to pollutants. This will be accomplished in part through flood protection. It will also involve erosion and sediment control measures described previously.

Protection of equipment and facilities from large runoff events typically will be accomplished by placement on high ground out of the flood plain. The injection, recovery

and monitor wells typically are protected from flooding by installation of cement seals around the well casings.

The proposed satellite plant will not be located in the channel of any ephemeral stream. To minimize surface water impacts, runoff will be routed around the plant."

RAI-16

Description of Deficiency

The information provided in TR Section 2.7.3.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Staff's review of the surface water sampling results identified two locations where measurements appeared to show anomalous values for cations, anions, and radionuclides. The two locations of concern are SW-1 and SW-29 located down-stream of the Leuenberger Satellite on Little Sand Creek. SW-1 is located just west of the Leuenberger Satellite and SW-29 is located further downstream from the satellite. As shown in the RAI 17 Surface Water Quality table SW-1 and SW-29 showed anomalously high average values for bicarbonate, chloride, conductivity, sulfate, calcium, sodium, magnesium, uranium and gross alpha. The values of these constituents at SW-24 on Little Sand Creek directly up-gradient of the Leuenberger Satellite were below the license area average.

Uranium One did not address the surface water quality anomalies at SW-1 and SW-29. Staff does not have reasonable assurance that Uranium One has characterized surface water quality at Little Sand Creek.

Formulation of RAI

Uranium One should evaluate the source of anomalous surface water quality at SW-1 and SW-29 at Little Sand Creek.

RAI-16 Response

Uranium One will make a commitment to collect additional surface water samples at the SW-1 and SW-29 locations. If necessary, additional locations may be sampled to further characterize the water quality at Little Sand Creek.

RAI-17

Description of Deficiency

The information provided in TR Section 2.7.3 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Two other surface water sampling locations within the license area demonstrated anomalous values for cations and anions but not radionuclides with respect to the average surface water quality reported for the license area. These sites were SW-6 located northwest of the North Platte Satellite, and SW-16 located east of the North Platte Satellite. The average values measured for SW-16 are shown in the following Surface Water Quality table. Staff is not aware of any uranium recovery operations in these locations or other sources for the anomalous values. Staff does not have reasonable assurance that the surface water quality has been reasonably characterized as these anomalies were not addressed by Uranium One.

Formulation of RAI

Uranium One should address if there is any source(s) which may be responsible for the anomalous surface water quality values at SW-6 and SW-16 (e.g., oil production water spills, agriculture). If a source exists, provide a strategy which may be used to distinguish future contamination from spills, leaks or excursions from nearby satellite facilities.

RAI-17 Response

It is possible there are sources within the project area that may have contributed to the anomalous cation and anions values; although, Uranium One is currently unaware of any documented spills or other agricultural sources in these areas.

Uranium recovery solutions have a distinctive geochemical fingerprints related to their elevated alkalinity, chloride, conductivity, and radionuclide content. The surface water sampling locations have diluted waters that appear to be mostly derived from rain or snow melt; thus, different compositions. These water quality fingerprints will enable the rapid and verifiable determination of any potential contamination due to leaks or spills associated with satellite operations.

RAI-18

Description of Deficiency

The information provided in TR Section 2.7.3 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium one did not evaluate if any seasonal trends were observed in the surface water quality data. Staff does not have reasonable assurance that the surface water quality has been characterized.

Formulation of RAI

Uranium One should provide an assessment of any temporal or seasonal variation in surface water quality based on surface water quality measurements.

RAI-18 Response

The Ludeman site is located in the Upper North Platte River drainage basin, central Wyoming. The streams located within proposed project boundary are comprised of ephemeral streams that only flow briefly during and following a period of substantial rainfall or snowmelt that occurs in the immediate locality of the stream channel. Due to adverse climatic conditions in central and northeast Wyoming regions, sufficient runoff and groundwater recharge required to stimulate and sustain stream flow has been unavailable for the past several years. Consequently, Uranium One's ability to obtain the necessary surface water samples to make a determination of any temporal or seasonal variations for the ephemeral streams on the site, has not been possible to date.

Water Resources

RAI-19

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Staff evaluated the Addendum 2.7-C table "Summary of Monitoring Well Completions" and found the majority of the well top of casing (TOC) elevations in the tables were in conflict with well log ground surface elevations of the same wells provided in the cross sections in Figures 2.6-3 through 2.6-13. The table below presents the monitoring well top of casing elevations provided Addendum 2.7-C vs. the elevations provided on the cross sections. As can be seen in the table, there are often very large differences in the elevations. These differences call into question the aquifer water levels in mean sea level which were calculated based on the top of casing elevation. These water elevations are the basis for the potentiometric surfaces created for all the aquifers in the proposed license area. In addition, the selection of aquifer sand location is questionable if the well TOC elevation is inaccurate. Because of these errors, staff was unable to evaluate the potentiometric surfaces, ground water flow direction and magnitude for the Leuenberger, North Platte or Peterson Satellites. Staff is also unsure if Uranium One has made the appropriate identification for the location of the underlying sands and aquitards based on the elevation errors. Staff cannot evaluate or provide reasonable assurance for the safety of operations at any of the proposed satellites without correction of the elevations of these monitoring wells and all figures and calculations (e.g. sand top and thickness) which were based on them.

Formulation of RAI

Uranium One should correct all monitoring well elevations noted to be in error on the table and correct all discussions, tables, maps, cross sections and isopachs which used the incorrect elevation information from these monitoring wells. In addition, Uranium One should ensure that all well surface elevations presented in the application are accurate and all calculations based on them are also accurate. Staff is especially concerned about the correction of the elevation of the overlying aquifer sand, ore zone aquifer sand, underlying aquifer sand and associated aquitards at each satellite.

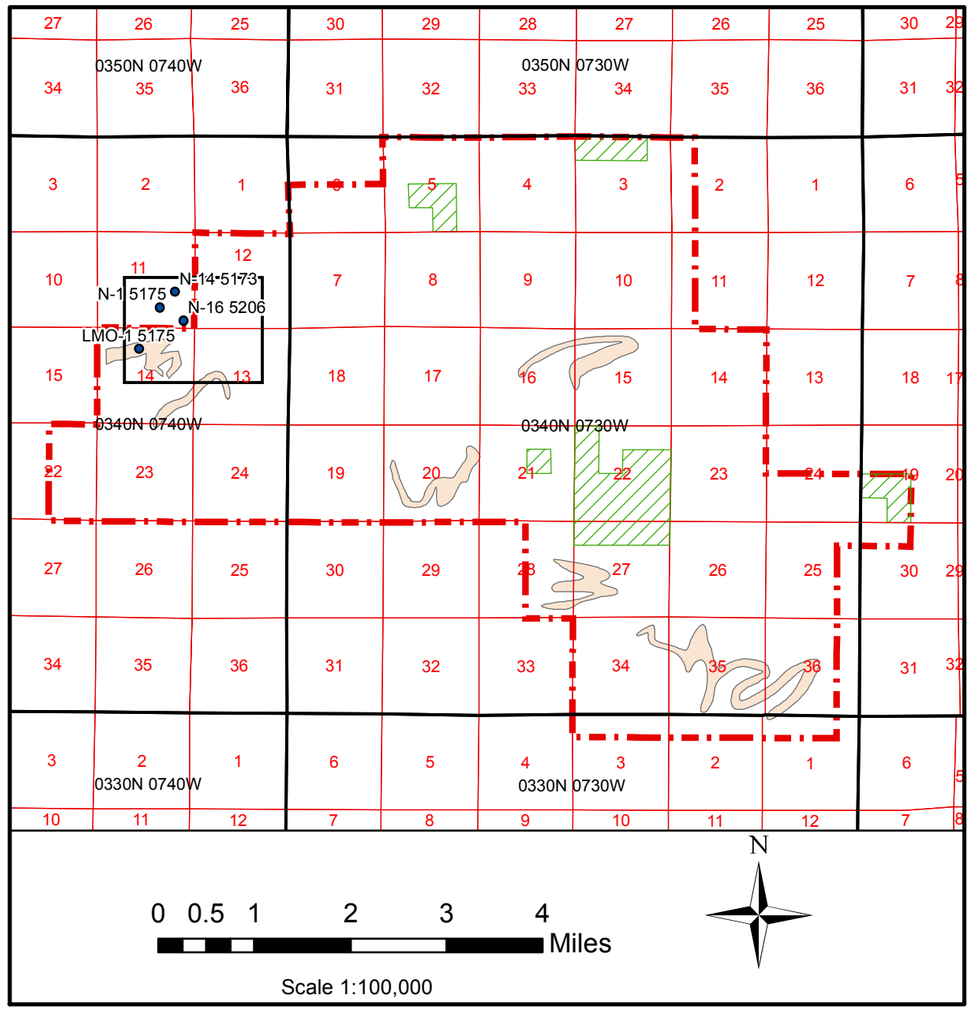
Additionally, staff is very concerned about the potentiometric surfaces and vertical gradients between aquifers which were calculated based on these elevations. Staff notes that anomalous potentiometric surface mounds were associated with some of these elevation errors. Therefore, once corrections are made to the elevations, provide the corrected potentiometric surfaces and estimate the ground water flow magnitude and direction for all overlying aquifers, ore zone aquifers and underlying aquifers for the Leuenberger, North Platte, and Peterson Satellites. Uranium One should use available water levels from wells located within 2 km of the each satellite's proposed wellfields for these updated surfaces, not just the limited monitoring wells available to provide better estimates of ground water flow direction and magnitude.

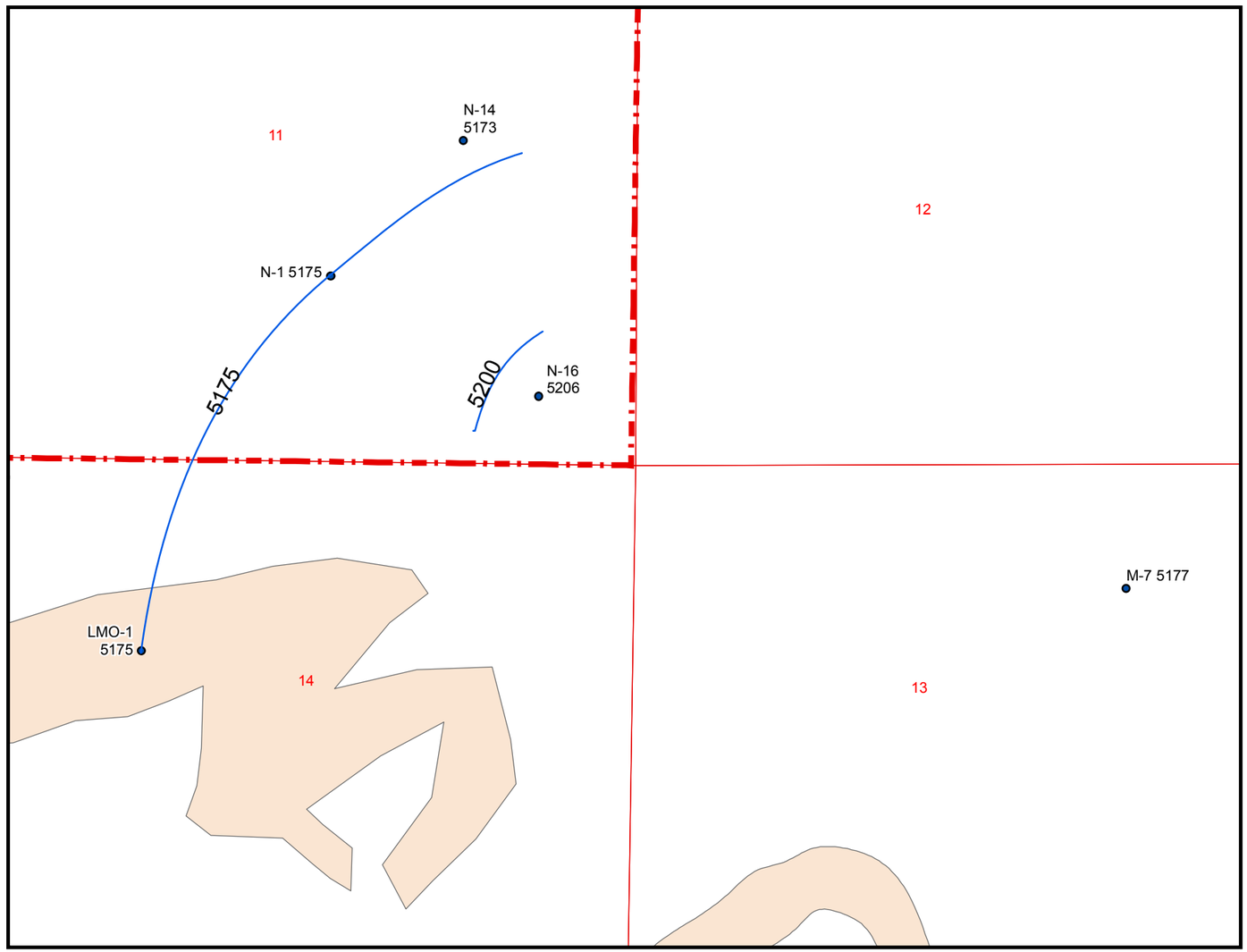
RAI-19 Response

Uranium One has updated the well elevations presented in Addendum 2.7-C Summary of Well Completions with survey data and subsequently the potentiometric maps. For the wells that did not have survey data available, NED elevations have been utilized. The review of the NED elevations versus the survey elevations showed that the NED data were quite close. Thus, in cases when new survey data were not available, the NED data should provide a good approximation of elevation. The cross sections and isopachs will not require updates as they utilized the survey data to develop the figures.

Uranium One notes the reviewer's recommendation to obtain "available water levels" from other wells located within 2 km. However, in order to be useful to construct a potentiometric map, these "available water levels" would all need to have been taken at about the same time from wells that were not being pumped. Majority of the wells within 2 km of the sites are actively pumped for domestic or stock use and are not monitoring wells. Therefore, it would be difficult to obtain truly static water levels, even if field personnel were sent out to inventory the wells. In addition, most water level data available in the SEO database, if any, probably would not be of high enough quality to construct a meaningful potentiometric map.

The updated potentiometric maps are shown below.





Note: Contoured wells were selected based on estimated completion intervals and the approximate elevation of the 110 sand. Only non-pumping wells were contoured.
Reference elevations for wells N-1, N-14 and N-16 determined by survey results provided by TREC, and reference elevations for LMO-1 and M-7 were estimated using the USGS National Elevation Dataset. Well M-7 was not contoured.

Prepared By: KKV
Project Manager:MM
Printing Date:10/05/12
Original Scale: 1:10,000
File: TREC03_potmapsD6_15_110Sand_2.mxd
Coordinate System:
NAD_1927_StatePlane_Wyoming_East_FIPS_4901
Operating System: Microsoft Windows 7 Professional
ArcMap Build Number: 10.1.3035

Selected Monitoring Wells
Townships
Sections
Excluded Areas
Project Boundary
Ore Body/Well Field
Potentiometric Surface Contour

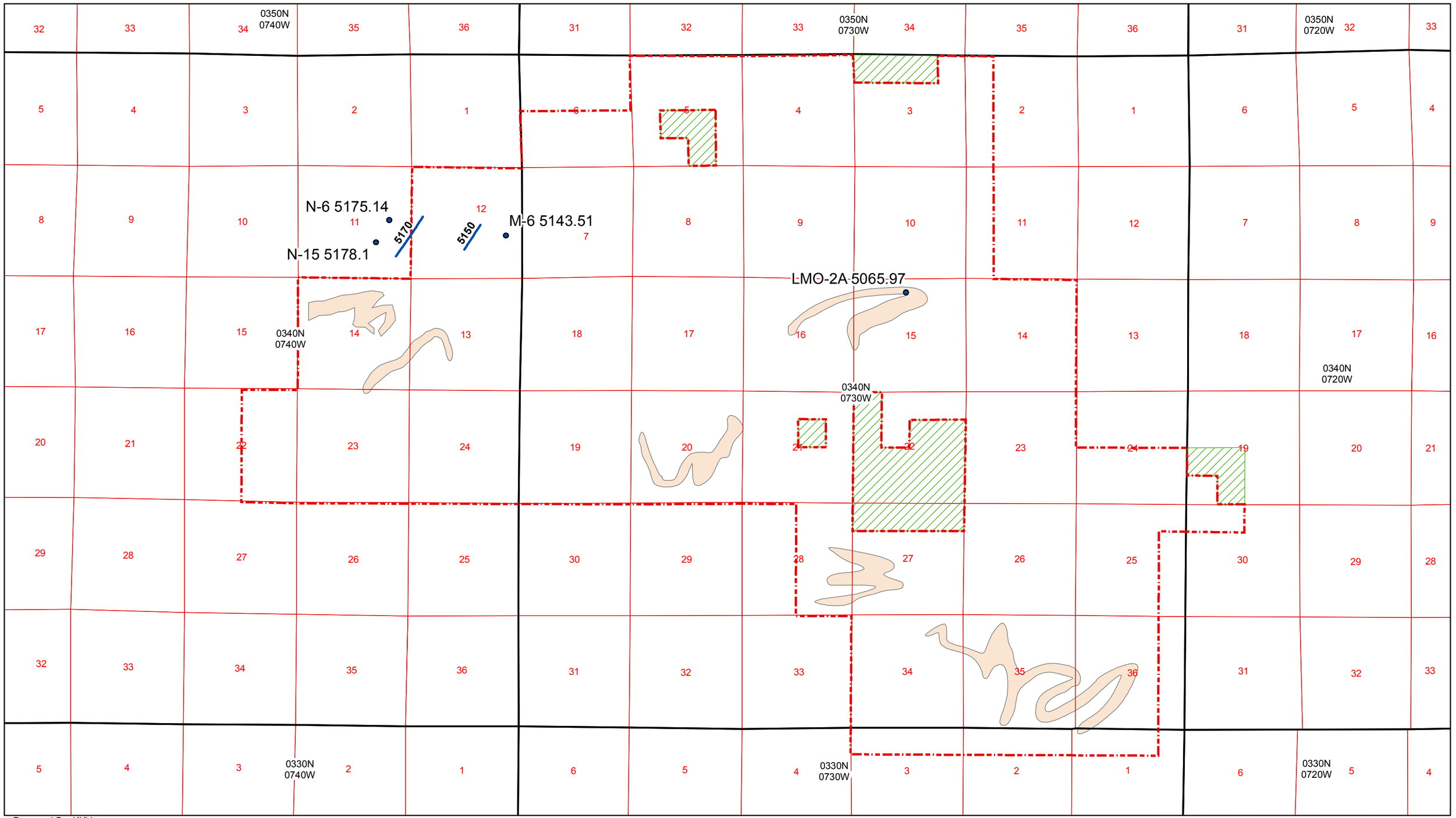
0 500 1,000 2,000 Feet

Hydro Solutions Inc

Potentiometric water surface countour is based on February/March 2009 monitoring data

N

110 Sand Potentiometric Map
Ludeman Regional Aquifer Test
Uranium One America
Converse County, Wyoming



Prepared By: KKV
Project Manager:MM
Printing Date:05/23/13
Original Scale: 1:50,000
File: TREC04_potmapsD6_15_100Sand.mxd
Coordinate System:
NAD_1927_StatePlane_Wyoming_East_FIPS_4901
Operating System: Microsoft Windows 7 Professional
ArcMap Build Number: 10.1.3035

Selected Monitoring Wells
Townships
Sections
Excluded Areas
Project Boundary
Ore Body/Well Field
Potentiometric Surface Contour

0 0.75 1.5 3 Miles

Hydro Solutions Inc

Potentiometric water surface countour
is based on February/March 2009 monitoring data

N

100 Sand Potentiometric Map
Ludeman Regional Aquifer Test
Uranium One America
Converse County, Wyoming

Revised June 2013

0350N 0740W
0350N 0730W
0350N 0720W
0340N 0740W
0340N 0730W
0340N 0720W
0330N 0740W
0330N 0730W
0330N 0720W

M-3
5143.46

M-4
5097.56

M-2*
5110.49

LPW-2
5144.74

M-13
5138.7

LPW-4
4966.93

M-24
4940.02

5120
5080
5040
5000
4960

0 0.75 1.5 3 Miles

N

* Apparent anamalous groundwater elevation for M-2

Potentiometric water surface countour is based on February/March 2009 monitoring data

Prepared By: KKV
Project Manager:MM
Printing Date:05/23/13
Original Scale: 1:50,000
File: TREC04_potmapsD6_14_90Sand.mxd
Coordinate System:
NAD_1927_StatePlane_Wyoming_East_FIPS_4901
Operating System: Microsoft Windows 7 Professional
ArcMap Build Number: 10.1.3035

Selected Monitoring Wells
Townships
Sections
Excluded Areas
Project Boundary
Ore Body/Well Field
Potentiometric Surface Contour
Inferred Potentiometric Surface Contour

Hydro Solutions Inc

90 Sand Potentiometric Map
Ludeman Regional Aquifer Test
Uranium One America
Converse County, Wyoming

Revised June 2013

0350N 0740W
0350N 0730W
0350N 0720W
0340N 0740W
0340N 0730W
0340N 0720W
0330N 0740W
0330N 0730W
0330N 0720W

M-5 5073.91
M-26 5119.79
LPW-1 5142.49
M-8 5137.9
M-12 5014.23 +
M-17 4996.93 +
M-19 4979.67
LMU-3 4965.07

5100
5140
5060
5020
4980

Prepared By: KKV
Project Manager:MM
Printing Date:05/23/13
Original Scale: 1:50,000
File: TREC04_potmapsD6_13_80Sand.mxd
Coordinate System:
NAD_1927_StatePlane_Wyoming_East_FIPS_4901
Operating System: Microsoft Windows 7 Professional
ArcMap Build Number: 10.1.3035

Selected Monitoring Wells
Townships
Sections
Excluded Areas
Project Boundary
Ore Body/Well Field
Potentiometric Surface Contour
Inferred Potentiometric Surface Contour

0 0.75 1.5 3 Miles

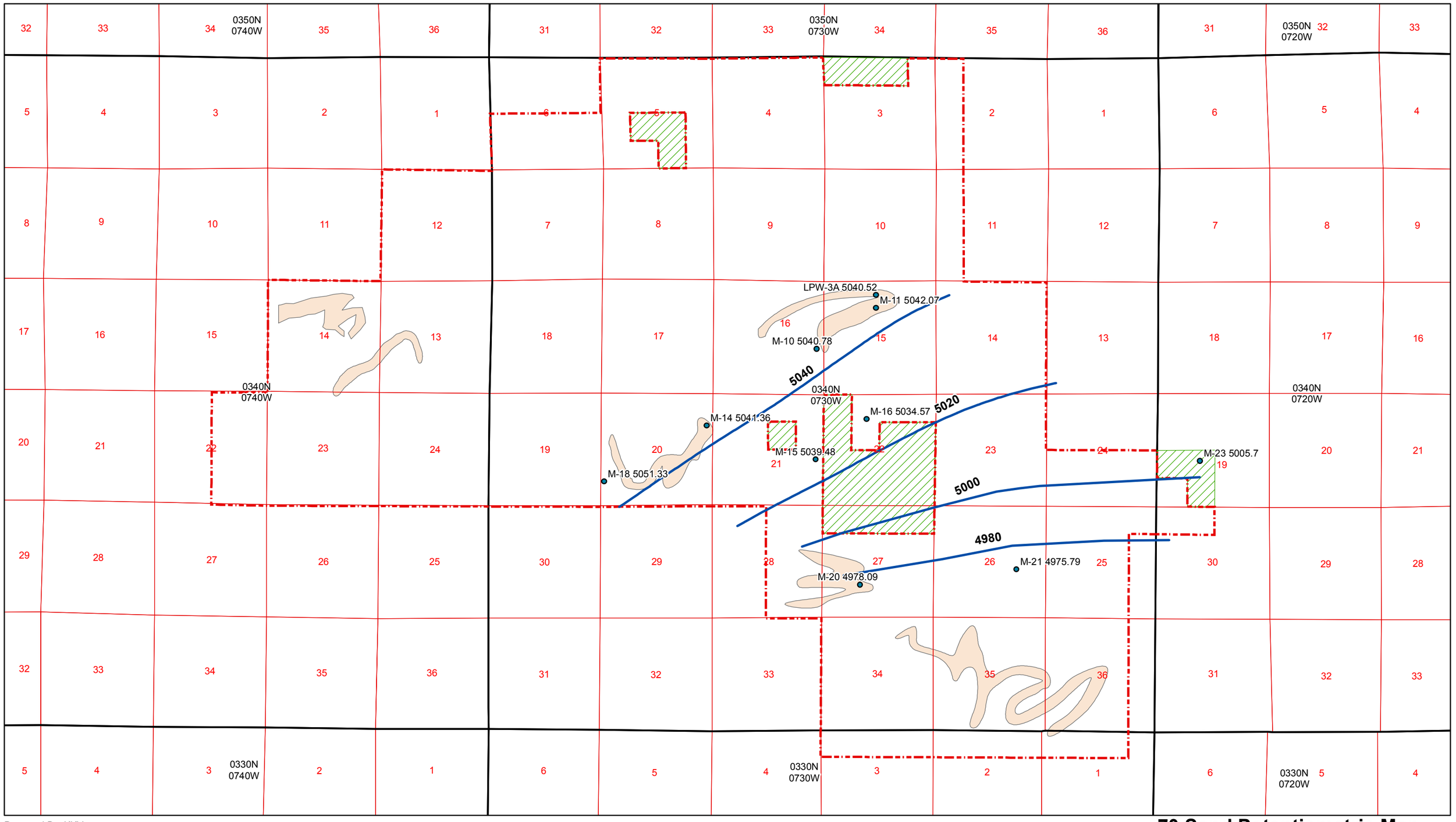
Hydro Solutions Inc

Potentiometric water surface countour
is based on February/March 2009 monitoring data
+ Artesian well

N

80 Sand Potentiometric Map
Ludeman Regional Aquifer Test
Uranium One America
Converse County, Wyoming

Revised June 2013



Prepared By: KKV
Project Manager:MM
Printing Date:05/23/13
Original Scale: 1:50,000
File: TREC04_potmapsD6_12_70Sand.mxd
Coordinate System:
NAD_1927_StatePlane_Wyoming_East_FIPS_4901
Operating System: Microsoft Windows 7 Professional
ArcMap Build Number: 10.1.3035

Selected Monitoring Wells
Townships
Sections
Excluded Areas
Project Boundary
Ore Body/Well Field
Potentiometric Surface Contour

0 0.75 1.5 3 Miles

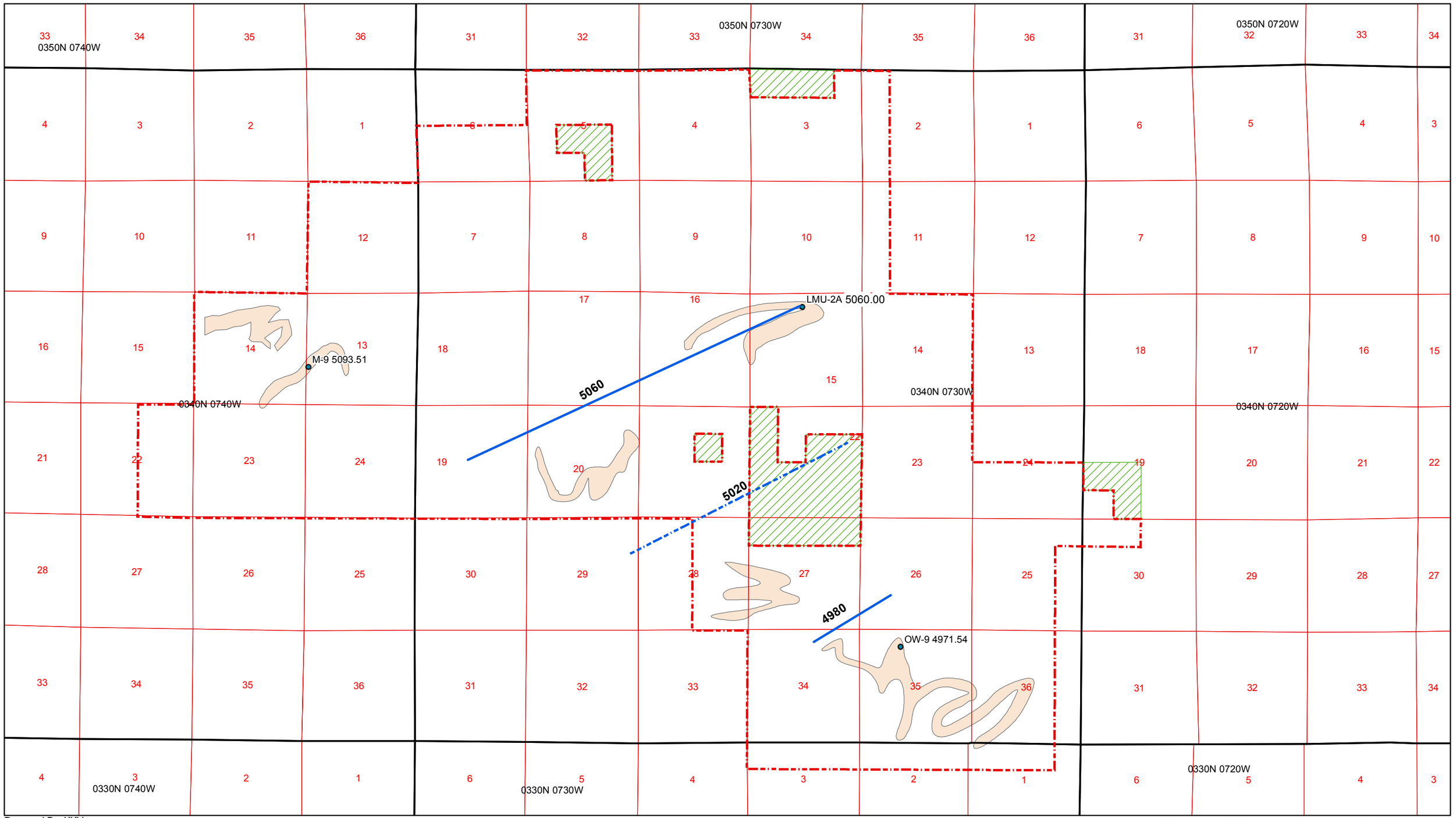
Hydro Solutions Inc

Potentiometric water surface countour
is based on February/March 2009 monitoring data

N

70 Sand Potentiometric Map
Ludeman Regional Aquifer Test
Uranium One America
Converse County, Wyoming

Revised June 2013



Prepared By: KKV
Project Manager:MM
Printing Date: 3/20/2013
Original Scale: 1:50,000
File: TREC03_potmapsD6_11_60Sand.mxd
Coordinate System:
NAD_1927_StatePlane_Wyoming_East_FIPS_4901
Operating System: Microsoft Windows 7 Professional
ArcMap Build Number: 10.1.3035

Selected Monitoring Wells
Townships
Sections
Excluded Areas
Project Boundary
Ore Body/Well Field
Potentiometric Surface Contour
Inferred Potentiometric Surface Contour

0 0.75 1.5 3 Miles

Hydro Solutions Inc

Potentiometric water surface countour is based on February/March 2009 monitoring data

N

60 Sand Potentiometric Map
Ludeman Regional Aquifer Test
Uranium One America
Converse County, Wyoming

Revised June 2013

RAI-20

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

During a site visit in August 2012, staff observed an occupied ranch with a house and several outbuildings to the east of the Leuenberger Satellite. Staff did not find a discussion of this residence and the private water wells or surface water rights associated with it in the application. Staff was not able to determine if any other such residences exist within the license area. Staff cannot evaluate the safety of the use of any private wells or surface water rights at this ranch or any other residences in the license area.

Formulation of RAI

Uranium One should clearly identify on a map and describe all residences and all of the private wells and surface water rights associated with each residence within the proposed license area.

RAI-20 Response

There is a single residence within the proposed project boundary. It is found within the SE Quarter of Section 13 T34N R74W and identified on the conceptual infrastructure map provided as Figure 20 (RAI 102) of this response package. The residence utilizes a nearby stock well (P9823.0W) for domestic use and identified as the "JS" well within the application. Currently there are no records of surface water rights associated with this residence. Surface water and groundwater rights are presented in RAI-12 and RAI-27 respectively.

RAI-21

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

No information was provided on LMP-5 in Addendum 2.7-C, "Summary of Monitoring Well Completion". The JS well on the table was not identified on maps. The completion information on OW-1 and OW-9 was not consistent throughout the application in several tables and discussions. The location of OW-9 was not shown on all maps.

Formulation of RAI

Uranium One should correct all tables and maps which include these wells and correct any discussions of these wells in the text.

RAI-21 Response

Addendum 2.7-C Summary of Monitor Well Completion has been updated to provide completion information on all monitor wells including LMP-5 and is provided below. The completion information and figures depicting OW-1 and OW-9 has also been revised throughout the application to maintain constancy. An updated figure depicting all monitor well locations is provided below and will be added to TR Section 2.7.

Table 3: Summary of Monitor Well Completion

Well ID	Northing	Easting	Twn/Rng	Sec.	Elevation TOC (ft; amsl)	Casing Depth (ft;bgs)	Hole Depth (ft;bgs)	Top Screen (ft;bgs)	Bottom Screen (ft;bgs)	Screen Length (ft)	Sand	Casing Type	AMSL DTW	Feb/March 2009 Static Depth to Water (ft from TOC)	Top of Sand (Elevation)	Confined / Unconfined
M-2	830484	366906	T34N R73W	6	5332'	400'	600'	380'	400'	20'	90	SDR-17, 5"	5110.49'	221.61'	4952.1	Confined
M-3	831516	372320	T34N R73W	5	5290'	400'	600'	380'	400'	20'	90	SDR-17, 5"	5143.46'	146.64'	4910.1	Confined
M-4	831550	377500	T34N R73W	4	5281'	400'	600'	380'	400'	20'	90	SDR-17, 5"	5097.56'	183.24'	4900.8	Confined
M-5	831585	382925	T34N R73W	3	5198'	400'	600'	380'	400'	20'	80	SDR-17, 5"	5073.91'	123.59'	4817.5	Confined
M-6	825255	363944	T34N R74W	12	5349'	380'	380'	360'	380'	20'	100	SDR-17, 5"	5143.51'	205.39'	4988.9	Confined
M-7	822462	362483	T34N R74W	13	5358'	500'	500'	260'	280'	20'	110	SDR-17, 5"	5176.68'	181.32'	5098	Confined
M-8	821501	358296	T34N R74W	14	5257'	600'	600'	390'	420'	30'	80	SDR-17, 5"	5137.90'	118.70'	4866.6	Confined
M-9	819727	359522	T34N R74W	13	5271'	600'	600'	580'	600'	20'	70	SDR-17, 5"	5093.51'	177.39'	4690.9	Confined
M-10	820025	380050	T34N R73W	16	5176'	600'	600'	470'	485'	15'	70	SDR-17, 5"	5040.78'	135.52'	4706.3	Confined
M-11	821946	382852	T34N R73W	15	5212'	570'	570'	550'	570'	20'	70	SDR-17, 5"	5042.07'	170.33'	4662.4	Confined
M-12	818897	389890	T34N R73W	14	5014'	250'	250'	220'	250'	30'	80	SDR-17, 5"	artesian	+0.23**	4794	Confined
M-13	816755	359099	T34N R73W	23	5299'	230'	230'	210'	230'	20'	100	SDR-17, 5"	5138.70'	160.00'	5088.7	Confined
M-14	816399	374853	T34N R73W	20	5110'	500'	500'	455'	480'	25'	70	SDR-17, 5"	5041.36'	68.34'	4654.7	Confined
M-15	814800	380005	T34N R73W	21	5079'	460'	460'	420'	440'	20'	70	SDR-17, 5"	5039.48'	39.72'	4659.2	Confined
M-16	816696	382402	T34N R73W	22	5063'	500'	500'	330'	350'	20'	70	SDR-17, 5"	5034.57'	28.43'	4733	Confined
M-17	816997	388900	T34N R73W	23	4997'	500'	500'	330'	370'	40'	80	SDR-17, 5"	artesian	+0.23**	4666.7	Confined
M-18	813753	370004	T34N R73W	20	5153'	360'	520'	340'	360'	20'	70	SDR-17, 5"	5051.33'	101.47'	4812.8	Confined

Well ID	Northing	Easting	Twn/Rng	Sec.	Elevation TOC (ft; amsl)	Casing Depth (ft;bgs)	Hole Depth (ft;bgs)	Top Screen (ft;bgs)	Bottom Screen (ft;bgs)	Screen Length (ft)	Sand	Casing Type	AMSL DTW	Feb/March 2009 Static Depth to Water (ft from TOC)	Top of Sand (Elevation)	Confined / Unconfined
M-19	807845	378952	T34N R73W	20	5032'	360'	360'	200'	220'	20'	80	SDR-17, 5"	4979.67'	52.33'	4832	Confined
M-20	808887	382104	T34N R73W	27	5039'	320'	320'	300'	320'	20'	70	SDR-17, 5"	4978.09'	60.71'	4738.8	Confined
M-21	809606	389488	T34N R73W	26	5068'	360'	360'	310'	330'	20'	70	SDR-17, 5"	4975.79'	92.21'	4758	Confined
M-23	814735	398152	T34N R72W	19	5040'	298'	360'	280'	295'	15'	70	SDR-17, 5"	5006.08'	33.92'	4760	Confined
M-24	804681	393222	T34N R73W	36	4988'	360'	360'	120'	150'	30'	90	SDR-17, 5"	4940.02'	47.68'	4867.7	Confined
M-26	825898	372206	T34N R73W	8	5389'	800'	360'	610'	630'	20'	80	SDR-17, 5"	5119.79'	268.71'	4778.5	Confined
OW-1	806885	387375	T34N R73W	35	5102'	175'	800'	127'	167'	40'	80	SDR-17, 5"	5031.67'	70.33'	4975	Confined
OW-9	806704	387481	T34N R73W	35	5103'	274'	338'	274'	314'	40'	60	SDR-17, 5"	4969.30'	133.70'	4829	Confined
LPW-1	822080	356445	T34N R74W	14	5217'	325'	420'	327'	347'	20'	80	SDR-17, 5"	5162.39'	54.61'	4890	Confined
LMU-1 +	822080	356455	T34N R74W	14	5217'	465'	520'	465'	485'	20'	70	SDR-17, 5"	5151.66'	65.34'	4752	Confined
LMO-1	822080	356425	T34N R74W	14	5194'	85'	160'	085'	107'	23'	110	SDR-17, 5"	5172.39'	21.61'	5109	Confined
LPW-2	822080	356435	T34N R74W	14	5217'	225'	290'	225'	245'	20'	90	SDR-17, 5"	5164.64'	52.36'	4992	Confined
LPW-3A	822565	382860	T34N R73W	15	5205'	555'	600'	555'	575'	20'	70	SDR-17, 5"	5038.57'	166.43'	4650	Confined
LMU-2A	822565	382870	T34N R73W	15	5205'	725'	800'	725'	745'	20'	60	SDR-17, 5"	5051.49'	153.51'	4480	Confined
LMO-2A	822565	382850	T34N R73W	15	5206'	230'	250'	232'	252'	20'	100	SDR-17, 5"	5058.46'	147.54'	4974	Confined
LPW-4	806525	387485	T34N R73W	35	5108'	237'	260'	237'	257'	20'	90	SDR-17, 5"	4969.69'	138.31'	4871	Confined
LMU-3	806525	387500	T34N R73W	35	5108'	285'	780'	285'	305'	20'	80	SDR-17, 5"	4974.40'	133.60'	4823	Confined
LMP-6*	806855	387430	T34N R73W	35	5104'	230'	280'	232'	247'	15'	90	SDR-17, 5"	4971.96'	132.04'	4872	Confined
LMP-7*	806320	387385	T34N R73W	35	5106'	220'	260'	223'	243'	20'	90	SDR-17, 5"	4972.38'	133.62'	4883	Confined

Well ID	Northing	Easting	Twn/Rng	Sec.	Elevation TOC (ft; amsl)	Casing Depth (ft;bgs)	Hole Depth (ft;bgs)	Top Screen (ft;bgs)	Bottom Screen (ft;bgs)	Screen Length (ft)	Sand	Casing Type	AMSL DTW	Feb/March 2009 Static Depth to Water (ft from TOC)	Top of Sand (Elevation)	Confined / Unconfined
LMP-1*	822380	356440	T34N R74W	14	5225'	350'	420'	350'	370'	20'	80	SDR-17, 5"	5139.73'	85.27'	4875	Confined
LMP-2*	821700	356450	T34N R74W	14	5220'	328'	420'	328'	350'	22'	80	SDR-17, 5"	5139.89'	80.11'	4892	Confined
LMP-3*	822390	356435	T34N R74W	14	5225'	245'	290'	245'	270'	25'	90	SDR-17, 5"	5142.29'	82.71'	4980	Confined
LMP-4*	821700	356435	T34N R74W	14	5220'	225'	290'	225'	245'	20'	90	SDR-17, 5"	5141.44'	78.56'	4995'	Confined
LMP-5*	823090	38285	T34N R73W	15	5206'	560'	600'	560'	580'	20'	70'	SDR-17, 5"	5043.85'	162.15'	4646'	Confined
JS[1]	NESE (qtr/qtr)		T34N R74W	14												

+ Static Water Level data not used due to abnormal rise in water level

*Static Water Level Before Pumping Test

**Artesian well, static water level in feet above measuring point based on reported pressure measurement.

Gray shaded cells indicate approximate wellhead elevation based on NED

[1] No SEO information available

LEUENBERGER TEST AREA
LPW-2 80 SAND
*NO 100 SAND WELLS

NORTH PLATTE TEST AREA
LPW-3A 70 SAND
*NO 80 SAND WELLS

LEUENBERGER TEST AREA
LPW-2 90 SAND
*NO 80 SAND OR 100 SAND WELLS

PETERSON TEST AREA
LPW-4 90 SAND
*NO OVERLYING AQUIFER EXISTS

R75W R74W R73W R72W

T35N T34N T33N

M-1 M-2 M-3 M-4 M-5 M-6 M-7 M-8 M-9 M-10 M-11 M-12 M-13 M-14 M-15 M-16 M-17 M-18 M-19 M-20 M-21 M-23 M-24 M-26 JS OW-1 OW-9

LMP-1 LPW-2 LMO-1 LMU-1 LPW-1 (Pumping Well) LMP-2

LMP-5 LPW-3A (Pumping Well) LMO-2A LMU-2A

LMP-3 LMO-1 LMU-1 LPW-2 (Pumping Well) LMP-4

OW-1 LMP-6 OW-9 LPW-4 (Pumping Well) LMU-3 LMP-7

0 250 500 Feet

This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

PREPARED FOR
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investing in our energy

LUDEMAN PROJECT
CONVERSE COUNTY, WY

TREC, Inc.
Engineering & Environmental Management
900 Werner Court
Suite 150
Casper, WY 82601
Phone (307) 265-0696
Fax (307) 265-2498
www.treccorp.com

Legend
- Ludeman Project Boundary
- Excluded Area
- Satellite Facility
- Monitor Well
- Wellfield Ore Body

Well Completion
- 110 Sand
- 100 Sand
- 90 Sand
- 80 Sand
- 70 Sand
- 60 Sand

- Major Road
- Minor Road

1:72,000
0 0.25 0.5 1 1.5 2 Miles

N W E S

DRAWN BY: EGS
CHECKED BY: CAT
APPROVED BY: RMD

Ludeman Project Area and Pumping Test Monitoring Areas Regional Aquifer Test

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	EGS	6/17/13	11
1	For Submittal	RMD	6/20/13	

Path: O:\WY_Projects\8201-2013-102_Infrastructure\Project_MXD\Ludeman_Wellfield_Aquifer_Test.mxd

(Leuenberger Water Resources)

RAI-22

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The proposed Leuenberger Satellite is located in T34N, R74W in the far northwestern corner of the proposed license area. Three wellfields are proposed for the satellite. Uranium One stated that the target ore zones of interest are the 90 or 80 sands of the Ft. Union formation. However, Uranium One did not indicate whether one or both of the sands would be targeted in any of the three designated wellfields. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without specification of the exact sands to be targeted for extraction at each wellfield.

Formulation of RAI

Uranium One should separately identify the overlying aquifer, aquitard, ore zone aquifer, underlying aquitard and underlying aquifers specifically targeted at Wellfields 1, 2 and 3 at the Leuenberger Satellite. Uranium One should be aware that these ore sands will be the sands in which extraction can occur under this license at the Leuenberger Satellite. Any extraction in additional wellfields/ore sands will require a license amendment.

RAI-22 Response

The respective sand units that will be developed for each of the individual wellfields is provided below. In addition, the overlying unit, underlying unit and estimated unit depths for each wellfield have been incorporated into the following table and TR Section 2.7. Uranium One would like to note that Wellfield 3 has been incorporated into Wellfield 1 as depicted on the figure presented in RAI 102:

Table 4: Wellfields and Sand Units for the Proposed Project

Wellfield Number	Wellfield Acreage	Production Zone		Overlying Unit		Underlying Unit	
		Sand	Depth (ft)	Sand	Depth (ft)	Sand	Depth (ft)
1	93	90	194-345	100	43-128	80	295-450
		80	295-450	90	194-345	70	414-478
2*	58	70	695-747	80	563-652	60	704-770
3	131	70	470-690	80	352-532	60	538-733
4	104	70	480-590	80	286-463	60	561-694
5	107	80	224-383	90	151-279	70	303-550
		70	303-550	80	224-383	60	362-565
6	271	90	53-271	100	41-172	80	122-331

Note: this is preliminary data; more complete data will be included in the Wellfield Data Package which will be submitted to the WDEQ/LQD prior to production.

*The sands units in wellfield 2 are currently being further evaluated and will be updated for the final application to ensure accurate description.

RAI-23

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

In the 1980 Teton mining application for the Leuenberger site, the 100 and 110 overlying aquifer sands were identified as the O sand. The 1980 potentiometric surface for the O sand prepared by Teton was defined by water levels from several wells with good spatial coverage and showed that the groundwater flow direction was to the southwest. Teton indicated the groundwater surface in the O sand followed the topography, and O sand groundwater discharged to the Little Sand Creek drainage to the west of the facility. Uranium One provided a potentiometric surface for the same overlying aquifer in the 110 and 100 sands, defined by only two wells, which now show the flow is toward the east and north, respectively. This change in potentiometric surface would represent essentially a reversal of ground water flow direction in the overlying 100 and 110 sand aquifers. Uranium One did not present the historical potentiometric information for the O sand even though it referenced historical data from the Leuenberger pilot project in many other parts of the application. Staff cannot evaluate the safety of the operations at Leuenberger Satellite without an evaluation of this change in groundwater flow direction in the overlying 100 and 110 sand aquifers.

Formulation of RAI

Uranium One should evaluate the potentiometric surface in the 110 and 100 sands at the Leuenberger Satellite and determine if the groundwater flow direction in these aquifers has significantly changed direction since the evaluation in 1980 for the Teton Leuenberger ISR application. If the flow direction has changed, please provide an explanation (e.g., pumping drawdown from the Negley Subdivision wells which staff has determined were mostly installed after 1979).

RAI-23 Response

Uranium One has revised all potentiometric maps for the aquifer sands in the proposed project area. The revised 100 Sand potentiometric map is based on data from four wells and updated wellhead elevation data. This map indicates that groundwater in the 100 Sand is flowing to the southeast. It is unclear why these data are not in agreement with the 1980 potentiometric map referred to in NRC's RAI. However, at this time, we find no reason to question the southeasterly groundwater flow direction indicated on this revised 100 Sand potentiometric map.

The 110 Sand map is also based on four wells and suggests that groundwater is flowing to the northwest in the 110 Sand. This potentiometric map is based on the limited data that are currently available for this aquifer, which are considered to be of lower accuracy than the data used to construct the other potentiometric maps. However, this map is only intended to provide an initial estimate of groundwater flow direction, and it will be updated and revised if needed as wellfield data packages are prepared and submitted for individual wellfields.

See RAI-19 for the revised 110 and 100 potentiometric maps.

RAI-24

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One did not characterize the surficial (uppermost) aquifer at the proposed Leuenberger Satellite. Characterization is critical to assess if spills and leaks from proposed surface operations and subsurface piping will contaminate the uppermost aquifer which may be connected to surface water. Staff cannot evaluate or provide reasonable assurance of the safety of operations without characterization of the surficial (uppermost) aquifer.

Formulation of RAI

Uranium One should characterize the surficial (uppermost) aquifer(s) at the Leuenberger Satellite. Provide a map of the depth to the uppermost aquifer(s) at the Leuenberger Satellite within a 2 km buffer around Wellfields 1, 2 and 3 and the proposed surge ponds. Uranium One should discuss any hydraulic connection between the uppermost aquifer(s) with surface water features and the drainages, particularly Little Sand Creek, at the Leuenberger Satellite.

RAI-24 Response

Uranium One commits to installing additional monitor wells in the wellfield and satellite areas to identify the surficial aquifer and establish baseline water quality prior to operations.

RAI-25

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

For the 80 sand aquifer test at LPW-1, Uranium One provided the water level vs. time curves for the pumping wells and all of the observation wells for the pumping and recovery periods in Figures 6-1 through 6-8 of Appendix A-2. For the 90 sand aquifer test at LPW-2, Uranium One provided the water level vs. time curves for the pumping wells and all of the observation wells for the pumping and recovery periods in Figures 6-9 through 6-16 of Appendix A-2. Uranium One provided electronic files of the water level data for the test on CD for the 80 sand but not the 90 sand. The plots are useful for a quick check of the well response to pumping; however, the plots were insufficient for NRC staff to evaluate the aquifer response as the time scale was oddly set as a log scale of the Julian date which repeated for several points instead of the usual log scale in minutes. Uranium One also provided a Cooper Jacob analysis of the recovery data of only one observation well for each test in Appendix A-4. Uranium One did not provide an analysis of the recovery data from the pumping well or the other observation wells for either test. The staff finds the 2008 80 sand multi-well tests indicate a higher transmissivity than the original Teton tests. The 2008 80 sand multi-well tests did not indicate the leakage seen on the Teton 80 and 90 sand tests. The staff finds the 2008 test did not demonstrate the boundary effects that were noted in the original Teton 80 and 90 sand tests. Staff finds that the information provided for the 80 sand aquifer test at LPW-1 and 90 sand aquifer test at LPW-2 is not sufficient to assess the hydrologic characteristics of these aquifers.

Formulation of RAI

Uranium One should provide traditional time drawdown curves on semi-log time scale for all observation wells for both the 80 and 90 sands aquifer tests at the Leuenberger Satellite. Uranium One should also provide recovery curves on semi-log time scale for the pumping well and the observation wells. Please analyze all curves for transmissivity and storage coefficient and provide these values. If any boundary effects or leakage are noted, describe and reassess the hydrogeologic characteristics of the 80 sand and 90 sands at the Leuenberger Satellite. Provide the water level data for the 90 sand pumping test in electronic form.

RAI-25 Response

See Appendix A for response to this RAI.

RAI-26

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

During the 80 sand aquifer test, the 70 sand underlying aquifer monitoring well, LMU-1, showed a steady increase in water level which continued through the 90 sand test and several months later. Uranium One stated this increase was due to an incomplete seal between the casing and the well bore allowing flow presumably from an overlying aquifer to the 70 sand. The TR does not indicate that Uranium One had plugged the well to prevent this transfer.

Uranium One did not determine if the 70 sand well might be demonstrating recovery that is related to the interference of a nearby pumping well in the 70 sand (e.g. State deep water well 7-16). NRC staff cannot assess the behavior of the underlying 70 sand based on the information provided.

Formulation of RAI

Uranium One should provide assurance that this well has been properly abandoned to prevent leakage, and a discussion of other potential causes for this response and any implications for operations.

RAI-26 Response

After review of the MIT and the statement given in the Hydrologic Pump Test Report, Uranium One has determined that this is a misstatement. The MIT report and the revised text are provided below:

"After review of the MIT performed in December 2009, Uranium One determined that LMU-1 is a properly functioning monitoring well."

Mechanical Integrity Test

Uranium One - Project - Leuenberger

WELL SPECIFICATIONS:

WELL NUMBER	LMU-1	INITIAL	✓
MINE UNIT		5 YEAR	
CASING TYPE	PVC	WORKOVER	
CASING I.D.	4.5	OTHER	
CASING J-TOP	457	TURNAROUND	

MIT STATUS: (Check one)

Specifications

HEADER HOUSE MAX. INJ. PSI X %125 = PRESSURE BETWEEN PACKERS X %90 = PASS PRESSURE

____ PSI X %125 = ____ PSI X %90 = ____ PSI

TEST DEPTH FROM 450 TO Surface FEET

TEST #1		TEST #2		TEST #3	
0 MIN	150	0 MIN		0 MIN	
2 MIN		2 MIN		2 MIN	
4 MIN	146	4 MIN		4 MIN	
6 MIN		6 MIN		6 MIN	
8 MIN		8 MIN		8 MIN	
10 MIN	144	10 MIN		10 MIN	

PASS ✓ FAIL ____

COMMENTS ____

TESTERS NAME Matt Sutton DATE 12/14/09

RAI-27

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

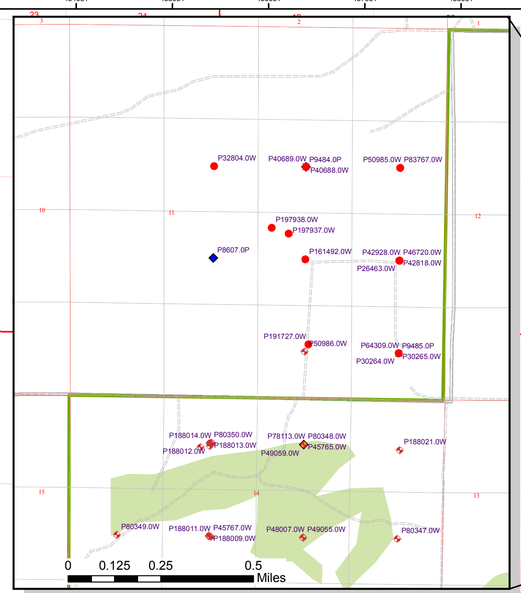
The Leuenberger Satellite has three proposed wellfields. Wellfields 1 and 3 are located in Section 14 of T34NR74W (Figure 2.7-11). Wellfield 2 crosses both Sections 13 and 14 of T34NR74W. Addendum 2.7-A-1 provides the existing ground water rights for all private wells within a 2 mile buffer of the license area. However, the locations of these wells are not provided on a map at the scale of the Leuenberger Satellite demonstrating the proximity to the proposed wellfields.

Formulation of RAI

Uranium One should provide a map at a scale which clearly shows the location of all private wells within 2 km of the proposed Leuenberger wellfields and add the coordinates of these wells to the table in Addendum 2.7-A.

RAI-27 Response

An updated figure depicting all groundwater wells has been developed utilizing the latest 2013 WSEO data and is shown below. In addition, the corresponding revised table listing all the before mentioned wells and locations has been inserted into Addendum 2.7-A.



This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

Data provided by source may be reflected to the Quarter-Quarter Section and not the exact geographic location.

PREPARED FOR

uranium one
investing in our energy

LUDEMAN PROJECT
CONVERSE COUNTY, WY

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- Ludeman Project Boundary
- Excluded Area
- Two Mile Review Area
- Satellite Facility
- Wellfield Ore Body

SEO Well Class of Use

- Domestic
- Domestic; Stock
- Irrigation
- Miscellaneous
- Miscellaneous; Stock
- Monitor
- Stock
- Industrial

DRAWN BY:	CAT
CHECKED BY:	WFC
APPROVED BY:	RMD

Wyoming State Engineer's Office
Permitted Wells Within Two Miles

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	CAT	4/10/13	13
1	For Submittal	RMD	6/20/13	
2				

Well Data Source: Wyoming State Engineer's Office, February 27, 2012 (WYGISC Data, Published Oct. 2012, Accessed 04/09/13; ftp://seoftp.wyo.gov/geolibrary_data/SEOwells.zip)

RAI-28

Description of Deficiency

The information provided in TR Addendum 2-7A does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Staff reviewed the Addendum 2-7A table for private wells (other than Negley Subdivision) within 2 km of the Leuenberger wellfields which included wells in Sections 9, 10, 11, 12, 13,14,15, 16, 22, 23, 24, 25, and 26. Within the table, staff identified 4 private wells in Section 9, one private well in Section 10, one private well in Section 12, one private well in Section 13, one private well in Section 14, 2 private wells in Section 15, and no private wells in Sections 22, 23 and 24. These wells are listed in the following table. Staff has no information on which aquifer(s) these wells are completed in and their current use. Staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

The staff also searched the WSEO water rights database to verify the completeness of wells provided in the Addendum 2-7 A table and identify any additional wells completed within 2 km of the Leuenberger proposed wellfields. The area reviewed within the 2 km included all of Sections 10, 11, 12,13,14,15, 22, 23, and 24. This search uncovered four new wells which had been permitted or installed within the 2 km buffer but were not listed by Uranium One and one well which had a different location description which placed it one mile closer to the wellfields. These wells are listed in the following table. One well, identified as Hart 1 had been installed and 2 wells, Brody 1 and Wesston 1 received permits in the Negley Subdivision. Staff is concerned about the Brody 1 and Wesston 1 wells as their approved depth may be in the 90 or 80 sands. Additionally a miscellaneous/drilling water well, South Hylton, had been permitted for Section 24. This well may be located in the 80 sand and its approved rate could be sufficient to impact hydraulic control of any 80 sand ore zone extraction. Staff has no information on the current status of these wells. Therefore, staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Formulation of RAI

(A.)Uranium One should provide the status, target aquifer(s), current use and predicted use of the wells which are listed in the above tables and indicate if any of these wells are completed in the 80 or 90 sand or any targeted ore zone aquifers and overlying/underlying aquifers at the North Platte Sattelite. (B.)Uranium One should

discuss if operation of those wells could incur any safety issue for well owners or impact hydraulic control of the wellfields during operations. (C.)Uranium One should also provide a commitment to annually update information on private well use and describe any new private wells installed within 2 km of the Leuenberger Satellite proposed wellfields including their coordinates, completion, type of use and rate until the license is terminated.

RAI-28(A) Response

The potential well depths/screen depths listed by the reviewer for those remaining two wells (Brody 1 and Wesston 1) are simply estimated depths contained within the permit application. For example, the final depth for Hart 1 is only 108 feet; yet, the estimated depth was 700 feet on the permit application. Here is the current disposition of each well as stated by WSEO (June 1, 2013).

1. **Brody 1: Permit No. U.W. 197937** - The U.W. 5 Form, or Application for Permit to Appropriate Ground Water, lists the estimated depth of the well at 300 feet, and the estimated production interval at 280 - 300 feet. A U.W. 6 Form, or Statement of Completion and Description of Well or Spring has not yet been filed with the State Engineer's Office. Therefore, SEO does not yet know how the actual well was constructed. The appropriator has until December 31, 2013 to file either a U.W. 6 Form or request an extension of time for completion of construction and completion of the beneficial use of water for the purposes specified on the approved permit.
2. **Wesston 1: Permit No. U.W. 197938** – This is the correct permit number. The RAI incorrectly lists the number at P197937.0W. The U.W. 5 Form, or Application for Permit to Appropriate Ground Water, lists the estimated depth of the well at 300 feet, and the estimated production interval at 280 - 300 feet. A U.W. 6 Form, or Statement of Completion and Description of Well or Spring has not yet been filed with the State Engineer's Office. Therefore, SEO does not yet know how the actual well was constructed. The appropriator has until December 31, 2013 to file either a U.W. 6 Form or request an extension of time for completion of construction and completion of the beneficial use of water for the purposes specified on the approved permit.
3. **Hart 1: Permit No. U.W. 191727** - The U.W. 5 Form, or Application for Permit to Appropriate Ground Water, lists the estimated depth of the well at 700 feet. An estimated production interval was not provided. A U.W. 6 Form, or Statement of Completion and Description of Well or Spring was received on December 8, 2009

and notes the total depth at 108 feet. The actual production interval was not provided.

4. **South Hylton Ranch: Permit No. U.W. 195273 –** This is the correct permit number. The RAI incorrectly lists the number at P195723.0W. This permit has been cancelled per request of the applicant. It is SEO's understanding the well authorized under this permit was never constructed.

RAI-28 (B) (C) Response

As previously discussed in RAI-27, an updated figure depicting all groundwater wells has been developed utilizing the latest 2013 WSEO data. Operation of these wells will not incur a safety risk or impact hydraulic control of the wellfields during operations. All targeted, overlying, and underlying aquifers will have a monitoring program designed to detect potential excursions of lixiviant for a wellfield during uranium recovery operations and restoration. As noted in SUA-1341 (LC 11.8), Uranium One will include in its annual report to NRC the identification of any new ground water wells or new use of existing wells, where the information is publicly available and/or known to Uranium One. This includes the proposed project area and the area within 2 km.

The proposed project will have an extensive program of wellfield and pipeline flow and pressure monitoring. Injection and recovery flow rates will be monitored at each header house to balance injection and recovery throughout the wellfield. The recovery and injection flow rate in each well will be continuously individually monitored by electronic flow meters in each wellfield header house. The pressure of each recovery and injection trunk line also will be monitored at the header house with electronic pressure gauges. Both flow meter and pressure gauges will tie into the header house control panel that will ultimately tie into the satellite control room. High and low, pressure and/or flow alarms will alert wellfield and plant operators if specified ranges are exceeded. Automatic shutoff valves will stop the flow in the event of significant changes in volume or pressure. This monitoring will alert the operators to detect malfunctions that could lead to either wellfield infrastructure or pipeline failures.

(North Platte Satellite Water Resources)

RAI-29

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The proposed North Platte Satellite is located in the eastern and central portion of the proposed license area in T34N, R73W. Two wellfields are proposed: Wellfield 1 is located south of the satellite facility in Sections 15 and16; and Wellfield 2 is located further southeast of the satellite facility in Section 20. Uranium One stated that the target ore zone of interest is the 70 sand of the Ft. Union formation, but did not indicate whether this sand or other sands would be targeted for extraction in either of the two designated wellfields. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without specification of the exact sands to be targeted for extraction at each wellfield.

Formulation of RAI

Uranium One should identify the overlying aquifer, aquitard, ore zone aquifer, underlying aquitard and underlying aquifers specifically targeted at Wellfields 1 and 2 at the North Platte Satellite. Uranium one should be aware that these ore sands will be the sands in which extraction can occur under this license at the North Platte Satellite. Any extraction in additional wellfields/ore sands will require a license amendment.

RAI-29 Response

See RAI-22 for response to this RAI.

RAI-30

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One did not characterize the surficial (uppermost) aquifer at the proposed North Platte Satellite. Characterization is critical to assess if spills and leaks from surface operations and subsurface piping will contaminate the uppermost aquifer which may be connected to surface water. Staff cannot evaluate or provide reasonable assurance of the safety of operations without characterization of the surficial (uppermost) aquifer.

Formulation of RAI

Uranium One should identify the surficial (uppermost) aquifer(s) under the North Platte Satellite. Provide a map of the depth to the uppermost aquifer(s) at the North Platte Satellite within a 2 km buffer around Wellfields 1 and 2 and the proposed surge ponds. In addition, the TR should discuss any hydraulic connection between the uppermost aquifer(s) with surface water features and the drainages, at the North Platte Satellite.

RAI-30 Response

See RAI-24 for response to this RAI.

RAI-31

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

For the 70 sand aquifer test at LPW-3a, Uranium One provided the water level vs time curves for the pumping well and all of the observation wells for the pumping and recovery periods in Figure 6-17 through 6-21 of Appendix A-2. Uranium One also provided the aquifer test data in electronic form on CD. These plots are useful for a quick check of the well response to pumping and atmospheric conditions; however, the plots were insufficient for the staff to evaluate the aquifer response as the time scale was oddly set as a log scale of the Julian date which repeated for several points instead of the usual log scale in minutes. Uranium One also provided a Cooper Jacob analysis of the recovery data of one observation well, LMP-5 in Appendix A-4. The residual drawdown of greater than one at t/t'= 1 and value of S/S' =0.57 value for this analysis is outside the range considered acceptable for the assumptions inherent to this analysis and may be indicative of a limited aquifer (Driscoll, 1986). The TR did not address this issue. Staff finds that the information provided for the 70 sand aquifer test at LPW-3a is not sufficient to assess the hydrologic characteristics of these aquifers.

Formulation of RAI

Uranium One should provide traditional time drawdown curves on semi-log time scale for all observation wells for the 70 sand aquifer test at North Platte Satellite. Provide recovery curves on semi-log time scale for the pumping well and the observation wells. In addition, analyze all curves for transmissivity and storage coefficient and provide these values. If any boundary effects or leakage are noted, describe and reassess the hydrogeologic characteristics of the 70 sand at the North Platte Satellite.

RAI-31 Response

See RAI-25 for response to this RAI.

RAI-32

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

For the LPW-3a 70 sand aquifer test, overlying well LMO-2a was located in the 100 sand according to TR Addendum 2.7C. The isopach for the North Platte site shows the 80 sand is the overlying aquifer to the 70 sand in this location in Wellfield 1. The overlying well should have been located in the 80 sand, or if missing, the 90 sand, to evaluate the integrity of the overlying shale to the 70 sand ore zone. Uranium One noted that this occurred and stated it was due to a re-evaluation of the screen interval at LMO-2a after the test. The staff cannot conclude that the ore zone is isolated from the overlying aquifer to assure the safety of the operation in the 70 sand.

Formulation of RAI

Uranium One should provide additional evidence, than the pumping test at LPW-3a, that the overlying shale to the 70 sand is sufficient to preclude fluid movement to the overlying aquifers at the North Platte Satellite.

RAI-32 Response

See Appendix A for response to this RAI.

RAI-33

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The North Platte Satellite has two proposed wellfields. Wellfield 1 is located in Section 20 of T34NR73W (Figure 2.7-11), and Wellfield 2 crosses both Sections 15 and 16 of T34NR73W (Figure 2.7-11). Uranium One provided the existing ground water rights for all private wells within a 2 mile buffer of the license area in addendum 2.7-A-1, but did not provide the coordinates of these wells and a map of the North Platte Satellite demonstrating the proximity of these wells to the proposed wellfields.

Formulation of RAI

Uranium One should provide a map at a scale which clearly shows the location of all private wells within 2 km of the proposed North Platte wellfields, and add the coordinates of these wells to the table in Addendum 2.7-A.

RAI-33 Response

See RAI-27 for response to this RAI.

RAI-34

Description of Deficiency

The information provided in TR Addendum 2-7A does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The staff reviewed the Addendum 2-7A for private wells within 2 km of the North Platte wellfields. For Wellfield 1, this includes wells in Sections 8, 9, 10, 11,13,14,15, 16, 17, 21, 22 and 23. For Wellfield 2, this includes wells in Sections 16, 17, 18, 19, 20, 21, 28, 29, and 30. From the table, staff identified two private wells in Section 9, two in Section 15, and one each in Sections 17, 19, 30 and 35. These wells are listed in the following table. The TR provides no information on which aquifer(s) these wells are completed in and their current use. Therefore staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

The staff also searched the WSEO water rights database to verify the wells provided in the Addendum 2-7 A table and identify any additional wells completed within 2 km of the North Platte proposed wellfields. This search uncovered one new well which had been permitted or installed within the 2 km buffer but was not listed in Addendum 2-7 A. This well was a miscellaneous/drilling water well, Gilbert Ditch Unit 34-73 16-1H WW that had been permitted in Section 16. This well may be located in the 70 sand or another targeted ore zone sand and its approved rate could be sufficient to impact hydraulic control of the wellfields. The staff has no information on the current status of these wells. Therefore, the staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Formulation of RAI

Uranium One should provide the status, target aquifer(s), current use and predicted use of the wells which are listed in the above tables, and indicate if any of these wells are completed in the 70 sand or any targeted ore zone aquifers and overlying/underlying aquifers at the North Platte Satellite. Uranium One should discuss if operation of these wells could incur any safety issue for well owners or impact hydraulic control of the wellfields during operations. Uranium One should also provide a commitment to annually update information on private well use and describe any new private wells installed within 2 km of the North Platte Satellite proposed wellfields including their coordinates, completion, type of use and rate until the license is terminated.

RAI-34 Response

See RAI-28 for response to this RAI.

(Peterson Satellite Site Water Resources)

RAI-35

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP (NRC, 2003a).

Basis for Request

Two wellfields are proposed for the Peterson Satellite which is located in the southeastern portion of the proposed license area. Wellfield 1 is located in Sections 27 and 28 of T34N, R73W west of the satellite facility. Wellfield 2 is located in Sections 34, 35, 36 of T34N, R73W south of the satellite facility. Uranium One stated that the target ore zone of interest is the 90 sand of the Ft. Union formation; however, Uranium One did not indicate whether this sand or other sands would be targeted for extraction in either of the two designated wellfields. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without specification of the sands to be targeted for extraction at each wellfield.

Formulation of RAI

Uranium One should separately identify the overlying aquifer, aquitard, ore zone aquifer, underlying aquitard and underlying aquifers specifically targeted at Wellfields 1 and 2 at the Peterson Satellite. Uranium One should be aware that these ore sands will be the sands in which extraction can occur under this license at the Peterson Satellite. Any extraction in additional wellfields/ore sands will require a license amendment.

RAI-35 Response

See RAI-22 for response to this RAI.

RAI-36

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One did not characterize the surficial (uppermost) aquifer at the proposed Peterson Satellite. Characterization is critical to assess if spills and leaks from surface operations and subsurface piping will contaminate the uppermost aquifer which may be connected to surface water. The staff cannot evaluate or provide reasonable assurance of the safety of operations without characterization of the surficial (uppermost) aquifer.

Formulation of RAI

Uranium One should identify the surficial (uppermost) aquifer(s) at the Peterson Satellite, and provide a map of the depth to the uppermost aquifer(s) within a 2 km buffer around Wellfields 1 and 2 and the proposed surge ponds. The TR should discuss any hydraulic connection between the uppermost aquifer(s) with surface water features and the drainages at the Peterson Satellite.

RAI-36 Response

See RAI-24 for response to this RAI.

RAI-37

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR includes an analysis of historical and recent pumping tests for the hydrogeological characterization of the Peterson Satellite ore zone aquifers and their potential connection to overlying and underlying aquifers. The TR states that Enviropshere had conducted two 24 hr tests to evaluate the 90 and 80 sands in 1979. The TR indicates the results may be found in the report, "Hydrologic Analysis, Cell 1 and Cell 2", but does not provide the data or results from these tests. The location of the cells was shown in Figure 2.7-18. The staff is concerned that the 90 sand is unconfined at these locations. Staff cannot evaluate or provide reasonable assurance for the safety of operations at the Peterson Satellite without access to available historical information on behavior of the 90 sand aquifer.

Formulation of RAI

Uranium One should provide available information from the historic pumping tests conducted by Envirosphere at the Peterson Satellite, including the report, "Hydrologic Analysis, Cell 1 and Cell 2."

RAI-37 Response

Uranium One is unable to locate the historic pumping test report developed by Envirosphere. This report was part of the original Peterson Project application and subsequently NRC License SUA-1386. It is Uranium One's understanding the NRC maintains an archive of all past and existing license application and associated reports that will provide this information.

RAI-38

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR stated the 90 sand aquifer is confined at the Peterson Satellite. The report also stated the 90 sand outcrops near the Peterson Satellite and has no overlying aquifer. The staff has determined that monitoring well M-24, which is located in the 90 sand in the eastern part of Wellfield 2, has a water level of 4932 ft according to the completion table in Table 3-1 in Appendix A-1. This water level is below the top of the 90 sand on the cross section F-F provided in Figure 2-14 in Appendix A-2 and is evidence that the 90 sand is unconfined in this location.

In addition, cross section N-N' in Figure 2-16 passes through LMU-3 which is in nearly the same location as the 90 sand pumping test observation wells, LMP6 and LMP7. The top of the 90 sand is at about 4950 feet at LMU-3 according to this cross section. The water levels for LMP6 and LMP7 are reported as 4971 and 4972 ft, respectively for these wells in Table 3-1 in Appendix A-1. These values place the aquifer water levels near the top of 90 sand. Therefore, under pumping the aquifer could reach an unconfined state in these locations. Staff cannot evaluate or provide reasonable assurance for the safety of operations at the Peterson Satellite without accurate characterization of the unconfined/confined conditions in the 90 sand aquifer.

Formulation of RAI

Uranium One should re-evaluate the water levels in all available monitoring wells in Peterson Wellfield 2 to determine if the 90 sand aquifer is unconfined. If the aquifer is found to be unconfined, or likely to behave as an unconfined aquifer under expected pumping conditions (15-45 gpm per expected bleed), Uranium One should provide an updated interpretation of the hydrological characteristics of the aquifer. The updated interpretation should discuss the potential that the aquifer is unconfined on the eastern edge of Wellfield 2 and confined along the western edge and may exhibit dual behavior during pumping tests.

RAI-38 Response

See Appendix A for response to this RAI.

RAI-39

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR provides pumping test data and results from a 2008 pumping test conducted in the 90 sand in the Peterson Satellite. The pumping well, LPW-4 and observation wells, LMP-6 and LMP-7 for the 90 sand were located in proposed Wellfield 2 as shown on application Figure 2.7-22. Only one observation well was located in the underlying 80 sand next to the pumping well. The TR indicates there was no overlying monitoring well as there is no overlying aquifer in the location. Two ore zone aquifer observation wells, LMP-6 and LMP-7 were located in the 90 sand at 334 and 228 ft, respectively, from the pumping well. For the 90 sand aquifer test at LPW-4, the TR provides the water level vs time curves for the pumping wells and all of the observation wells for the pumping and recovery periods in Figures 6-22 through 6-25 of Appendix A-2. These plots are useful for a quick check of the well response to pumping and atmospheric conditions; however, the plots are insufficient for staff to evaluate the aquifer response as the time scale was oddly set as a log scale of the Julian date which repeated for several points instead of the usual log scale in minutes.

The TR provides a Cooper Jacob analysis of the recovery data of one observation well, LMP-7, in Appendix A-4. The value is substantially lower than the transmissivity reported in the 90 sand at the Leuenberger Satellite, 94.85 vs 18.11 ft2/day. The staff is concerned with the analysis and results of this aquifer test for several reasons. The recovery plot analysis of LMP-7 in Appendix A-4 shows a large t/t' at zero drawdown and an S/S' =1.34. Both of these values are outside the range considered acceptable for the assumptions inherent to this analysis. These values are indicative of an aquifer with a varying storage coefficient which may indicate the aquifer is unconfined (Driscoll, 1986). The staff evaluated the recovery water level data provided by Uranium One for both the pumping well and the LMP-7 monitoring well. Staff's analysis indicates that the curves show evidence of the delayed yield expected in an unconfined aquifer in the recovery. Finally, the test was conducted at rate of 8.9 gpm, which is half the aquifer test rate at the other satellites. The staff is concerned that Uranium One used this lower rate to avoid drawdown which would dewater the 90 sand aquifer. The Staff finds the information provided is not sufficient to review the 90 sand aquifer test at LPW-4 at the Peterson

Satellite. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without an evaluation of unconfined aquifer behavior in the 90 sand at the Peterson Satellite.

Formulation of RAI
Uranium One should:

- *Provide traditional time drawdown curves on semi-log time scale for all observation wells;*
- *Provide recovery curves on semi-log time scale for the pumping well and the observation wells;*
- *Analyze all curves for unconfined aquifer behavior;*
- *Provide transmissivity, specific yield and storage coefficient values from the analysis for all wells; and*
- *Describe and reassess the hydrogeologic characteristics of the 90 sand at the Peterson Satellite, if unconfined behavior is demonstrated.*

RAI-39 Response

See Appendix A for response to this RAI.

RAI-40

Description of Deficiency

The information provided in TR Addendum 2.7-A-1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The Peterson Satellite has two proposed wellfields. Wellfield 1 crosses both Sections 27 and 28 of T34NR73W (Figure 2.7-11), and Wellfield 2 is located in Sections 34, 35 and 36 of T34NR73W (Figure 2.7-11). Addendum 2.7-A-1 provides the existing ground water rights for all private wells within a 2 mile buffer of the license area. However, Uranium One did not provide the coordinates of these wells and a map at the scale of within 2 km of the Peterson Satellite demonstrating the proximity of these wells to the proposed wellfields. Without a map and well coordinates, the staff is unable to evaluate any public safety concerns.

Formulation of RAI

Uranium One should provide a map at a scale which clearly shows the location of all private wells within 2 km of the proposed Peterson wellfields and provide the coordinates of these wells in Addendum 2.7-A.

RAI-40 Response

See RAI-27 for response to this RAI.

RAI-41

Description of Deficiency

The information provided in TR Addendum 2-7A does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Addendum 2-7A identifies wells within 2 km of the Peterson Wellfields. For Wellfield 1 this includes wells in Sections 20, 21, 22, 23, 26, 27, 28, 29, 32, 33, and 34 of T34R73W. For Wellfield 2 this includes wells in Section 25 of T34R73W, Sections 30, and 31 of T34R72W, Sections 1, 2, 3, 4, 10, 11, and 12 of T33 R73, and Section 6 of T33R72. Staff identified numerous private wells within 2 km of the wellfields. These wells are listed in the following table. Addendum 2-7A provides no information on which aquifer(s) these wells are completed in and their current use. Therefore, staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Formulation of RAI

Uranium One should; provide the status, target aquifer(s), current use and predicted use of the wells which are listed in the above tables, and determine if any of these wells are completed in the 90 sand or any targeted ore zone aquifers or underlying/overlying aquifers at Peterson Satellite. If yes, Uranium One should determine if operation of those wells could incur any safety issue for well owners or impact hydraulic control of the wellfields during operations.

Uranium One should provide a commitment to annually update information on private well use and describe any new private wells installed within 2 km of the Peterson Satellite proposed wellfields including their coordinates, completion, type of use and rate until the license is terminated.

RAI-41 Response

See RAI-28 for response to this RAI.

RAI-42

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

On November 13, 2001, the Supreme Court of the United States issued the Modified North Platte River Decree which addressed water use from the North Platte River. In this decree, portions of the North Platte watershed are identified as hydrologically connected to the North Platte River. Within these regions surface water and ground water use for irrigation and other purposes is strictly controlled by a court order. Staff's review of the regional map (https://sites.google.com/a/wyo.gov/seo/documents-data/maps-and-spatial-data) for hydrologically connected areas near the North Platte River showed that the Peterson Satellite is located within the hydrologically connected region. Therefore all water use at this satellite, whether surface or ground water, must be approved by WSEO to meet the requirements of the decree. Any evaporation or surge ponds must also meet the terms of the decree. The TR does not include a discussion of the decree in its characterization of ground water or surface water or the implications for the safety of operations at the Peterson Satellite if water use is limited or restricted. Staff cannot provide reasonable assurance of the safety of operations without this information.

Formulation of RAI

Uranium One should provide:

A. *A description of the Modified North Platte River Decree and implications for water use at Peterson Satellite;*
B. *Assurance that the water use required for production and restoration at the Peterson Satellite will be evaluated and approved as required under these orders. This water use includes wells and all surge /evaporation ponds; and*
C. *A commitment that if any changes to the wellfield design, ponds, or water use are incurred by the WSEO under this order before operations begin or during operations, Uranium One must inform NRC, so that a safety evaluation of these modifications may be made.*

RAI-42 (A) (B) (C) Response

Uranium One is currently in discussions with the WSEO regarding the proposed project operations in respect to the potential water use restrictions in the Peterson area. Uranium One will address the potential implications of the decree once there is conclusive information available.

RAI-43

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One took one measurement of ground water quality from a network of 12 stock wells within the proposed license area. The locations of the stock wells are shown in Figure 2.7-26. The TR states there is no completion information for the stock wells. Staff cannot assign the water quality of these wells to a specific aquifer without this information and therefore cannot evaluate the safety of the use of these stock wells within 2 km of the proposed wellfields without knowledge of their completion interval.

Formulation of RAI

Uranium One should:

- *Assess the depth and assign aquifer(s) to the twelve stock wells shown in Figure 2.7-26; and*
- *Determine if any of the ground water rights within the license area are associated with these stock wells.*

RAI-43 Response

The following language and associated table have been added to TR Sec. 2.7 and ER Sec. 3.4:

"There is limited completion information regarding construction details for the stock wells. This limited information is a result of WSEO permit locations being based on quarter-quarter sections rather than specific GPS data. Thus not all stock wells could be matched to permits. Uranium One was unable to assign aquifers to the individual wells due to the lack of well construction data and screened intervals. To gain access to the stock wells to determine screen intervals is not possible without the removal of existing piping and construction materials (e.g. wind mills and pumps). The known information is shown in the following table."

Table 5: Stock Well Completion Information

Project Well ID	Well Name	Form ID*	Permit #	Location	Estimated Depth (ft)	Static Water Level (ft)	Amount (gpm)	Water Use
SW-4	Smith No. 44	UW 5	UW8613	Lat: 42.95221 Long: -105.6115	256	125	5	Stock
SW-8	Smith No. 44	UW 7	UW4987	T34N R74W Sec. 12 NENE	150	70	10	Stock
SW-10	Lisco No. 3	Permit Summary	P77601.0W	Lat: 42.87607 Long: -105.6015	340	128	15	Stock
SW-11	PN5 L300	Permit Summary	P45751.0W	T34N R74W Sec. 14 NENW	28	14.5	20	Misc.
SW-12	Smith No. 5	UW 7	UW4988	T34N R74W Sec. 14 NWSW	145	60	10	Stock
SW-14	Water Well No. 1	Permit Summary	P60274.0W	T34N R73W Sec. 15 NENW	250	100	5	Misc.
SW-16	Lake Pasture No. 1	Permit Summary	P96396.0W	Lat: 42.90885 Long: -105.5621	50	26	5	Stock
SW-15	Smith No. 9	UW 7	UW4990	Lat: 42.44484 Long: -105.6555	90	50	8	Stock

* UW 5: application for permit; UW 7: completion report

Source: WSEO

RAI-44

Description of Deficiency

The information provided in TR Section 2.7.3.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The water quality from stock well SW-12 shows anomalous values for cations, anions, and radionuclides compared to the averages for these wells. SW-12 is located in the Leuenberger Satellite as shown in Figure 2.7-26. Staff does not know the depth of SW-12. Another RAI addressed anomalous values in the surface water quality near this location in Little Sand Creek which may be hydraulically connected to the uppermost aquifer. Based on this information, staff cannot conclude that the water quality in the uppermost aquifer has been characterized.

Formulation of RAI

Uranium one should provide additional information on the water quality in the surficial (uppermost) aquifer at the Leuenberger Satellite.

RAI-44 Response

See RAI-24 for response to this RAI.

RAI-45

Description of Deficiency

The information provided in TR Section 2.7.3.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR described the ground water quality monitoring for the aquifers in the proposed license area in Section 2.7.3.2. Ground water samples were collected quarterly from the majority of 41 monitoring wells within the license area sites in 2008. The locations of the monitoring wells were presented in Figure 2.7-25. The ground water quality in the license area showed spatial trends in the dominant ion types of water present, which varied with depth from the surface and distance from the sand outcrops in the southeastern part of the license area. Several of the aquifers are close to the ground surface, especially at the Peterson Satellite, where the 90 sand ore zone aquifer is also the uppermost aquifer. Given the proximity of many of the aquifers to the surface, the water quality may experience seasonal/temporal variation. Uranium One did not evaluate if any seasonal/temporal variation existed in the ground water quality data. Staff cannot conclude that there is no temporal variation without this analysis.

Formulation of RAI

Uranium One should provide an evaluation of any temporal variation the ground water quality in the aquifer(s) in the license area using the available water quality data from the monitoring wells. If any trends are seen, Uranium One should discuss them and any implications for operations or monitoring of water quality during operations.

RAI-45 Response

The following language and figure have been inserted into TR Section 2.7 and ER Section 3.4:

"Uranium One conducted an analysis of groundwater quality for the Ludeman site, based upon groundwater quality sampling conducted in 2008 and 2009. Twelve (12) groundwater quality monitoring wells were selected across the site in order to provide spatial coverage of the site. The wells were selected on the basis of providing seasonal and temporal groundwater quality data trends with respect to generalized up-gradient, down-gradient and side-gradient groundwater flow vectors for the site. The selected wells

are completed in the primary aquifers that are being evaluated for uranium recovery consisting of the 70, 80, and 90 Sands. These wells include the following:

- **Up-gradient** (western region of the site) – M2 (90 Sand), M8 (80 Sand), M14 (70 Sand);
- **Down-gradient** (eastern region of the site) – M24 (90 Sand), M12 (80 Sand), M23 (70 Sand);
- **Side-gradient** (northern region of the site) – M4 (90 Sand), M5 (80 Sand), M11 (70 Sand);
- **Side-gradient** (southern region of the site) – M24 (90 Sand), M19 (80 Sand), M21 (70 Sand).

Note: Groundwater monitoring well M24 was selected for both down-gradient and side-gradient groundwater quality analysis, as this was the only groundwater monitoring well available in these locations that was completed in the 90 Sand.

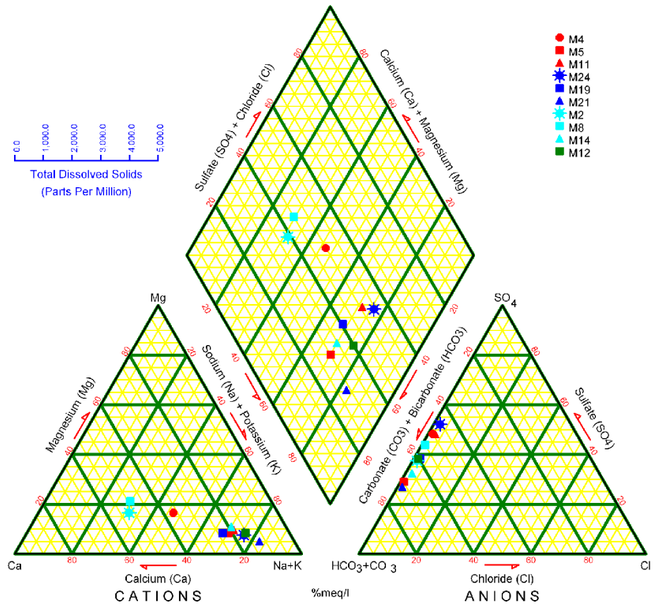
Groundwater quality data was plotted onto Piper trilinear diagrams (shown below) for Spring, Summer, Fall/Winter 2008 and Winter/Spring 2009, providing four consecutive quarters of groundwater quality monitoring. Groundwater quality analysis included the following major cations and anions: Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Bicarbonate (HCO_3), Carbonate (CO_3), Sulfate (SO_4), Iron (Fe), Copper (Cu), Aluminum (Al), Manganese (Mn), Silica (SiO_2), Nitrogen (NO_3 as Nitrate and Nitrite).

Analysis of the groundwater quality data shows no significant seasonal or temporal variation in groundwater quality trends. This trend is expected due to the depth of the aquifer systems (300+ feet) and the relatively long time periods required to recharge these aquifer systems in the form of infiltration from low annual precipitation volumes received in this region of Wyoming. The groundwater quality analysis reveals that there is a minor spatial variation in groundwater quality for the 90 and 80 Sands with respect to the north/northwestern regions of the site. As seen on the Piper trilinear diagrams, groundwater monitoring wells M2, M4, and M8 trend towards neutral with respect to sodium/calcium/potassium cation type, to slightly calcium type (M8), when compared to all the remaining groundwater monitoring wells included in this analysis, which are dominantly sodium or potassium type. Further geochemical analysis of the composition for the aquifer materials and cements would be necessary to account for this localized

variation. In addition, all the groundwater monitoring wells included in this analysis plot as bicarbonate anion type, except M24, which is slightly sulfate anion type."

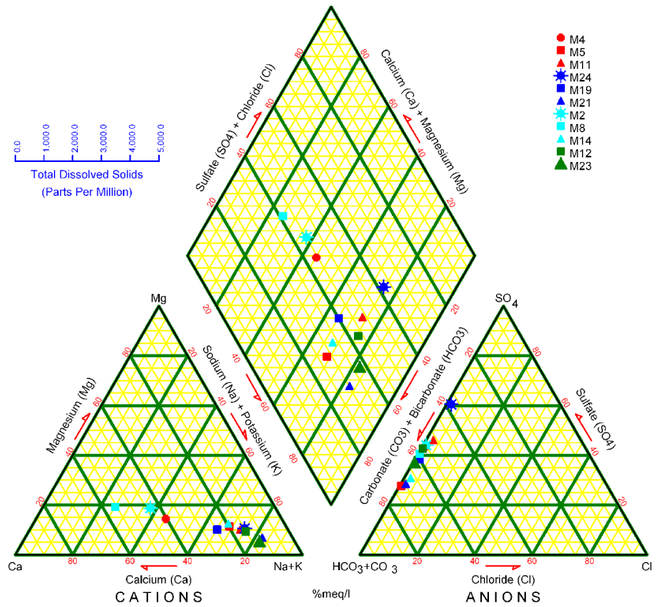
Piper Diagram

Ludeman Project Site - Spring 2008



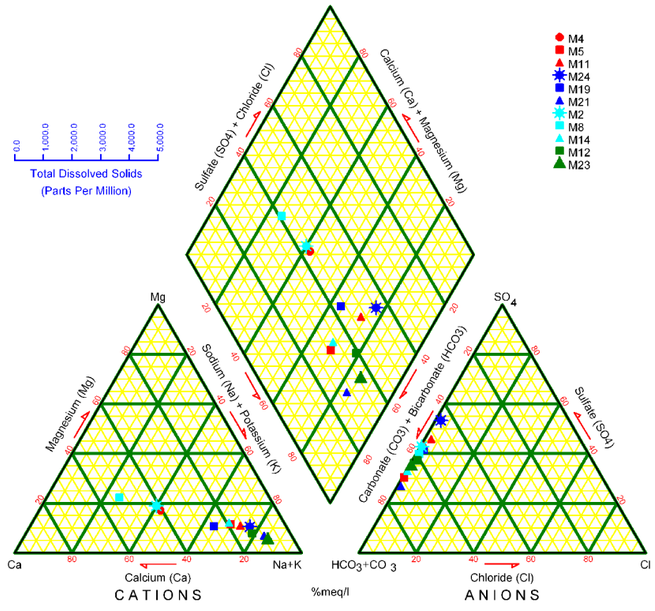
Piper Diagram

Ludeman Project Site - Summer 2008



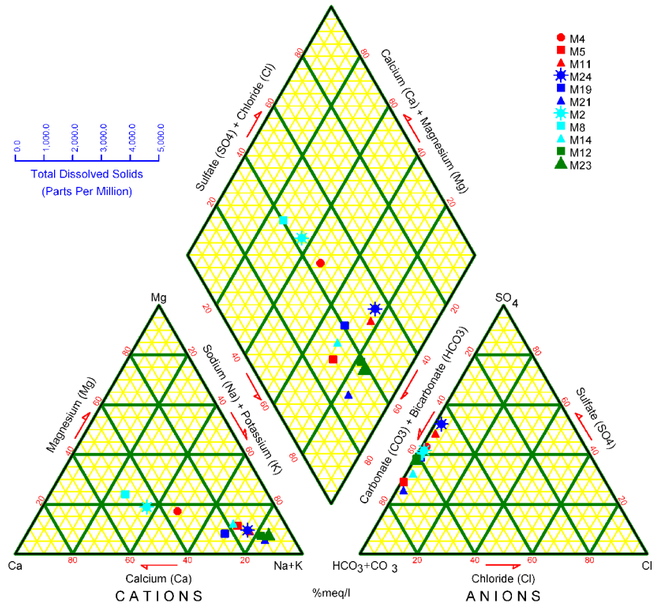
Piper Diagram

Ludeman Project Site - Fall 2008



Piper Diagram

Ludeman Project Site - Winter 2008 2009



Path: O:\WY_Projects\8201-2013-102_Infrastructure\Project_MXD\Ludeman_Seasonal_GW_Quality_Data.mxd

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Seasonal and Temporal Groundwater Quality Data

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	EGS	6/17/13	14
1	For Submittal	RMD	6/20/13	

RAI-46

Description of Deficiency

The information provided in the TR Section 2.9.4.1 is not consistent with SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the on-site environmental monitoring program should be designed in accordance with Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). The regulatory guide states that at each location, several sediment samples should be collected in a traverse across the body of water and composited for analysis. Uranium One only collected a single sample at each surface water site according to the description in TR Section 2.9.4.1 and Figure 2.9-37.

Formulation of RAI

Provide justification or rationale for not collecting any sediment samples in a traverse across any bodies of water as recommended in Regulatory Guide 4.14.

RAI-46 Response

The appropriateness of composite sampling is dependent upon the sampling objectives and the site characteristics. The ephemeral streams located in the proposed project area have narrow channels thus the width/length of most surface water sampling locations are only a few feet across. It is Uranium One's opinion the sampling protocol utilized is adequate to establish baseline data. Although Regulatory Guide 4.14 recommends several sediment samples should be collected in a traverse across the site, it does not recommend an interval. Uranium One respectfully reminds the reviewer Regulatory Guide 4.14 is to provide guidance/recommendations and should be treated as such.

RAI-47

Description of Deficiency

The information provided in TR Section 2.9.4.1 does not meet SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the monitoring programs to establish background radiological characteristics, including sampling frequency, sampling methods, and sampling location and density should be established in accordance with pre-operational monitoring guidance provided in Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). The regulatory guide states that for sediments collected from surface water passing through the site, sediment should be sampled upstream and downstream of the site. Samples should be collected following spring runoff and in late summer, preferably following an extended period of low flow. In each location, several sediment samples should be collected in a traverse across the body of water and composited for analysis.

It is not clear from the text in TR Section 2.9.4.1 that Uranium One followed the protocols described in Regulatory Guide 4.14.

Formulation of RAI

Uranium One should collect an additional set of samples up and downstream from the site in streams that flow through the site or identify which samples described in TR Section 2.9.4 are the upstream and downstream samples. The samples should be collected in a traverse across the body of water as recommended in Regulatory Guide 4.14.

RAI-47 Response

Consistent with previous applicant sampling methodologies, Uranium One collected single samples because there was insufficient rainfall or snowmelt to warrant a second sampling event thus surface water was ephemeral and did not indicate variability in water levels. The streams remained dry between sampling periods in the same year and therefore, would not result in transport of radionuclides in surface water that would have been absorbed or precipitated into sediments.

RAI-48

Description of Deficiency

The information provided in the TR Section 2.9.4 is not consistent with SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the applicant should design the on-site program in accordance with Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). TR Section 2.9.4 is not consistent with information from other applicants reviewed by the staff. Uranium One states that differences in measured sediment radionuclide concentrations between the two seasons submitted in other applications have been observed to be similar within normal sampling and analytical variability. Uranium One references two of its previous license applications for Moore Ranch and the Antelope and JAB Uranium Projects, but did not provide the statistics to support its argument. The staff finds that other applicants collected single samples because there was insufficient rainfall or snowmelt to warrant a second sampling event or surface water was ephemeral and did not indicate variability in water levels. The streams remained dry between sampling periods in the same year and therefore, would not result in transport of radionuclides in surface water that would have been absorbed or precipitated into sediments. Uranium One's rationale that sediment sampling at other ISR sites in the region show that measured differences in sediment radionuclide concentrations between runoff season (spring) and low-flow (fall) hydrologic conditions are very similar, is not sufficient justification for not following the regulatory guidance nor is it consistent with information that the staff has reviewed. Additionally, site specific data is needed to comply with 10 CFR 40, Appendix A, Criterion 7.

Formulation of RAI

Uranium One should collect a second set of samples to comply with the guidance in Regulatory Guide 4.14 or provide the statistical data that supports its position that a second set of samples within the same calendar year are not warranted as recommended in Regulatory Guide 4.14

RAI-48 Response

See RAI-47 for response to this RAI.

RAI-49

Description of Deficiency

The information provided in TR Section 2.9.11 is not consistent with SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the applicant should design the on-site program in accordance with Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). The regulatory guide states that the applicant should collect at least three food samples at time of harvest or slaughter or removal of animals from grazing within three km of the mill site, and that the applicant should collect fish samples semiannually from any bodies of water that may be affected by potentially contaminated areas. Section 2.9.11 of the TR states that no food sampling is planned because the applicant does not expect food to be in the exposure pathway to man. This justification is not acceptable and does not establish baseline conditions required by 10 CFR 40, Appendix A, Criterion 7 that requires the preoperational monitoring program establishing background concentrations in environmental media be conducted at least one-full year prior to any major site construction.

Formulation of RAI

Uranium One should provide fish and food samples as described in Regulatory Guide 4.14.

RAI-49 Response

Uranium One concludes from its preoperational vegetation sampling program and through MILDOS modeling that the ingestion pathway for radiological dose is not significant. Therefore, Uranium One does not intend to conduct vegetation, food, or fish sampling because the predicted dose to an individual from these pathways will be less than five percent of the applicable radiation protection standard. No fish species occur within the proposed project area since surface water is ephemeral in nature and does not have sufficient volume to support fish.

This is consistent with the Final Environmental Impact Statement for the Nichols Ranch ISR Project and the license issued by the NRC (SUA-1597). In fact, the Ludeman

Project's potential to influence these pathways is less than the Nichols Ranch Project as the proposed project will not have dryer on-site; thus, no yellowcake on site.

Description of Proposed Facility

RAI-50

Description of Deficiency

The information provided in TR Section 3.1 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.1 states that mineralization in the proposed license area is located in the 50, 60, 70, 80, 90 and 100 sands. TR Figure 3-1 shows numerous defined and potential roll fronts. Uranium One stated it will continue delineation in the license area to define future wellfield patterns. Uranium One has only proposed to extract uranium within certain wellfields and has been unclear about which mineral zones are targeted within those wellfields. Staff cannot provide reasonable assurance of the safety of operations without a clear definition of the specific mineralized zones targeted for extraction at each proposed satellite in this licensing action.

Formulation of RAI

Uranium One should provide a clear declaration of which ore zones will be targeted for extraction at each specific wellfield at the Leuenberger, North Platte and Peterson Satellites. Staff notes that new wellfields and operations in ore zones other than those specifically stated and reviewed for this application must be approved with a license amendment.

RAI-50 Response

See RAI-22 for response to this RAI.

RAI-51

Description of Deficiency

The information provided in TR Section 3.1.3 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.3.4 states that, after installation, all wells will undergo a MIT before being placed into operation. Staff recommends that all wells should undergo a MIT before any use that is regulated or undertaken to meet a regulatory standard, including ground water sampling.

Formulation of RAI

Uranium One should revise the TR to state that the integrity of all wells will be verified by MIT before any use that is regulated or undertaken to meet a regulatory standard, including baseline water quality sampling.

RAI-51 Response

Uranium One understands that Section 3.1.3(2)(b) of the SRP only requests MIT testing of injection and production wells. Similar language is found in WDEQ Guideline 4 (Reference Document 8). Uranium One is unable to locate language stating MITs are required before any use (such as monitor wells) that is regulated or undertaken to meet a regulatory standard including baseline water quality sampling.

The following language was added to TR Section 3.1.3.4:

"Prior to being placed into any use that is regulated or undertaken to meet a regulatory standard, and after well completion, the integrity of the injection/recovery wells will be verified by a pressure based mechanical integrity test. If Uranium One decides to convert a monitor well to an injection/recovery well then that well will undergo MIT testing prior to use."

RAI-52

Description of Deficiency

The information provided in TR Section 3.1.3 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.3.4 states that MITs will be performed on wells every five years after they are placed in service and after any workovers or suspected surface or subsurface damage. If a well fails the MIT it will be repaired or plugged and abandoned. Uranium One does not commit to evaluate the failure or potential contamination of any non-exempt aquifer as a consequence of the MIT failure of injection or extraction wells which have been in operation.

Formulation of RAI

Uranium One should provide a commitment to that if a well fails an MIT after being in service as a production or extraction well, Uranium One will assess the cause of the failure and evaluate if the well failure may have released fluids to a nonexempt aquifer.

RAI-52 Response

The following language was added to TR Section 3.1.3.4:

"If any production or injection well fails an MIT, Uranium One commits to assess the cause of the failure and evaluate if the well failure may have released fluids to a nonexempt aquifer."

RAI-53

Description of Deficiency

The information provided in TR Section 3.1.4 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.4.1 provides the lixiviant composition in Table 3.1. However, the table did not include the expected oxygen content in lixiviant. Staff needs the expected concentration of oxygen to assess if Uranium One will be able to maintain oxygen in solution during extraction operations in wellfields which have low potentiometric head or an unconfined aquifer (e.g. Peterson Satellite Wellfield 2). The release of oxygen from solution can lead to "gas lock" in the ore zone which can impact hydraulic control by reducing well injectivity and aquifer hydraulic conductivity unpredictably. Free gas can also lead to damage in pipes, pumps and other infrastructure which has not been designed to handle two phase flow of water and gas. Staff cannot provide reasonable assurance of the safe operation of the wellfields and wellfield infrastructure without information on the oxygen concentration and a determination if it will stay in solution during operations.

Formulation of RAI

Uranium One should provide the expected concentration of oxygen in the lixiviant to the composition in Table 3.1. The TR should discuss if these concentrations will remain in solution at all satellite wellfields and in wellfield infrastructure during operations. In addition, the TR should address if hydrogen peroxide is to be used in the lixiviant as it can also lead to the evolution of free oxygen gas in the ore zone aquifer.

RAI-53 Response

Uranium One will add the expected concentration of oxygen into Table 3.1 "Typical Lixiviant Concentrations" as follows:

Table 6: Typical Lixiviant Concentrations

SPECIES	RANGE (mg/L)	
	Low	High
Na	≤ 400	6000
Ca	≤ 20	500
Mg	≤ 3	100
K	≤ 15	300
CO_3	≤ 0.5	2500
HCO_3	≤ 400	5000
Cl	≤ 200	5000
SO_4	≤ 400	5000
U_3O_8	≤ 0.01	500
V_2O_5	≤ 0.01	100
TDS	≤ 1650	12000
pH	< 6.0	8.0
O_2	300	500

* All values in mg/l except pH (units).

NOTE: The above values represent the concentration ranges that could be found in barren lixiviant or pregnant lixiviant and would include the concentration normally found in “injection fluid”.

Uranium One has added the following text to Section 3.1.3.1 of the TR to address concerns on "gas locking":

"During the uranium recovery process phase, avoidance of potential "gas locking" as a result of dissolved oxygen evolving out of the solution is an operational goal. By design, ISR well fields are completed with the intent of focusing lixiviant flow on the uranium bearing portions of the reservoir. Redirection of lixiviant flow into other, barren portions of the reservoir because of gas locking or any other means results in a dilution of the uranium content of the recovered lixiviant and is inherently inefficient. As a result, prevention of gas locking is an ongoing operational objective. The occurrence of a partial or complete gas lock at or near an injection well will be readily apparent as the subject well will display a marked or total loss of injectivity. This loss of injectivity will develop in a matter of hours, or at most, a matter of a few days. Operational personnel will observe a significant reduction in the injection or flow capacity of the well at the normal or even maximum allowable well head injection pressure. Normal remedial action involves removal of the well from operations service. Qualified personnel then install a submersible pump, and subsequently back-flow the well to stimulate the movement of any gas block back into the subject well. Here the gas phase escapes from the reservoir in the form of two-phase flow via the submersible pump and associated piping. These fluids will be routed either to the production lixiviate gathering system or to the wastewater disposal system. Oxygen is readily soluble in aqueous fluids up to its solubility limit. As fluid is "back-flowed" to the subject well, unsaturated waters are effectively pushing the gas phase as oxygen re-dissolves into the unsaturated fluids.

These same two phenomena occur during the ground water restoration (GWR) phase. In addition, during GWR the oxygen content of circulating waters is deliberately reduced and minimized to halt the oxidation and, hence, mobilization of uranium and other metals. The movement of these highly undersaturated (with respect to oxygen) waters throughout the reservoir provides the means for removing any residual oxygen gas phase from portions of the reservoir by again pushing such gas pockets toward recovery wells while at the same time absorbing portions of the gas phase into the liquid phase. Since several pore volumes of undersaturated waters are required during GWR, any residual gas blockage is removed. Chemical analysis of production waters during and at the conclusion of GWR is employed to confirm the removal of any elevated concentrations of metals and common ions.

Uranium One would like to retain the option of utilizing hydrogen peroxide as an oxidant but would anticipate oxygen would be the primary oxidant utilized."

RAI-54

Description of Deficiency

The information provided in TR Section 3.1.5 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

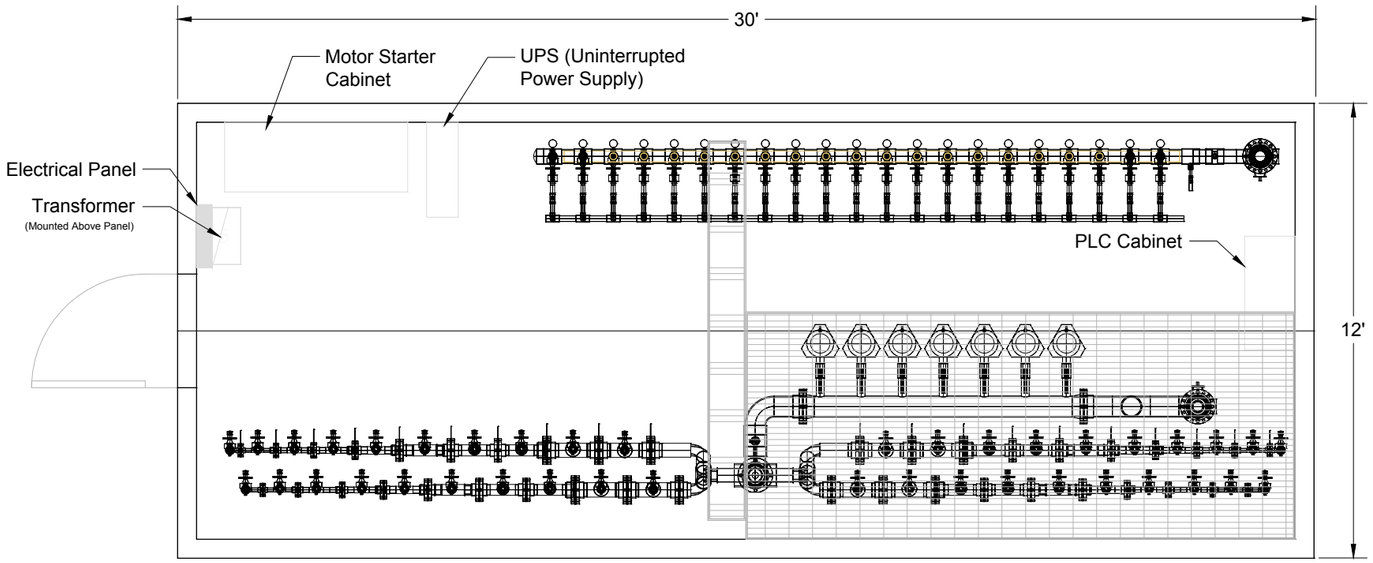
TR Section 3.1.5 states that the wellfields will be composed of header houses and pipelines which will service the injection/recovery wellfields. The TR does not provide a schematic of the header house design.

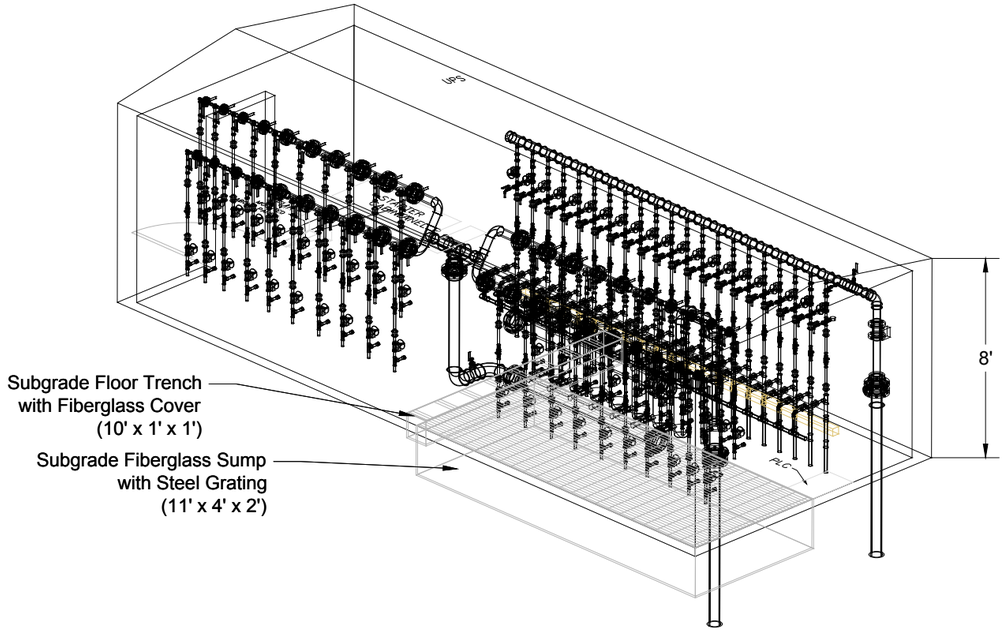
Formulation of RAI

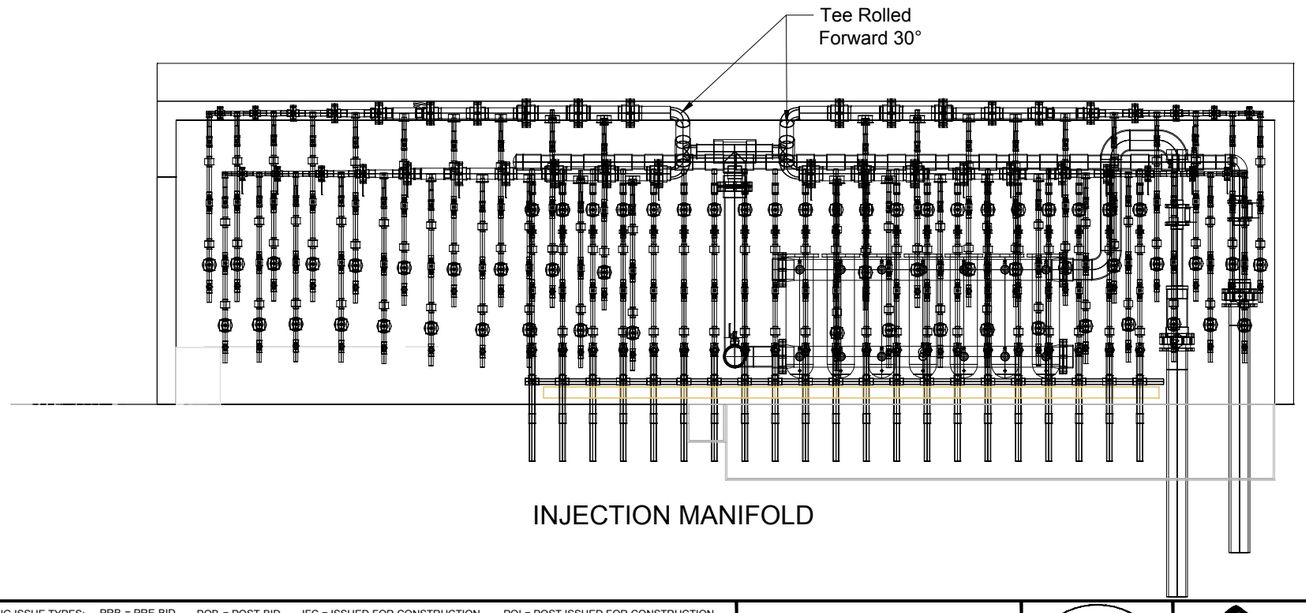
Uranium One should provide a schematic of the header house design.

RAI-54 Response

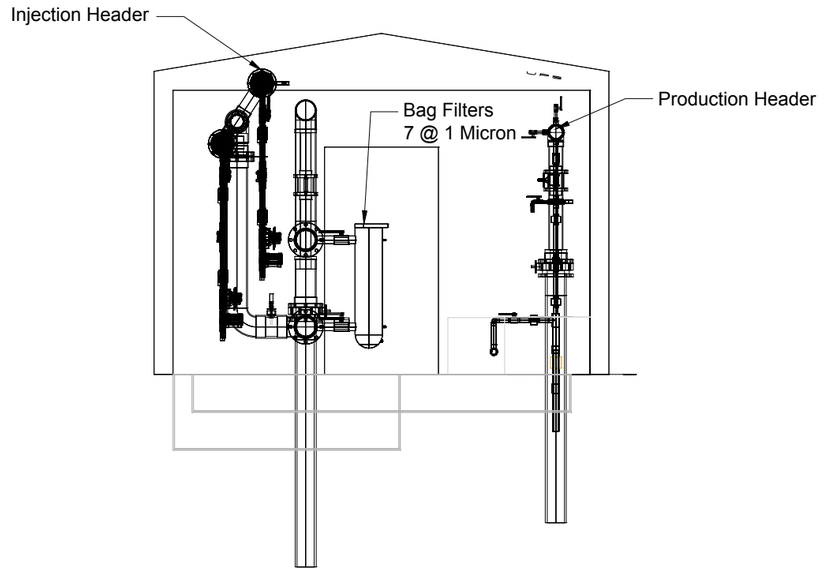
The schematic of the typical header house design shown below has been be added to TR Section 3:







INJECTION MANIFOLD



DRAWING ISSUE TYPES: PRB = PRE-BID POB = POST-BID IFC = ISSUED FOR CONSTRUCTION POI = POST ISSUED FOR CONSTRUCTION

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8201-2013-100	AJE	----	----	06-13-2013

WELLFIELD STRUCTURES
HEADER HOUSE DESIGN
LUDEMAN ISR PROJECT
CONVERSE COUNTY, WY

FIGURE
15

DRAWING: Z:\CURRENT PROJECTS\8201 URANIUM ONE\8201-2013-100 LUDEMAN RAIS\020-CAD\FIGURES\2013-100 HEADERHOUSE-DESIGN.DWG

RAI-55

Description of Deficiency

The information provided in TR Section 3.1.6 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.6 provides a general discussion of the formation fracture pressure for the proposed license area. This information is not sufficient for staff to provide reasonable assurance that Uranium One will operate the injection and extraction wells below their specific formation fracture pressures at all times in the variable conditions expected at the proposed wellfields.

Formulation of RAI

Uranium One should provide an estimate of the formation fracture pressure for each proposed wellfield at the Leuenberger, North Platte and Peterson Satellites. In addition, Uranium One should provide a commitment to maintain injection pressure at a specific value based on the maximum allowable for the main trunk line into each header house.

RAI-55 Response

The following formation fracture discussion has been inserted into TR Section 3.1.6:

"Downhole injection pressures will be maintained below the formation fracture pressure. The formation fracture pressure gradient commonly used is 1.0 psi for every foot of depth to the top of the screened interval. At the Ludeman Project, the depth to the top of the anticipated screened interval varies from approximately 300 to 600 feet in the western portion, to 200 to 400 feet in southeast portion of the project area. Pressures vary according to the depth of ore. Injection pressures will range from 100 psi at the header houses located in shallower ore (90 sand) areas to no greater than 150 psi at the header houses located in the deeper ore (60 sand) areas. Using the average ore depths discussed in Section 3.4, the average injection pressure is determined to be approximately 116 psi. Well casing integrity will be tested at 150 psi plus a 20% engineering factor, or 180 psi."

RAI-56

Description of Deficiency

The information provided in TR Section 3.1.6 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.6.1 provides the ROI for the 90 sand, 80 sand, and 70 sand as 550 ft, 500 ft, and 750 ft, respectively, based on the aquifer pumping tests. The TR also states there would be no impact to groundwater levels outside the project boundaries based on these estimates for the proposed bleed rate (15-45 gpm). These ROI were derived based on observations during the aquifer testing of these sands but the TR provided no calculations to support these numbers. Staff does not agree with Uranium One's definition of ROI. In practice, the ROI is defined by a function of transmissivity (T), time (t) and storage coefficient (S) in consistent units (Bear, 1979).

$$ROI=1.5*\sqrt{(Tt/S)}$$

Staff requires the ROI and drawdown which will be realized at each satellite to assess the impacts of consumptive use on surrounding private wells and to provide reasonable assurance of the safe operation of the satellites.

Formulation of RAI

Uranium One should provide: (a) the ROI using the estimated T, S and the time of production and restoration for each satellite wellfield; and (b) a prediction of the drawdown for each satellite wellfield within 2 km for each phase of operation using the appropriate consumptive use (e.g. 15-45 gpm).

RAI-56 Response

See Appendix B for response to this RAI.

RAI-57

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

In Addendum 2.7-F, Uranium One states that the Negley Subdivision has numerous domestic and stock wells located in the 120, 110 and 100 sands but none in the 90 or 80 ore zone sands. The closest of these private wells are within 1000 ft of the Leuenberger Wellfields. The 120, 110 and 100 sands are the overlying and uppermost aquifers at the Leuenberger Satellite Wellfields. These sands may experience contamination from spills, leaks or excursions from ISR operations which may go undetected. The TR reports the combined pumping rates for Negley domestic wells in the 100 and 110 sands was 5.61 gpm, and 2.1 gpm in the 120 sand. However, the TR did not include the rates for the stock wells in these sands which make the combined rates be substantially higher. The staff is concerned that the combined pumping rates of all domestic and stock wells may be sufficient to move any contamination in the 100, 110 and 120 sands from the Leuenberger Wellfields toward the Negley wells during the proposed operations. Uranium One did not assess the potential for such contamination to move toward the Negley wells in response to the ground water flow field created by the use of all domestic and stock wells in the Negley Subdivision. Staff cannot provide reasonable assurance of the safe operation of the Negley wells without an assessment of the potential for groundwater contamination to be drawn to the wells by the groundwater flow field created by the operations of all Negley wells. Additionally, staff cannot provide reasonable assurance that the Negley Subdivision wells will be protected from undetected contamination from the Leuenberger Satellite operations without a guard well monitoring strategy.

Formulation of RAI

Uranium One should evaluate and provide: (A) the ground water flow direction and magnitude in the 120, 110 and 100 sands created by all of the Negley wells combined while operating at (1) their permitted rates, and (2) their reported rates over the life of the Leuenberger Satellite operations (2014-2023); (B) an estimate of the time of travel of any contamination from spills, leaks or excursions into these sands at the Leuenberger facility to reach any well at the Negley Subdivision using these two separate ground water flow field scenarios. Uranium One is encouraged to determine the time of travel

using a worst case scenario for a spill, leak or excursion into the 120, 110 or 100 sands near the northern edge of Leuenberger Wellfield 1; (C) based on these groundwater flow field scenarios, provide a monitoring guard well strategy to detect the movement of any contamination from leaks, spills or excursions in the 120, 110 or 100 sands at the Leuenberger Satellite toward the Negley Subdivision wells. This guard well strategy is to be proposed in addition to the typical excursion monitoring of the overlying aquifers in the 100 and 110 sands.

RAI-57 (A) (B) (C) Response

In addition to the typical excursion monitoring, Uranium One commits to developing a monitor network to detect the potential movement of any contamination from leaks, spills, or excursions that could impact Negley Subdivision wells. Uranium One requests to have further discussions with the NRC to implement a strategy on the development of the monitoring network.

RAI-58

Description of Deficiency

The information provided in TR Section 3.1.1 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.1 states that all production aquifers in the 90, 80 and 70 sands within the proposed license area are confined. However, staff has evaluated the characterization data presented for the 90 sand aquifer at Peterson Wellfield 2, and finds evidence that this aquifer is unconfined based on water levels and the aquifer pumping test at LPW-4.

Formulation of RAI

Please address the following topics with respect to operations at Peterson Wellfield 2 and any other production zone aquifer in the proposed license area which may be unconfined or is likely to become unconfined during operations:

A. *The limiting extraction rate for the unconfined aquifer for all operations (including excursion capture) to prevent excessive dewatering.*
B. *A revised production schedule if this limiting extraction rate for the unconfined aquifer is determined to be less than the proposed bleed of 15-45 gpm required for production and restoration operations.*
C. *Assurance that dissolved oxygen will be maintained at levels in the lixiviant to prevent "gas lock" when injected into the unconfined aquifer production zone.*
D. *A strategy to detect and correct for "gas lock" in the unconfined aquifer production zone.*
E. *A strategy to detect and correct for free gas in produced waters to prevent damage to piping, pumps and other wellfield infrastructure from the two phase flow of gas and water.*
F. *An evaluation of the maximum drawdown and mounding expected during operations anywhere the unconfined aquifer.*
G. *An evaluation which shows that an inward gradient in the wellfield will be maintained at all times with either five-spot, alternating line drive, or line drive patterns that may be used within the unconfined aquifer. If necessary, please provide the updated bleed rate to maintain this inward gradient.*

H. A strategy for excursion capture in the unconfined aquifer given the limiting extraction rate.

I. A strategy for assuring complete sweep of the unconfined aquifer during restoration of given the mounding and dewatering patterns which will develop.

J. An updated flare value which takes into account the vertical flow from mounding and dewatering patterns in the unconfined aquifer.

RAI-58 (A) (B) (F) (G) (H) (I) Response

See Appendix A for response to this RAI.

RAI-58 (C) (D) (E) Response

See RAI-53 for response to this RAI.

RAI-59

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

On November 13, 2001, The Supreme Court of the United States issued the Modified North Platte River Decree which addressed water use from the North Platte River. In this decree, portions of the North Platte watershed are identified as hydrologically connected to the North Platte River. Within these regions surface water and ground water use for irrigation and other purposes are strictly controlled by a court order. Staff's review of the regional map (https://sites.google.com/a/wyo.gov/seo/documents-data/maps-and-spatial-data) for hydrologically connected areas near the North Platte River showed that the Peterson Satellite is located within the hydrologically connected region. Therefore all water use at this satellite, whether surface or ground water must be approved by WSEO to meet the requirements of the decree. Any evaporation or surge ponds must also meet the terms of the decree. Uranium One did not discuss the decree in its analysis of operations at the Peterson Satellite. The TR does not address implications for the safety of operations at the Peterson Satellite if water use is limited or restricted by WSEO under the decree. Staff cannot provide reasonable assurance of the safety of operations without an analysis of the impact of this decree on proposed operations.

Formulation of RAI

Uranium One should provide a discussion of the operation of the Peterson Satellite with respect to the water use restrictions for all wells and surface impoundments under the Modified North Platte River Decree. This discussion should:

- *provide reasonable assurance that Uranium One will receive the necessary WSEO well permits to operate the wellfields and surface impoundments at the Peterson Satellite wellfields which are affected by the decree;*
- *provide assurance that wells will be permitted at required bleed and restoration rates (15-45 gpm) to ensure that the operations may be conducted safely;*
- *describe if this decree has the potential to reduce or revoke water well permits/rates or surface impoundments permits/rates at any time before restoration of the Peterson Wellfields is completed if water use is found to be in violation of the decree after operations start; and*

- *provide a commitment that if any changes to the wellfield design, ponds or water use are incurred by the WSEO under this decree before operations begin or during operations, Uranium One will inform NRC, so that a safety evaluation of these modifications may be made.*

RAI-59 Responses

See RAI-42 for response to this RAI.

RAI-60

Description of Deficiency

The information provided in TR Section 3.1.6 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

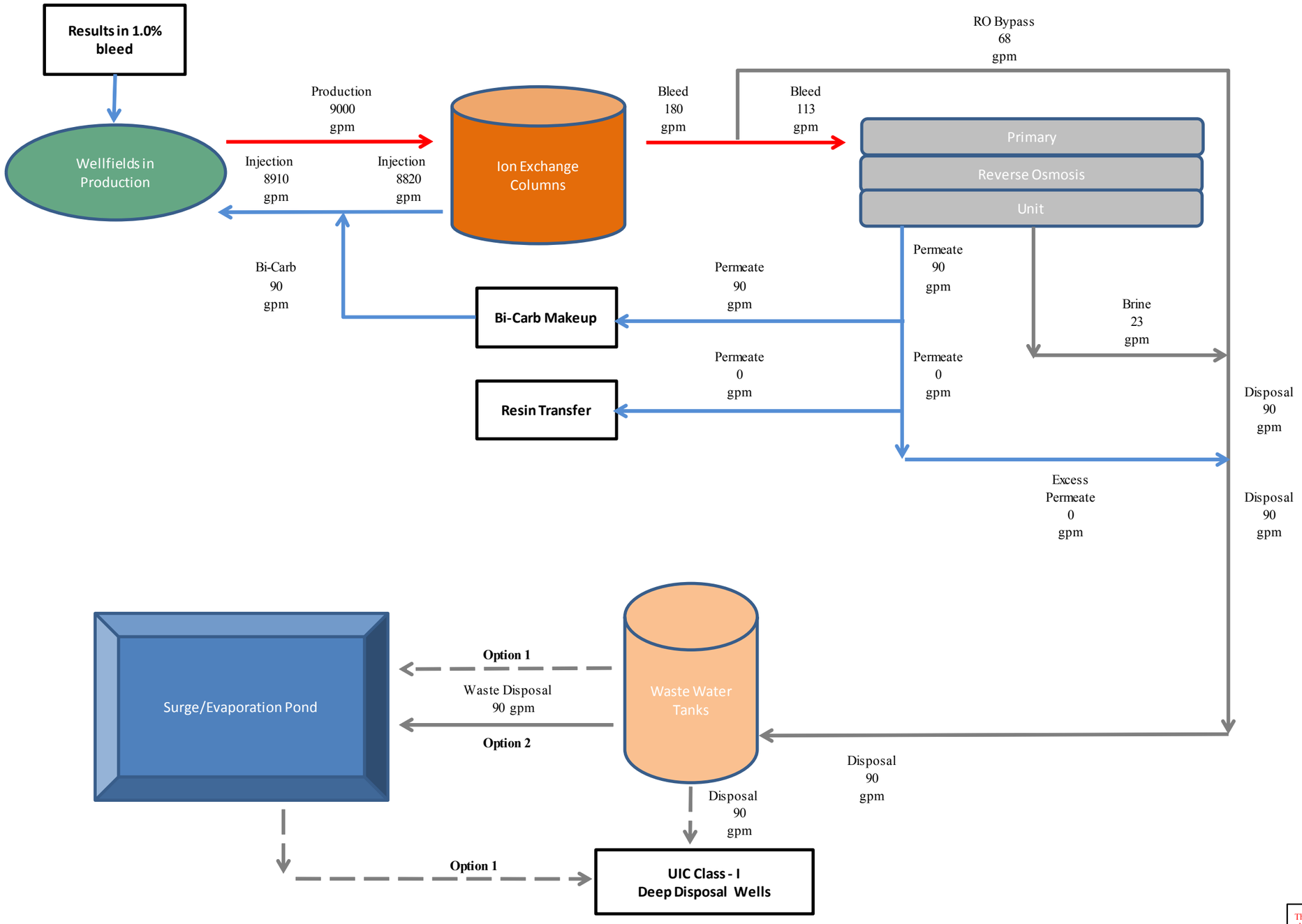
TR Section 3.1.6 presents a generic water balance for the production phase and restoration phase for all Ludeman satellites in Figures 3-6 and 3-7, respectively. The water balance was not specific to each satellite. The estimated waste disposal rate required at each satellite will be 60-160 gpm. The staff notes the field rates for existing DDWs in the Tecla Teapot Parkman formation (not projected permitted rates) at currently licensed ISR DDWs in the Powder River Basin are approximately 30 gpm on average. The TR indicates that only two DDWs will be installed for each satellite; therefore, each DDW would need to achieve rates of 30-80 gpm during operations. Staff cannot provide reasonable assurance that Uranium One has sufficient waste disposal capacity without a separate water balance at each proposed satellite for each phase of operation which includes realistic estimates of DDW rates based on field values from similarly situated DDW wells in the Powder River Basin.

Formulation of RAI

Uranium One should: (a) provide a separate waste water balance specific to each proposed satellite and phase of operation including production, production/restoration restoration for each year of operation in table format; and (b) demonstrate that only two DDW will be sufficient to handle the expected waste disposal rates of 60-160 gpm at each satellite. If, Uranium One determines two DDWs will not be sufficient, address how sufficient disposal capacity will be achieved.

RAI-60 (A) Response

Uranium One has developed a separate waste water balance specific to each phase of operations including production, production/groundwater sweep, production/restoration, and restoration. The values represented on the figures are based on maximum flows thus represent maximum disposal capacity required by DDWs and/or evaporation ponds. The figures are shown below and have been inserted into TR Section 4.



Note:Flow rates are approximate and are subject to change.

Path: O:\WY Projects\8201-2013-102 Infrastructure\Project MXD\Ludeman Water Balance Production Only.mxd

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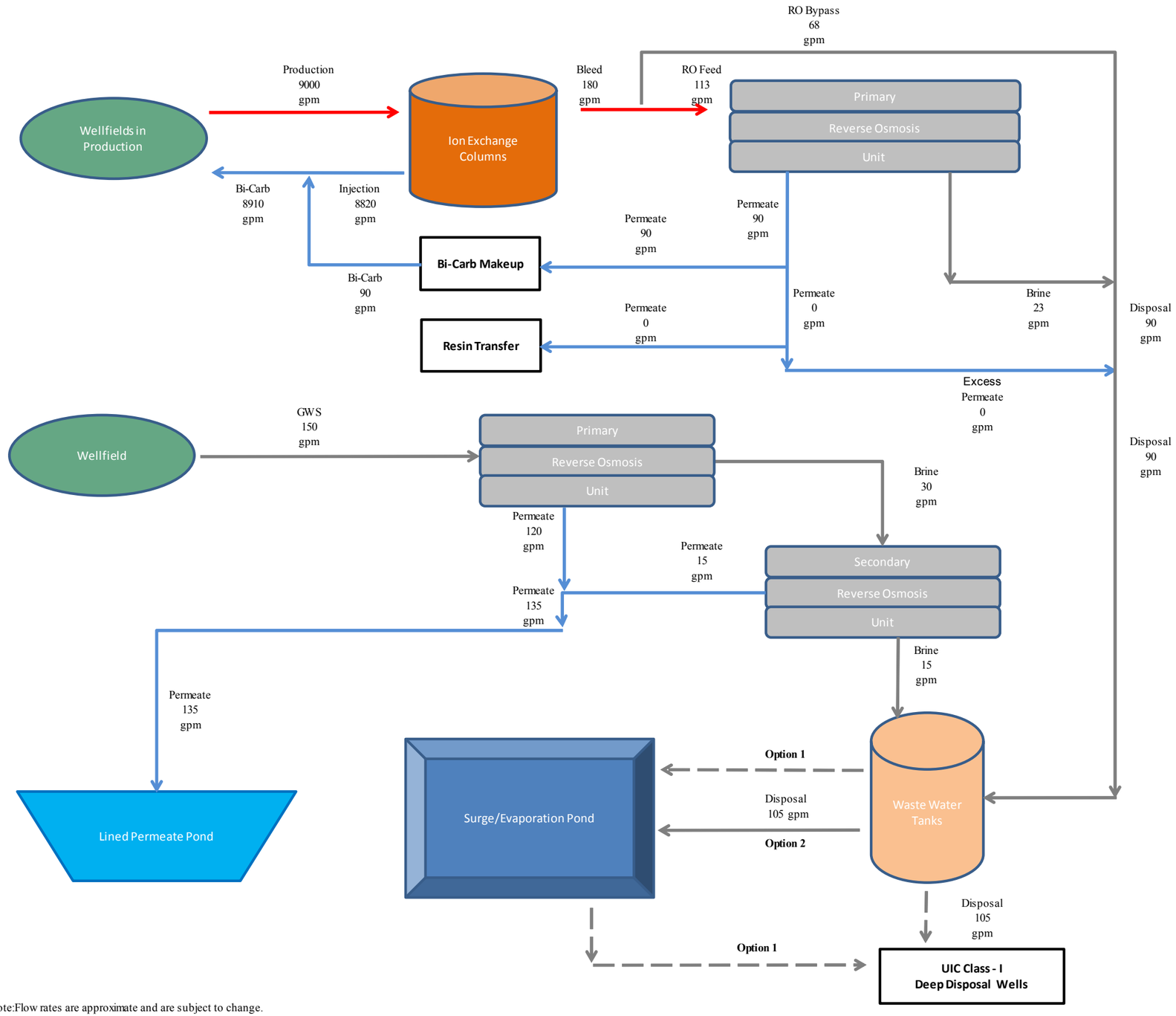
Production Only

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	EGS	6/20/13	16
1	For Submittal	RMD	6/20/13	



Note:Flow rates are approximate and are subject to change.

This map (or data product) is for assessment and planning purposes only. It is not intended to be used for description, conveyance, authoritative definition of legal boundary, or property title. This is not a survey product.

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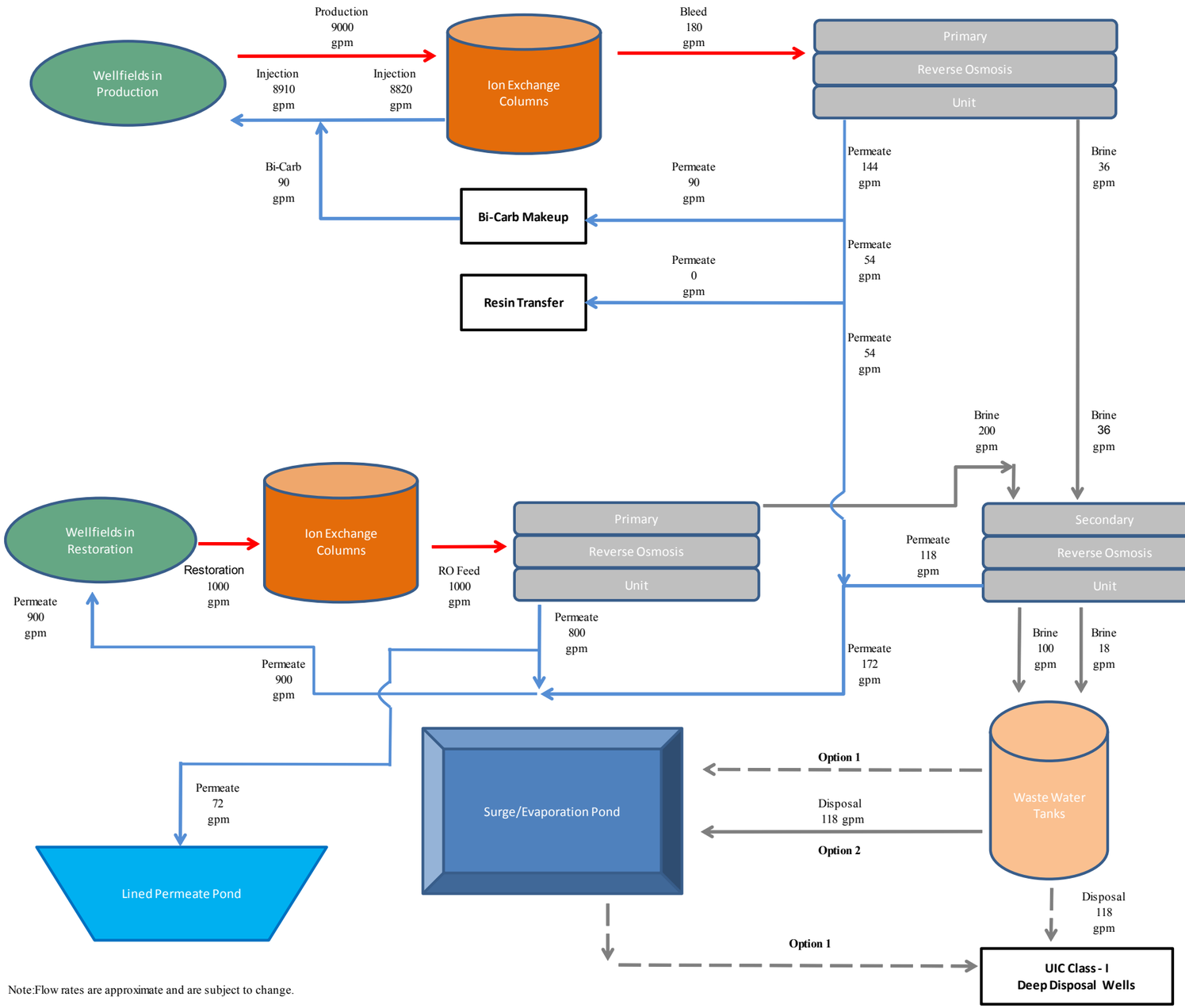
Production Groundwater Sweep Phase (Optional)

REV #	DESCRIPTION	BY	DATE	FIGURE
0	Draft for Review	EGS	6/20/13	17
1	For Submittal	EGS	6/20/13	



Note:Flow rates are approximate and are subject to change.

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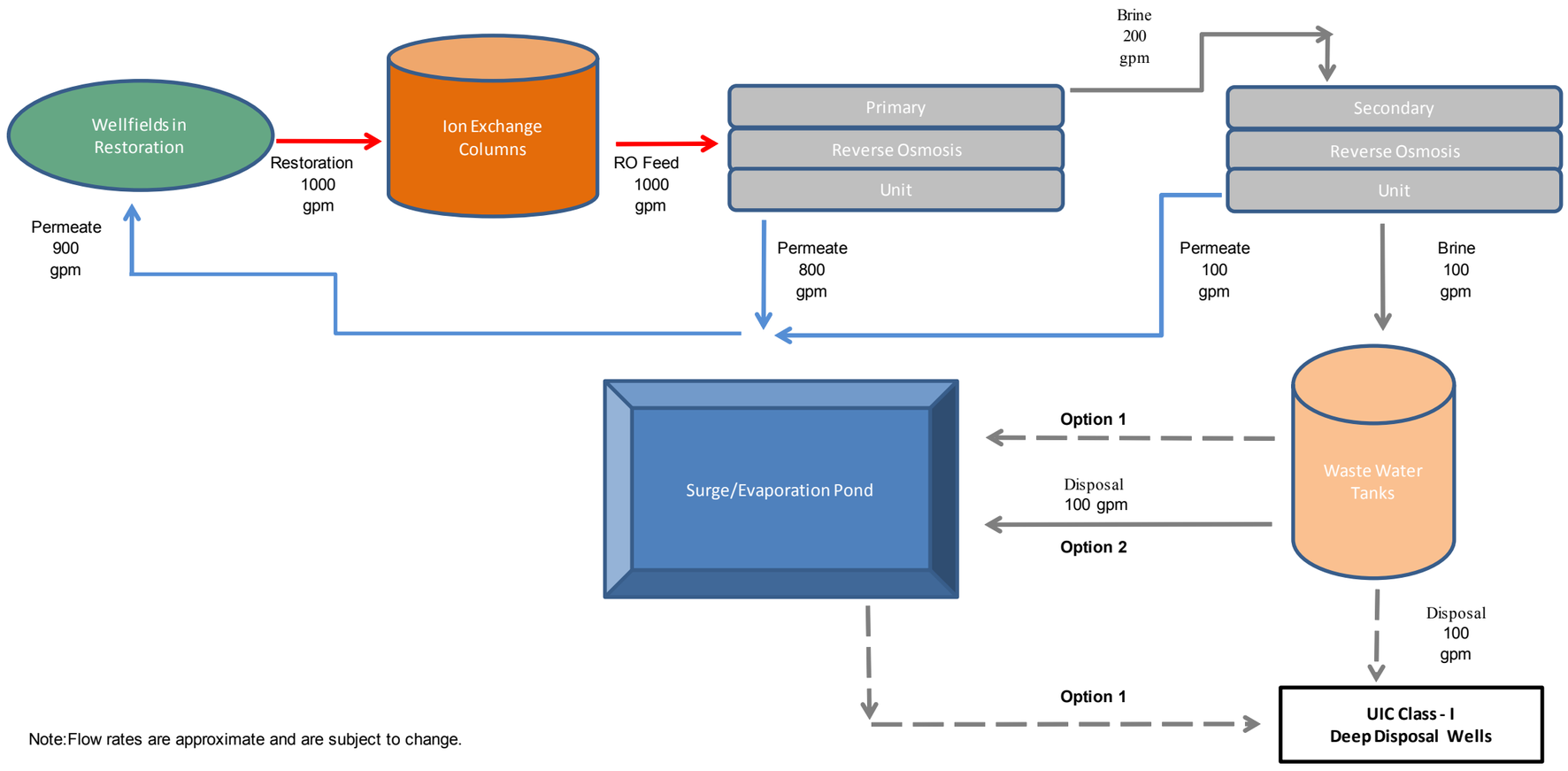
Production Restoration

REV #	DESCRIPTION	BY	DATE
0	Draft for Review	EGS	6/20/13
1	For Submittal	RMD	6/20/13

FIGURE 18



Note:Flow rates are approximate and are subject to change.

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REV #	DESCRIPTION	BY	DATE	FIGURE
0	Description	EGS	6/20/13	19
1	For Submittal	RMD	6/20/13	
2				

RAI-61

Description of Deficiency

Application does not clearly summarize the proposed activities for the Ludeman Project.

Basis for Request

Staff has reviewed the application and understands that Uranium One's plans for the Ludeman Project include the following[D1]:

A. *The Ludeman Project would be a satellite facility to license SUA-1341. Loaded ion exchange resins generated at Ludeman will be shipped to the Willow Creek Central Processing Plant for the final stages of yellowcake production.*
B. *Construction and operation of three satellite processing facilities (Leuenberger, North Platte, and Peterson). Each satellite processing facility would operate at 3,000 gpm measured on a monthly average basis.*
C. *Liquid byproduct material would be disposed of via a series of Class I DDWs. As many as six wells are planned for the Ludeman Project. Additionally, Uranium One plans to construct as many as six surge ponds to provide disposal capacity on a temporary basis if any of the DDWs become inoperable.*

Information from this clarification may be included as part of a standard license condition. This clarification is intended to prevent confusion related to development of those license conditions, if the staff finds the application acceptable from a safety and environmental standpoint.

Formulation of RAI

Please confirm that the staff has correctly interpreted Uranium One's proposed action.

RAI-61 (A) Response

As currently stated in TR and ER Section 1, the Ludmean Project will be operated as a satellite facility to License SUA-1341. Loaded ion exchange resins generated at Ludeman will be shipped to the Willow Creek Central Processing Plant for the final stages of yellowcake production.

RAI-61 (B) Response

As a function of economics of the current and projected status of the uranium industry, Uranium One evaluated the current Ludeman Project application to assess if certain operational components of the proposed plan could be optimized. First and foremost, this evaluation identified the utilization of a single satellite plant as opposed to the three satellites proposed in the original application. A single satellite plant has been deemed more economically feasible and would diminish a number of potential impacts. It is Uranium One's strong opinion this modification will improve the viability of the project and overall reduce any potential impacts. Perhaps most importantly, these proposed revisions to the project's application are minor in nature and constitute limited additional review by NRC staff and contractors.

As noted above, the primary modification to the amendment application involves the use of a single satellite as opposed to the three satellites originally proposed. This lone satellite will be constructed at the same location as the proposed Leuenberger Satellite location on the west end of the project area. The previously proposed North Platte and Peterson Satellites would not be constructed. Such a modification will result in a proposed maximum flow rate of 9,000 gpm for the lone satellite plant. The previous proposal suggested 3,000 gpm/satellite for the equivalent project total of 9,000 gpm.

RAI-61 (C) Response

In the Ludeman amendment application currently under review by NRC, Uranium One proposes the use of surge ponds/DDWs as part of the liquid 11e.(2) byproduct storage and disposal infrastructure at the Leuenberger Satellite Plant. The surge pond storage option is still considered a viable and key component of Uranium One's proposal. However, Uranium One is also investigating the possibility of evaporation ponds as an alternative its liquid 11e.(2) byproduct management system.

Uranium One will soon begin the geotechnical work necessary for potential construction of evaporation ponds. Included in this investigation will be the required geotechnical test borings and pond design. At the conclusion of this work, Uranium One will submit a complete geotechnical report as Addendum 4-B of the Technical Report. This report will include:

- Site and material characterization;
- Configuration and location;
- Slope stability analysis;
- Settlement;
- Pond storage/freeboard analysis;
- Surface water diversion design;
- Erosion protection design (embankment slopes and diversion ditches);
- Liner design;
- Leak detection system design;
- Hydrostatic uplift analysis;
- Construction specifications;
- Quality Control testing program (methods and frequencies);
- Operational inspection plans; and
- Closure plans.

RAI-62

Description of Deficiency

Uranium One has not provided sufficient information regarding the ISR mine unit operation and instrumentation and control.

Basis for Request

Section 3.3.3 (3) of the SRP states that facility instrumentation is acceptable if: "Control components on the systems are equipped with backup systems that activate in the event of a failure of the operating system or a common cause failure such as power failure." Section 3.3 of the TR does identify the presence of backup monitoring monitors and alarms. However, the TR does not appear to identify any other engineering or operational features available in the well fields or satellite processing plants. Staff's position is that monitoring alone does not constitute a backup system.

Section 3.3.3 (4) of the SRP states facility instrumentation is acceptable if: "Well field operating pressures are kept below casing and formation rupture pressures to prevent vertical excursions. Well field operation pressures are routinely monitored either at the well head or on the entire system, and are measured and recorded daily." Staff is not able to verify that Uranium One will operate the injection wells in a manner that prevents vertical excursions.

Formulation of RAI

The following information should be provided in the application:

A. *The descriptions of the process and well field instrumentation and controls and radiation safety monitoring instrumentation need to be more detailed and specific, including their minimum specifications and operating characteristics (alarms, interlocks, etc.). Specifically, please discuss backup systems that will be available to control process fluids within the satellite processing plants or well fields in the event of a power failure or other potential disruption in operations.*
B. *A discussion of well casing max operating and formation fracture pressures.*

RAI-62 (A) Response

The following language was added to TR Section 3.3.1:

"The oxidant system (liquid or gaseous) in each header house will have a control valve that will automatically close and shut off flow of oxidant to injection wells in the event of

injection flow shutdown due to power failure. The satellite facility will have a backup generator in case of power failure.

Redundancy is built into the system by monitoring flows and pressures. For example, one of the manifold valves does not close properly, the control unit will identify this by continuing to register either flows to individual wells or pressure on the manifolds. The control unit will further alert the Satellite Plant and wellfield operators of this condition.

The header house control unit will be connected to the Satellite Plant through either a hard wired communication cable such as fiber optics or through use of a telemetry system. The control unit in each header house will consist of a programmable logic controller (PLC), a smart logic controller (SLC) or a distributed control system (DCS). In the event of an upset condition in a header house, a control unit will identify the header house and alert Satellite Plant operators by causing an alarm to sound within the plant. CPP operators will alert a wellfield operator of the upset condition. Uranium One will have Satellite Plant operators on site 24 hours a day, while wellfield operators will work 8 hour shifts. If a header house alarm sounds during the night shift, a Satellite Plant operator will respond to the alarm.

An operator will inspect the header house to determine the cause of shut down and repairs will be initiated. Based on determination of the shut down and if the ongoing repairs do not affect the safe operation of the header house, all or a portion of the header house wells will be restarted. In addition to the instrumentation monitoring system, operators will perform daily inspections of header houses and wellfield areas to ensure that systems are operating properly and to detect leaks.

To control the movement of lixiviant within the ore zone, a small percentage of barren lixiviant will continuously be diverted away from the volume being pumped back to the injection wells, resulting in more lixiviant being pumped from the production zone than injected. This bleed will create an inward gradient within the production zone, causing groundwater from the surrounding area to be drawn toward the wellfield. Inward gradient will contain lixiviant within the ore-bearing region of the production zone, preventing lixiviant from migrating away from the wellfield, and minimize dilution of lixiviant by uncontrolled fluid movement."

RAI-62 (B) Response

See RAI-55 for response to this RAI.

Effluent Control Systems

RAI-63

Description of Deficiency

The information provided in TR Section 4.1.3 does not meet SRP Section 4.1.3 acceptance criterion (3).

Basis for Request

Acceptance criterion (3) of SRP Section 4.1.3 states, that the application should demonstrate that adequate ventilation systems are planned for process buildings to avoid radon gas buildup. Ventilation systems should be consistent with the requirements of Regulatory Guide 8.31.

Further, the acceptance criterion states that the review emphasis should be on uranium particulate emissions resulting from spills in addition to emissions from drying uranium and radon.

TR Section 4.1.3 states that no potential hazardous air particulate effluents will be produced because the proposed licensed facility will consists of only wellfield and ion exchange operations, and no yellowcake processing occurs where airborne particles could be present. The staff disagrees with Uranium One's position and believes the TR should address air particulates produced from spills or radon progeny build-up within header houses.

Radon-222, a radioactive gas with a 3.8-day half-life, decays to several solid particles that tend to be electrically charged and can deposit on surfaces or attach to dust particles (Mohamed et al., 2008). Radon progeny can build-up in buildings, such as the header houses, if the ventilation is not adequate to ensure complete air exchange. Further, NUREG/CR-6733 states that spills of radioactive liquids can be a source of air particulates and pose an inhalation hazard if the spills dry before the applicant cleans the spills.

Formulation of RAI

Provide information in the TR that describes engineering controls and ventilation that will be used to limit buildup in the workplace or airborne releases of radon progeny and uranium particulates.

RAI-63 Response

Uranium One has updated multiple discussions in the TR to describe the controls and ventilation that will be used to limit radon progeny and uranium particulates. The updated sections are provided below.

TR Section 4.1.3 now reads:

"The proposed project consists of only wellfield and ion exchange operations, and no yellowcake processing occurs where airborne particles could be present. However, Uranium One understands that radon-222, a radioactive gas with a 3.8-day half-life, decays to several solid particles that tend to be electrically charged and can deposit on surfaces or attach to dust particles (Mohamed et al., 2008). Radon progeny can buildup in buildings, such as the header houses, if the ventilation is not adequate to ensure complete air exchange. As noted in NUREG/CR-6733, spills of radioactive liquid can be a source of air particulates and pose an inhalation hazard if the spills dry before cleanup. To reduce such potential build-up, Uranium One will initiate the controls and designs outlined in the previous section and the radiation monitoring program discussed in Section 5.7.3 of this TR."

TR Section 5.7.3.1 now reads:

"Uranium One commits to the extent practical, to include the procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are ALARA as noted in 10 CFR §20.1101 (b). Though no elution, precipitation, or yellowcake drying activities will occur during the proposed Ludeman Project, there is a potential for radon progeny buildup as a result of spills, routine maintenance or other activities performed under an RWP. To reduce such potential buildup in buildings such as header houses, Uranium One will initiate the engineering controls outlined in Section 4.1.2 and closely monitor for those progeny as outlined in this section."

The following paragraph was added to TR Section 4.1.2:

"For a typical header house, a minimum of one exhaust fan will operate at a rate of approximately 30 to 70 cubic feet per minute (cfm), at zero inches of water. A typical header house contains approximately 3,600 cubic feet of volume. The system would have a design rate of five to ten air exchanges per hour which is sufficient to control buildup of radon progeny and minimize airborne concentrations from re-suspension of dust associated with spills."

RAI-64

Description of Deficiency

The information provided in TR Section 4.1.3 does not meet SRP Section 4.1.3 acceptance criterion (1) or the review procedures in SRP Section 3.3.2.

Basis for Request

In TR Section 4.1 Uranium One states that radon gas may potentially be released in the satellite facilities as a result of solution spills, ion exchange (IX) resin transfer operations, and maintenance activities, and that routine monitoring of radon progeny, as described in TR Section 5.7.3.2, will identify exposure levels and initiate corrective actions, if necessary, to ensure exposures of workers are maintained ALARA in accordance with 10 CFR 20.1101(b).

Uranium One will only measure the radon progeny present at the time of sampling to demonstrate compliance with the regulatory occupational exposure limits. The proposed instrumentation will not be able to demonstrate ALARA. Uranium One has not described instrumentation to detect radon gas buildup in buildings that are consistent with SRP Section 3.3.2.

Formulation of RAI

Provide justification for not using instrumentation designed to detect radon gas buildup in buildings consistent with review and acceptance criteria in SRP Sections 3.3.2. and 4.1.3.

RAI-64 Response

Section 4.1.3 of the SRP stipulates monitoring systems will be located to optimize their intended function. Monitor locations will be placed in locations based on air flow patterns in areas that would provide a conservative estimate of airborne concentrations. Instrumentation utilized to determine radon progeny concentrations is consistent with recommendations contained in Regulatory Guide 8.30.

Section 3.3.2 of the SRP states in part that "Particular attention should be focused on whether proposed monitoring and control instrumentation is adequate to quickly identify and remedy in situ leaching and processing problems than can increase radiological and chemical hazards. Areas of concern include monitoring and ventilation systems designed

to detect and control elevated releases of yellowcake dust from drying and storage operations and radon gas buildup in buildings."

Instrumentation referenced in Section 3.3.2 of the SPR is limited to the yellowcake dryer and emission control systems, and equipment utilized to control and detect releases from the wellfield. Discussions within Section 3.3.2 do not include reference to instrumentation demonstrating ALARA. Instrumentation does not demonstrate conditions are ALARA. Rather it provides site personnel with useful information which can be utilized to make the determination that exposures are being maintained ALARA. Uranium One believes the ventilation controls and monitoring frequency as well as establishment of site actions levels as discussed in Section 5.7 of the TR provide adequate capabilities to quickly identify and control release of dust or radon progeny which meet the intent of Section 3.3.2 of the SRP. Table 5-1 of Section 5.7.6 of the TR is consistent with the sampling methods and frequency for radon daughters as specified in Section 2.3 and Table 3 of Regulatory Guide 8.30.

The first paragraph in TR Section 5.7.3.2 now reads:

"Surveys for radon daughter concentrations will be conducted in the operating areas of the proposed Satellite facility and wellfield module buildings at a frequency based on air concentrations as specified in Table 5-1. Sampling locations will be determined in accordance with the guidance contained in USNRC Regulatory Guide 8.25. Proposed radon daughter sampling locations for the proposed Ludeman Satellite facility is shown on Figure 5-2. Because module buildings are small, one-room structures, sample locations will be determined on a case-by-case basis as deemed appropriate by the RSO in order to best estimate worker exposures while working in these areas."

RAI-65

Description of Deficiency

Section 4.2.3 of the TR indicates that Uranium One does not currently have an agreement in place for the disposal of 11e.(2) byproduct material. Uranium One is required to have an NRC approved agreement in place for the disposal of 11e.(2) byproduct material before operation commences.

Basis for Request

Section 4.2.3(6) of the SRP requires that the applicant have an NRC approved agreement in place for the disposal of 11e.(2) byproduct material before operation commences. Section 4.2.3 of the TR states, "SUA-1341 currently has an agreement with pathfinder mine Corporation Shirley Basin Facility which will be modified to include shipment of 11e.(2) byproduct materials from the proposed Ludeman Project facilities."

Formulation of RAI

Uranium One should: (1) modify Section 4.2.3 of the TR, and all other applicable sections of the TR, by committing to have a signed agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project facilities prior to commencing operations at the site; or (2) indicate where in the TR the commitment is made.

RAI-65 Response

The following language was added in TR Sections 4.2.3 and 6.3.4:

"Uranium One (via SUA-1341 License Condition 9.7) currently has an agreement with Pathfinder Mine Corporation Shirley Basin Facility to receive shipments of solid 11e.(2) materials from the operating Willow Creek Project. Prior to operations Uranium One commits to have a signed agreement with the Pathfinder facility or another NRC licensed facility to receive the solid 11e.(2) byproduct materials generated as a result of the proposed Ludeman Project."

RAI-66

Description of Deficiency

Section 4.2.3 of the TR does not include a commitment to notify NRC in writing within 7 days if the NRC approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project expires or is terminated and to submit a new agreement for NRC approval within 90 days of the expiration or termination.

Basis for Request

Section 4.2.3(6) of the SRP requires that the applicant commit to notify NRC in writing within 7 days if the NRC approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project expires or is terminated and to submit a new agreement for NRC approval within 90 days of the expiration or termination.

Formulation of RAI

Uranium One should: (1) modify Section 4.2.3 of the TR, and all other applicable sections of the TR, by including a commitment to notify NRC in writing within 7 days if the NRC approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project expires or is terminated and to submit a new agreement for NRC approval within 90 days of the expiration or termination; or (2) indicate where in the TR the commitment is made.

RAI-66 Response

The following language was added to TR Section 4.2.3:

"As requested in NUREG-1569 (Sec. 4.2.3(6)), Uranium One commits to notify NRC in writing within 7 days if the NRC-approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials expires or is terminated. Uranium One also commits to submit a new agreement for NRC approval within 90 days of the expiration or termination. These commitments are in accordance with SUA-1341 License Condition 9.7."

RAI-67

Description of Deficiency
Section 4.2.4.4 of the TR appears to be out of date.

Basis for Request
Section 4.2.4.4 of the TR states: "In this regard, Uranium One anticipates submittal of a Class 1 injection well permit during the second quarter of 2010."

Formulation of RAI
Uranium One should modify Section 4.2.4.4 of the TR, and all other applicable sections of the TR, by stating when the Class 1 injection well permit was submitted.

RAI-67 Response

To date, Uranium One has not submitted the Class I UIC Permit for the Ludeman Project. Other disposal alternatives are currently being investigated and the results of these investigations will dictate how Uranium One will proceed with the Class I UIC permit. Table 1 of the ER Response Package provides the status for all additional permits anticipated for the proposed project.

RAI-68

Description of Deficiency

Section 4.2.4.4 of the TR references Section 8.3 for additional discussion of the liquid waste disposal alternative considered by Uranium One. Section 8.3 does not exist in the TR. The staff believes the correct reference is Section 8.1.7.

Basis for Request

Section 4.2.4.4, of the TR states: "Further discussion of the liquid waste disposal alternatives considered by Uranium One is contained in Section 8.3 of this TR."

Formulation of RAI

Uranium One should modify Section 4.2.4.4 of the TR, and all other applicable sections of the TR, by referencing Section 8.1.7 instead of Section 8.3.

RAI-68 Response

The following language was changed in TR Section 4.2.4.4:

"Further discussion of the liquid waste disposal alternatives considered by Uranium One is contained in Section 8.1.7 of this TR."

RAI-69

Description of Deficiency

Section 4.2.4.5.2 of the TR states that surge pond inspections will be done weekly. This inspection frequency appears to be inconsistent with the Section 4.2.3(2) of the SRP.

Basis for Request

Section 4.2.4.5.2 of the TR states: "The surge pond inspection plan is based on the routine weekly inspections currently required in SUA-1341 for the Willow Creek evaporation ponds. Weekly inspections will consist of checking the pond depth and visually inspecting the pond embankments for slumping, movement, or seepage. The pond depth measurements will be checked against the freeboard requirements. The liner system will be visually inspected to identify any damage."

Section 4.3.2(2) of the SRP states: "The monitoring and inspection program consists of documented daily checks of impoundment freeboard and leak detection system."

Formulation of RAI

Uranium One should modify Section 4.2.4.5.2 of the TR, and all other applicable sections of the TR, to be consistent with Section 4.3.2(2) of the SRP, or justify why weekly inspections are adequate.

RAI-69 Response

In accordance with SUA-1341 License Condition 11.4, Uranium One is aware the inspection frequency for surge/evaporation ponds and checks of the leak detention systems and freebaord is conducted on a weekly basis. NRC has conducted and approved an SER and EA for the Willow Creek Project, that a documented weekly inspection frequency is appropriate and protective of health and environment. Since the proposed Ludeman Project is an amendment to SUA-1341, Uranium One believes a documented weekly inspection frequency is appropriate and protective for surge/evaporation ponds operations at the proposed project. All appropriate text regarding the pond monitoring and inspection program will be updated in the application.

RAI-70

Description of Deficiency

The application does not provide sufficient information regarding the disposal of solid and liquid wastes generated by the operations at the Ludeman facility. The information requirements are specified Regulatory Guide 3.11, Section 4.2 of the SRP for ponds, and Section 6.1 for DDWs.

Basis for Request

Uranium One has provided a general overview of how it plans to dispose of solid and liquid waste generated by the operations at Ludeman. In many instances, the TR only contains a conceptual description of Uranium One's plans. The staff is unable to verify the following information related to the liquid effluents at the proposed facility:

- *Section 6.1.3 (13) of the SRP identifies acceptance criteria for deep well injection of liquid wastes. The TR does not contain sufficient details about the planned DDWs. The TR identifies the Parkman Formation as a possible target zone for the DDWs, but the geologic cross sections in Section 2 of the TR do not show where the Parkman Formation is located at Ludeman[D2]. Additionally, the relationship between the location of the target zone for the deep injection wells and nearby oil and gas wells is not clear to the staff[D3].*
- *Section 4.2.3 (3) of the SRP identifies disposal capacity as an issue for staff's review. The TR does not contain sufficient information related to the water balance for the facility. As a result, the staff cannot verify if adequate disposal capacity is available for liquid byproduct material. Based on the staff's review of the water balances in TR Figures 3-6 and 3-7 and Uranium One's proposed schedule in TR Figure 3-10, staff estimates that the peak disposal need in year 7 of operations would vary between 772.1 Lpm and 1907.6 Lpm (204 gpm and 504 gpm). Uranium One has not demonstrated that adequate disposal capacity is available for liquid byproduct material. Additionally, it is not clear to the staff if the water balance presented is representative of the conditions at each satellite facility. Staff experience indicates that wellfield size is a major factor in the time period necessary to complete ground water restoration activities[D4]. Additionally, it is not clear if the DDWs are dedicated to a specific satellite processing facility, or if Uranium One will be able to transfer liquid byproduct material generated at one satellite facility for disposal at a DDW located in another portion of the Ludeman site[D5].*

- *Section 4.2.4 (4) of the SRP identifies subgrade preparation as an issue for the staff's review. Subgrade preparation is dependent on the soil conditions in the vicinity of the storage ponds. The application does not appear to contain discussion of geotechnical conditions in the vicinity of the surge ponds. The results of the geotechnical investigation should also discuss the liquefaction potential of the soils that will be used to construct the storage pond embankments[D6].*
- *Section 4 of Regulatory Guide 3.11 identifies the need for proper characterization of ground water prior to use of a pond. The geotechnical investigation for the proposed pond locations should also include characterization of the uppermost aquifer in the vicinity of each surge pond. This is consistent with the recommendations provided in Section 1.2 of Regulatory Guide 3.11[D7].*
- *Section 4.2.4 (4) of the SRP identifies slope preparation as an issue for the staff's review. Staff recognizes that Uranium One has presented analyses addressing slope stability and settlement. However, these analyses were based on assumed soil properties.*
- *Uranium One does not appear to have presented a pseudostatic slope stability analysis. As discussed in Section 2.1.1.3 of Regulatory Guide 3.11, a slope stability analysis considering earthquake loading should be performed[D8].*
- *Section 2.1.2 of Regulatory Guide 3.11 identifies liquefaction as a factor that should be considered for retention system design. The application does not appear to have addressed potential for liquefaction in the vicinity of the surge ponds. The analysis for the potential of liquefaction[D9] should be based on the results of the geotechnical investigation.*
- *Section 4.2.4 (4) of the SRP indicates that design details and drawings should be provided to the staff. Staff recognizes that Uranium One has presented conceptual drawings showing the layout of each pond. However, these conceptual drawings do not show the grading and drainage characteristics in the vicinity of each pond. Therefore, the staff is not able to verify that the ponds have been designed to prevent run-on from entering the ponds[D10].*
- *Uranium One based its freeboard analysis of the ponds on a six hour, 25 year storm event. This is not consistent with the approach recommended in Regulatory Guide 3.11, which recommends basing pond capacity and freeboard requirements on a six hour probable maximum precipitation event[D11].*

- *Section 4.2.4 (4) of the SRP identifies deterioration of the liner system when exposed to waste products as an item for staff to consider. The application does not appear to address chemical compatibility of the liner system with the anticipated composition of the liquid byproduct material. The TR does address compatibility issues in general, but not the specific aspects at the Ludeman Project. Note the Renken 2005 reference cited in the TR Section 4.2.4.5.1 text is not contained in the reference list at the end of that section, so staff has not been able to locate and review to reference to determine its applicability[D12].*
- *The proposed surge pond monitoring program is not consistent with the guidance in acceptance criteria (2) in Section 4.2.3 of the SRP or with Section 4.2 of Regulatory Guide 3.11. Specifically, the proposed monitoring program does not appear to include daily inspections of freeboard or the leak detection system [D13].*
- *Section 4.2.4 (4) of the SRP identifies construction methods, design details, and QA programs as items that should be considered during the staff's review. The TR does not include a set of construction specifications for the surge ponds[D14].*
- *Section 4.2.4 (1) of the SRP identifies decommissioning aspects of waste disposal as an item for staff's consideration during a review. The TR does not include a discussion of decommissioning aspects of the surge ponds[D15].*
- *Section 4.2.4 (5) identifies secondary containment as an item for consideration during the staff's review. Staff has not been able to verify that adequate secondary containment is available within the satellite processing facilities[D16].*

Formulation of RAI

The following information should be provided in the application, or Uranium One should direct the staff to where the information can be found:

A. *Identify the status of the DDW application, the target formation, and the number of DDWs necessary to provide sufficient disposal capacity;*
B. *A water balance that demonstrating that sufficient disposal capacity is available at the facility. The water balance should reflect differences in operating characteristics that may exist for each satellite facility;*
C. *The results of the geotechnical investigation for the proposed pond locations, including discussion of soil classification, grain size analysis, plasticity index, moisture content, as well as compaction and density requirements for soils that may be used to construct the perimeter embankments;*

D. Characterization of groundwater in the vicinity of the surge ponds. This should include depth to groundwater, groundwater flow direction and gradient, as well as groundwater quality. Based on this information, Uranium One should identify locations for groundwater monitoring wells around each surge pond;

E. Updated slope stability analyses to reflect the actual site conditions identified during the site investigation;

F. A slope stability analysis that considers earthquake loading conditions;

G. An analysis on the potential for liquefaction in the vicinity of the surge ponds;

H. Drawings showing the location of each surge pond and the surrounding topography at a sufficient level of detail to demonstrate that run-on is diverted around the surge ponds;

I. A re-evaluation of the freeboard based on the PMP event, or provide justification as to how the six hour, 25 year storm event combined with site features provides an adequate level of protection to prevent loss of byproduct material during a significant storm event;

J. A discussion of potential deterioration of the liner system when exposed to the anticipated wastes;

K. A comparison of the proposed pond inspection program to the recommendations in Regulatory Guide 3.11 and explain how deviations from the guidance provide an equivalent level of protection;

L. A set of construction specifications for the surge ponds so staff can evaluate whether or not the pond liner system will be installed in a manner that is protective. This should include a QA plan for soil and liner installation;

M. A discussion addressing timing of decommissioning, surface reclamation, and any unique aspects of radiological surveys necessary to complete the work; and

N. A discussion of the volume of the largest tank in each satellite facility as well as the volume of liquid contained within the concrete curbs in each satellite facility.

RAI-70 (A) Response

Uranium One currently anticipates submittal of a Class I UIC well permit application during the fourth quarter 2013. The target formation for these deep disposal wells will be the Lance Formation through the Parkman Formation (depths ranging from 4,500 to 10,000 feet). Uranium One will apply for six deep disposal wells to ensure sufficient disposal capacity. Uranium One is currently evaluating alterative disposal methods that may negate the Class I UIC permit submittal.

RAI-70 (B) Response

Uranium One has developed a separate waste water balance specific to each phase of operations including production, production/restoration, and restoration. The values represented on the figures are based on maximum flows thus represent maximum disposal capacity required by DDWs and/or evaporation ponds. New water balance figures and values have been provided in the response to RAI-60.

RAI-70 (C) (E) (F) (G) (H) (I) (J) (K) (L) Responses

See RAI-61(C) for the response to these RAIs

RAI-70 (D) Responses

See RAI-24 for response this RAI.

RAI-70 (M) Response

Uranium One has provided comprehensive discussion of decommissioning, surface reclamation, and radiological surveys necessary to complete the work within TR Section 6 (Groundwater Quality, Surface Reclamation, and Facility Decommissioning). The term "facilities" when referring to decommissioning and reclamation includes the surge/evaporation ponds and has been clarified within the text to make this more evident.

RAI-70 (N) Response

The primary form of containment throughout the processing building is each individual process tank or vessel. Secondary containment will consist of concrete curbing. There are two philosophies used for curbing within the satellite facility, total containment in the event of tank failure and containment of leaks or spills during operations. Curbing to contain a failed tank will be used in areas that pose a major health risk or potential product recovery; these areas will have curbing to contain at least 110 percent of the volume of the largest tank. Curbing for spill containment only will be employed in areas where it is unnecessary or impractical to contain the total volume of fluid in that area but where it is still desirable to contain spills. The use of sloped floors within designated areas throughout the satellite facility will direct any spilled/leaked fluid to an appropriate sump to be disposed of or returned to the process.

Operations

RAI-71

Description of Deficiency

Section 5.1 of the TR does not identify the manager responsible for the QA function at the Ludeman facility.

Basis for Request

Section 5.1 of the SRP requires the staff to review the organizational structure including the functional description of the key management positions to ensure that sufficient detail is provided for positions responsible for developing, reviewing, approving, implementing, and enforcing the proposed programs related to radiological safety, environmental safety, ground-water protection, QA, and maintenance.

Formulation of RAI

Uranium One should modify Section 5.1 of the TR, and all other applicable sections of the TR, to identify the key management position responsible for the QA function for operations at the Ludeman facility.

RAI-71 Response

Section 5.1.7 Safety Supervisor/Radiation Safety Officer of the TR specifically states "The Safety Supervisor/Radiation Safety Officer (RSO) has direct responsibility for the development, review, implementation and adherence to the Industrial Safety and Radiation safety Programs and associated quality assurance programs for the Willow Creek operation."

Uranium One modified the text as follows:

"The Radiation Safety Officer (RSO) has direct responsibility for the development, review, implementation and adherence to the Radiation Safety Programs and associated Quality Assurance Programs for the Willow Creek and the proposed Ludeman operations."

RAI-72

Description of Deficiency

Management positions described in Sections 5.1.1 – 5.1.8 of the TR are not always consistent with the organization chart provided in Figure 5-1.

Basis for Request

Sections 5.1.4, 5.1.5, and 5.1.7 reference a position titled, Manager Site SHE. Figure 5-1 identifies a position titled Manager Satellite SHE
Section 5.1.6 references the Satellite Operations Manager.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to ensure that the management positions identified on Figure 5-1 are consistent with the position descriptions described in Sections 5.1.1 – 5.1.7.

RAI-72 Response

Figure 5-1 was be modified to indicate the position as Manager Site SHE. The position of Director of Operations was eliminated on Figure 5-1 and its corresponding responsibilities will be incorporated into the Mine Manager position. See RAI-1 for the revised organizational structure figure and position descriptions.

RAI-73

Description of Deficiency

The functional description for the Satellite Operations Manager (Section 5.1.6) is not adequately reflected on Figure 5-1.

Basis for Request

Section 5.1.6 states: "All site operations, maintenance, construction, and support groups report directly to the Satellite Operations Supervisor and environmental health and safety have coordinating reporting responsibilities as shown in Figure 5-1." There is no indication from Figure 5-1 that the Satellite Operations Manager is the highest level manager located at the Ludeman facility. Further, Figure 5-1 does not show that there is a coordinating responsibility between the Satellite Operations Manager and Manager Satellite SHE.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to ensure that the organizational structure shown on Figure 5-1 is consistent with management functional responsibilities at the Ludeman facility.

RAI-73 Response

See RAI-1 for response to this RAI.

RAI-74

Description of Deficiency

The functional description for the RSO (Section 5.1.9.1.1) is not consistent with Section 5.2.2 of the LRA for SUA-1341.

Basis for Request

TR Section 5.1.9.1.1 (3) says the RSO will: "Assist with the review and approval of new equipment, process changes or operating procedures to ensure that the plans do not adversely affect the RPP."

Section 5.2.2 of the LRA states that: the RSO must approve procedures and changes to procedures.

Formulation of RAI

Uranium One should revise Section 5.1.9.1.1 of the TR, and all other applicable sections of the TR, to state that the RSO must review and approval of new equipment, process changes or operating procedures to ensure that the plans do not adversely affect the RPP.

RAI-74 Response

Section 5.2.1 of the LRA is the correct reference and it states in part: "Any revisions made to the SOP's are reviewed and approved by the RSO and appropriate supervisor prior to implementation."

This is in accordance with SUA-1341 License Condition 9.6 which states in part: "All written procedures for both operational and non-operational activities shall be reviewed and approved in writing by the RSO before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied.

Additionally, listed item #3 in TR Sec. 5.1.9.1.1 has been modified to read:

3. Review and approve of new equipment, process changes or operating procedures to ensure that the plans do not adversely affect the RPP;

RAI-75

Description of Deficiency

TR Section 5.1.10 is inconsistent with License Condition 12.2 of SUA-1341 and Section 5.2.3(12) of the SRP.

Basis for Request

Section 5.1.10 states: "Reporting of excursions and corrective actions will be conducted as described in Section 5.7.8." Section 5.7.8.2.6 of the TR provides that Uranium One will submit a written report to the NRC within 60 days of the excursion confirmation. Section 5.2.3(12) of the SRP and License Condition 12.2 of SUA-1341 indicate that a written report should be submitted to the NRC within 30 days of the excursion notification.

Formulation of RAI

Uranium One should revise Section 5.7.8.2.6 of the TR, and all other applicable sections of the TR, to ensure that excursion reporting requirements are no less stringent than Section 5.2.3(12) of the SRP, and consistent with License Condition 12.2 of SUA-1341.

RAI-75 Response

The excursion reporting commitment found in Section 5.7.8.2.6 of the TR has been changed from 60 to 30 days to remain consistent with License Condition 12.2 of SUA-1341.

RAI-76

Description of Deficiency

TR Section 5.2.4, Safety and Environmental Review Panel, states: "The SERP process and procedures that will apply to the proposed project are described in Section 5.2.2 of the LRA for SUA-1341." The SERP procedures to be implemented for the Willow Creek facility are not applicable to the Ludeman facility because management positions of responsibility are not identical for Willow Creek and Ludeman.

Basis for Request

Section 5.2.2, Safety and Environmental Review Panel, of the LRA for SUA-1341 states: "One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and shall have responsibility for implementing any operational changes; and, one member shall be either the RSO or equivalent (typically, the Manager, Environmental and Regulatory Affairs), for the responsibility of assuring changes conform to radiation safety and environmental requirements."

The organizational structure for the Ludeman facility, as provided in Section 5.1 of the TR, does not include Manager, Environmental and Regulatory Affairs.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to include a Manager, Environmental and Regulatory Affairs, or revise Section 5.2.4 of the TR to provide an accurate description of the SERP.

RAI-76 Response

As a result of the approval of LRA for SUA-1341, Uranium One believes Section 5.2.4 of the TR is consistent with SUA-1341 regarding the makeup of the Safety and Environmental Review Panel (SERP). Section 5.2.2 (Safety and Environmental Review Panel) of the LRA for SUA-1341 states:

"One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and shall have responsibility for implementing any operational changes; and, one member shall be either the RSO or equivalent (typically, the Manager, Site Safety, Health and Environment, for the responsibility of assuring changes conform to radiation safety and environmental requirements."

RAI-77

Description of Deficiency

Section 5.3, Management Audit and Inspection Program, references Section 5.3 of the LRA for SUA-1341, which does not directly apply to the Ludeman facility.

Basis for Request

Section 5.3, states: "The management audit and inspection program for the proposed Ludeman Project will be the same as that described in Section 5.3 of the LRA for SUA-1341." It is insufficient to reference 5.3 of the LRA for SUA-1341 for the following reasons: (1) there is no Central Processing Plant proposed for Ludeman facility; (2) the LRA is written specifically for the Christensen Ranch and Irigaray Plant facilities; and (3) the LRA identifies responsibilities for the Site/Construction Manager which does not exist for Ludeman.

Formulation of RAI

Uranium One should revise Section 5.3 of the TR, and all other applicable sections of the TR, to describe a management audit and inspection program that is specific to the Ludeman project

RAI-77 Response

TR Section 5.3 now reads:

"Uranium One commits to conduct inspections to ensure exposures are ALARA in accordance with SUA-1341, License Condition 11.4 and Regulatory Guide 8.31 (Sec. 2.3). The following internal inspections, audits and reports, which include guidance from RGs 3.11 and 8.31, will be performed for the proposed project operations.

Radiation Safety Inspections

Daily Inspections

The RSO or qualified designee will conduct a daily documented walk-through inspection of all active satellite plant areas including storage areas to ensure that radiation control practices are being implemented appropriately. This is consistent with LC 11.5 of SUA-1341.

Weekly Inspections

The RSO or qualified designee will conduct weekly inspections to observe general radiation safety control and make or review required changes in practices, procedures and equipment. Any items of non-compliance or other problems are reviewed with the Manager Site SHE and/or Site Manager.

Monthly RSO Reports

The RSO provides a written summary of month's radiological activities at the Ludeman facility. The report includes a review of all monitoring and exposure data for the month, a summary of worker protection practices, a summary of all pertinent radiation survey records, a discussion of any trends in the ALARA program, and a review of adequacy of the implementation of the USNRC license conditions. Recommendations are made for any corrective actions or improvements in the process or safety programs. This is consistent with LC 11.5 of SUA-1341.

Annually

On an annual basis, an audit of the radiation protection and ALARA program is conducted and a written report of the results submitted to corporate management. The audit team consists of either the Director SHE, a qualified employee, familiar with radiation control and ALARA practices, and/or an outside radiation safety auditor, the RSO, and the Site Manager. The RSO may accompany the audit team, but may not participate in the conclusions.

The Radiation Safety Auditor for the ALARA audit utilized by Uranium One will be a member of the Corporate SHE Department, a qualified employee, or qualified outside radiation protection auditing service to provide assurance that all radiation health protection procedures and license condition requirements are being conducted properly. Any outside service used for this purpose will be qualified in radiation safety procedures as well as environmental aspects of in situ recovery operations.

The annual ALARA audit report summarizes the following data:

1. Employee exposure record
2. Bioassay results

3. Inspection log entries and summary reports of mine and process inspections
4. Documented training program activities
5. Applicable safety meeting reports
6. Radiological survey and sampling data
7. Reports on any overexposure of workers
8. Operating procedures that were reviewed during this time period

The ALARA audit report specifically discusses the following:

1. Trends in personnel exposures
2. Proper use, maintenance and inspection of equipment used for exposure control
3. Recommendations on ways to further reduce personnel exposures from uranium and its daughters

The ALARA audit report is reviewed by the President, Director SHE, Manager Site SHE, and Mine Manager with the audit team. Implementations of the recommendations to further reduce employee exposures, or improvements to the ALARA program, are discussed at that time.

An audit of the Quality Assurance/Quality Control (QA/QC) program is also conducted on a biannual basis. The audit is performed by an individual qualified in analytical and monitoring techniques who does not have direst responsibilities in the areas being audited. The results of the QA/QC audit are documented and reported to Manager Site SHE, RSO, and Director SHE. The RSO will have the primary responsibility for implementation of the QA/QC program at the Ludeman facility."

RAI-78

Description of Deficiency

Section 5.3.1, Surge Pond Inspections, does not include a commitment to inspect surge ponds in accordance with Regulatory Guide 8.31.

Basis for Request

Section 5.3.3 of the SRP states that the management audit and inspection plan will be acceptable if it is consistent with Regulatory Guides 3.11 and 8.31. In Section 5.3.1 Uranium One commits to inspect surge ponds in accordance with Regulatory Guide 3.11, but as discussed in RAIs 70 and 79, Uranium One has proposed a surge pond monitoring plan that is not consistent with this guidance document. Additionally, Uranium One does not commit to conduct inspections to ensure exposures are ALARA in accordance with Regulatory Guide 8.31, Section 2.3.

Formulation of RAI

Uranium One should revise Section 5.3 of the TR, and all other applicable sections of the TR, to commit to conducting surge pond inspections in accordance with Regulatory Guide 8.31.

RAI-78 Response

See RAI-69 for response to this RAI.

RAI-79

Description of Deficiency

Section 5.3.1.1, Inspection Frequency and Reporting, is not consistent with the Regulatory Guide 3.11. Further, TR does not include discussion of special inspections as provided in Regulatory Guide 3.11, Section 4.2.

Basis for Request

In Section 5.3.1 of the TR, Uranium One commits to inspect surge ponds in accordance with Regulatory Guide 3.11. Section 5.3.1.1 states: "During operations, the leak detection standpipes will be checked for evidence of leakage on a weekly frequency. Visual inspection of the pond embankments, fences and liners and the measurement of pond freeboard will be performed on the same frequency.

Regulatory Guide 3.11, Section 4.2, states that detection standpipes, pond embankments, and liners should be inspected on a daily basis. In Section 5.3.1 Uranium One commits to inspect surge ponds in accordance with Regulatory Guide 3.11, but does not commit to conduct inspections to ensure exposures are ALARA in accordance with Regulatory Guide 8.31, Section 2.3.

Formulation of RAI

Uranium One should revise Section 5.3 of the TR, and all other applicable sections of the TR, such that the surge pond inspection frequencies and special inspections are consistent with Regulatory Guide 3.11.

RAI-79 Response

See RAI-69 and RAI-77 for response to this RAI.

RAI-80

Description of Deficiency
Section 5.4, Radiation Safety Staff Qualifications, is insufficient.

Basis for Request
Section 5.4 states: "The requirements for education, experience, and training for radiation safety staff for the proposed Ludeman project will be the same as that described in Section 5.4 of the LRA for SUA-1341."

Referencing Section 5.4 of the LRA for SUA-1341 in the Ludeman application is insufficient for the following reason: (1) the qualification requirements for the RSO in Section 5.4 of the LRA is inconsistent with Regulatory Guide 8.31; and (2) the LRA provides no qualifications for an RSO designee, when a designee is assigned responsibility for conducting inspections.

Formulation of RAI
Uranium One should revise Section 5.4 of the TR, and all other applicable sections of the TR, by providing specifying qualification requirements for the RSO and RSO designee, which are consistent with Regulatory Guide 8.31.

RAI-80 Response

Uranium One believes SUA-1341, License Condition 9.12, addresses some concerns raised by the reviewer regarding an RSO designee. This includes an SOP which will describe the training and procedures to be used by the designee to conduct daily inspections in the temporary absence of the RSO or Radiation Safety Technician.

Additionally, the following language was added to TR Section 5.4:

"Qualifications for the RSO and RST will utilize guidance from Regulatory Guide 8.31 (NRC, 2002). The following qualifications are the minimum requirements for the RSO and RST.

Radiation Safety Officer Qualifications

The minimum qualifications for the RSO are as follows:

- Education - A Bachelor's Degree in physical sciences, industrial hygiene, or engineering, from an accredited college or university, or an equivalent combination of training and relevant experience in uranium mill radiation protection. Two years of relevant experience are generally considered equivalent to one year of academic study;
- Health Physics Experience - At least one year of work experience, relevant to uranium recovery operation, in applied health physics, radiation protection, industrial hygiene, or similar. This experience must involve actual and significant work with radiation detection and measurement equipment, not strictly administrative or "desk" work;
- Specialized Training - At least four weeks of specialized classroom training in health physics specifically applicable to uranium milling. In addition, the RSO will attend refresher training on uranium mill health physics every two years; and
- Specialized Knowledge - A thorough knowledge of the proper application and use of all health physics equipment used at the proposed project, the chemical and analytical procedures used for radiological sampling and monitoring, methodologies used to calculate personnel exposure to uranium and its daughters, and a thorough understanding of the uranium recovery process and equipment used in the CPP, and how the hazards are generated and controlled during the uranium recovery process.

Radiation Safety Technician Qualifications

The Radiation Safety Technician (RST) will have one of the following combinations of education, training and experience:

- Education - An associate degree or two or more years of study in the physical sciences, engineering or a health-related field.
  - Training - At least a total of four weeks of generalized training (up to two weeks may be on-the-job training) in radiation health protection applicable to uranium recovery operations; and
  - Experience - One year of work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in a uranium recovery operation.
- Education - A high school diploma;

- Training - A total of at least three months of specialized training (up to one month may be on-the-job training) in radiation protection relevant to uranium; and
- Experience - Two years of relevant work experience in applied radiation protection.

The RST will demonstrate a working knowledge of the proper operation of health physics instruments used in the facility, surveying and sampling techniques, and personnel dosimetry requirements."

RAI-81

Description of Deficiency

Section 5.6.1, License Area and Facility Security, assigns responsibility for facility security to a management position not identified in Section 5.1.

Basis for Request

Section 5.6.1 states: "Visitors will only be allowed at the facility during regular working hours unless prior approval is obtained from the General Manager, Wyoming Operations." Section 5.1 of the TR does not include this position in the Corporate Organization Chart.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, by including the position of General Manager, Wyoming Operations, in the Corporate Organization.

RAI-81 Response

Uranium One has corrected the reference in Section 5.6.1 of the TR from General Manager, Wyoming Operations to the Mine Manager.

RAI-82

Description of Deficiency

Section 5.7.1.2.1.3, assigns responsibility for SERP functions to management positions not identified in Section 5.1.

Basis for Request

Section 5.7.1.2.1.3 states: "At least once per year, the Manager of Health, Safety, and Environmental Affairs will convene the SERP to review the cause of recent spills. The SERP will consist of at least three individuals with experience in operations. After reviewing the causes of recent spills, the SERP will send a report to the facility manager detailing reasonable recommendations on how to prevent and minimize the size of future spills." Section 5.1 of the TR does not include Manager of Health, Safety, and Environmental Affairs and Facility Manager in the Corporate Organization Chart.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to ensure that management positions having responsibility for health and safety and environmental management are included in the Corporate Organization Chart.

RAI-82 Response

Uranium One will revise Section 5.7.1.2.1.3 of the TR to be consistent with the management positions listed in Section 5.1 of the TR and revised Figure 5-1 (Organizational Structure).

RAI-83

Description of Deficiency

The information provided in TR Section 5.7.2 is not consistent with SRP Section 5.7.2.3 acceptance criterion (4).

Basis for Request

Acceptance criterion (4) of SRP Section 5.7.2.3 states that all monitoring equipment should have a LLD that allows measurements of 10 percent of the applicable limits. Planned surveys of external radiation are consistent with the guidance in Regulatory Guide 8.30, "Health physics Surveys in Uranium mills," Section 1 (NRC, 2002a).

In Section 5.7.2.1 Uranium One describes the MDL for gamma survey equipment, but does not describe the LLD. Regulatory Guide 8.30, states that all monitoring equipment should have an LLD that allows measurement of 10 percent of the applicable limits in 10 CFR 20.

Formulation of RAI

Provide the LLD of monitoring equipment as described in Regulatory Guide 8.30, "Health Physics Surveys in Uranium Mills," Section 1 (NRC, 2002).

RAI-83 Response

Uranium One believes Regulatory Guide 8.30 does not state that all monitoring equipment shall have an LLD which allows measurement of 10% of the applicable limits in 10 CFR 20. Regulatory Guide 8.30 stipulates an LLD for airborne constituents associated with uranium and radon progeny at 10% of the applicable limits in 10 CFR 20. External gamma survey equipment and contamination survey equipment referenced in Regulatory Guide 8.30 does not address an LLD recommendation of 10% of the regulatory limit. Therefore, Uranium One's listing of the MDL as provided for in Section 5.7.2 of the TR is appropriate and consistent with recommendations of Regulatory Guide 8.30.

RAI-84

Description of Deficiency

The information provided in TR Section 5.7.2 is not consistent with SRP Section 5.7.2.3 acceptance criterion (6).

Basis for Request

Acceptance criterion (6) of SRP Section 5.7.2.3 states that the application should present radiation dose levels for corrective action that are consistent with the 10 CFR Part 20 regulatory requirements. Uranium One did not establish, nor describe in the application, action levels for the dosimetry monitoring program above which the RSO should determine the cause and/or corrective actions. Recommendations for establishing actions levels for a monitoring program are found in Regulatory Guide 8.30, Section 4.6.

Formulation of RAI

Describe action levels for the monthly or quarterly personnel dosimetry monitoring.

RAI-84 Response

While Uranium One does not disagree with establishing a corrective action for dosimetry monitoring devices, the reviewer's reference to Section 5.7.2.3 criterion (6) of the SRP is debatable. This reference does not establish a specific corrective action level. This particular SRP citation states, "The applicant presents radiation dose levels for corrective action that are consistent with the 10 CFR Part 20 regulatory requirements." The discussion in 10 CFR 20 has no corrective action levels specified for dosimetry monitoring. In fact, historical data from uranium ISR facilities accurately depict dosimetry levels which are <10 percent and do not require monitoring under 10 CFR 20.

The NRC-approved Uranium One LRA of 2008 does include a 25 percent action level for airborne constituents. Theoretically, this could be applied to dosimetry badges. However, Uranium One questions whether the use of 25 percent for a dosimetry badge is ALARA. Uranium One believes rather than specify a corrective action level for dosimetry, the decision for such an action level should be left to the discretion of the RSO. Such responsibility, as noted in RG 8.30 (Sec. 4.6), is a part of the RSO's data review comparisons of analytical results to historical data whenever observed outliers are investigated.

A corrective action level for dosimetry be established, for consistency purposes, Uranium One proposes 25 percent of the annual limit of 1.25 rem/qtr or 0.3125 rem/quarter as the corrective action limit which is consistent with and Regulatory Guide 8.30 and 8.31.

RAI-85

Description of Deficiency

The information provided in TR Section 5.7.2 is not consistent with 10 CFR 20.1501 (survey for potential hazards) or Regulatory Guide 3.46 (Standard Format and Content for ISRs).

Basis for Request

In TR Section 5.7.2.1 it states,

The processing, drying and packaging of yellowcake activities are not proposed to be conducted at the proposed project and would not require beta surveys as recommended in USNRC Regulatory Guide 8.30, Section 1.4.

The staff believes Uranium One should conduct beta surveys due to the potential build-up of Pb-210, a beta emitter and a radon progeny.

Formulation of RAI

Uranium One should: (1) demonstrate what the static and scan MDC for alpha measurements are; and (2) either (a) propose measuring betas, or (b) relate the beta activity to the measured alpha activity. In order to have a relationship of alphas to betas, Uranium One will need to account for all sources of alphas and betas, including potential alpha and beta sources that are not in equilibrium with the uranium. This would apply to personnel and the release of items for unrestricted use (e.g. TR Section 5.7.6 Contamination Control).

RAI-85 Response

Regulatory Guide 3.46, Section 5.7.2 (External Radiation Exposure Monitoring Program), calls for the following items to be included:

- Instrumentation
- Equipment for determining exposures to employees
- Type of surveys to be conducted
- Frequency of surveys
- Action levels
- Management audits
- Corrective Action requirements

Section 5.7.2 of the Ludeman TR lists:

- Examples of instrumentation to be utilized
- List instruments and use of dosimetry for determining exposures
- Types of surveys are listed in Table 5-1 as well as frequency
- Action level listed as 2.0 mrem/hour surveyed on a monthly basis
- Management Audits is covered in Section 5.3
- Corrective actions are listed for levels at 5 mr/hr

Uranium One believes it is appropriate to follow the guidance as established in Regulatory Guide 8.30, Table 2, which lists 1,000 dpm/100cm^2 for alpha contamination of personnel and clothing utilized for uranium and its daughters in uranium recovery facilities.

SUA-1341, License Condition 11.9, details specific MDC limits for radiation instruments. Also, License Condition 11.9 states beta surveys are proposed for items being released for unrestricted use. The limit of 0.2 mr/hr or 5,000 dpm/100cm^2 is utilized as a requirement under License Condition 9.8 (paragraph 1).

RAI-86

Description of Deficiency

The information provided in TR Section 5.7.3 is not consistent with SRP Section 5.7.3.3 acceptance criterion (3).

Basis for Request

TR Section 5.7.3.1 states:

Routine airborne uranium particulate sampling is not proposed for the Satellite facilities at Ludeman because there is no elution, precipitation, or drying activity in these facilities that would be a potential source of airborne uranium. However, airborne uranium particulate monitoring may be necessary during some maintenance or other activities performed under an RWP. Airborne uranium monitoring required for these activities will be performed in accordance with the approved program under SUA-1341.

The TR does not address the potential build-up of other isotopes from residual spills and radon decay that may occur in the satellite facilities.

Staff notes that whereas in a conventional mill Th-230 is in secular equilibrium with U-238 and U-234, it is unlikely to be measured in an ISR plant because thorium is extremely insoluble and not observed to appreciably leach from the ore into groundwater or lixiviant. The half-lives of U-234 and Th-230 are too long to generate build-up of Th-230 from the decay of U-234 in the plant. Therefore, Th-230 build-up within satellite facilities is unlikely. However, Th-234, a U-238 progeny and beta-emitter with a 24 day half-life, approaches secular equilibrium with U-238 within 90 days. Radon-222 decays to several solid particles that tend to be electrically charged and can deposit on surfaces or attach to dust particles and build-up in if the ventilation is not adequate to ensure complete air exchange. Lead-210 and Po-210 are longer lived radon progeny that may be detected in air samples.

Formulation of RAI

Uranium One should include Th-234, Pb-210, or Po-210 in the air particulate sampling program or provide justification for their exclusion.

RAI-86 Response

Uranium One commits to conduct airborne uranium sampling on a frequency consistent with the requirements of 10 CFR 20 or the guidance contained in USNRC Regulatory Guide 8.25, "Air Sampling in the Workplace." Initially sampling will be collected on a monthly basis at the resin transfer bay (truck bay) for the Ludeman facility to be consistent with sampling conducted at the Christensen Satellite facility.

SUA-1341, License Condition 11.3, contains language requiring in-plant air particulate sampling for natural uranium, Ra-226, Po-210, Th-230 and Pb-210 once every 6 months for 2 years.

TR Section 5.7.3.1 now reads:

"Airborne uranium sampling will be performed on a frequency consistent with the requirements of 10 CFR 20 or the guidance contained in USNRC Regulatory Guide 8.25, "Air Sampling in the Workplace."

Measurement of airborne uranium is performed by gross alpha counting of the air filters using an alpha scaler such as a Ludlum Model 2000 with a 43-10 detector, Eberline SAC-4 or equivalent instrumentation. The current efficiency of the instruments listed above is 35 percent. The counting time is adjusted to assure the lower is 10 percent of the DAC listed in Appendix B of 10 CFR 20. Counting the airborne filters utilizing gross alpha activity is a conservative approach as results could include Uranium-238, Th-230, Pb-210, and Po-210."

RAI-87

Description of Deficiency

The information provided in TR Section 5.7.3 is not consistent with SRP Section 5.7.3.3 acceptance criterion (1).

Basis for Request

Acceptance criterion (1) of SRP Section 5.7.2.3 states that the applicant should provide one or more drawings that depict the facility layout and the location of samplers for airborne radiation and that locations of samplers should be consistent with Regulatory Guide 8.30. Figure 5.2 of the TR does not identify the location of air particulate samplers. Figure 5.2 only shows where Radon and gamma dose rates will be surveyed. Further, TR Section 5.7.3.1 states that routine airborne uranium particulate sampling is not proposed for the Ludeman satellite facilities because no drying or packaging activities will be conducted. Uranium One does not address the potential for spills which can be a source of airborne particulates. Although, Regulatory Guide 8.30 does not address sampling for spills, the regulatory guide states that the purpose for airborne uranium particulate sampling is to determine whether exposures to radioactive materials are being maintained ALARA as stated in 10 CFR 20.1101 and 20.1702.

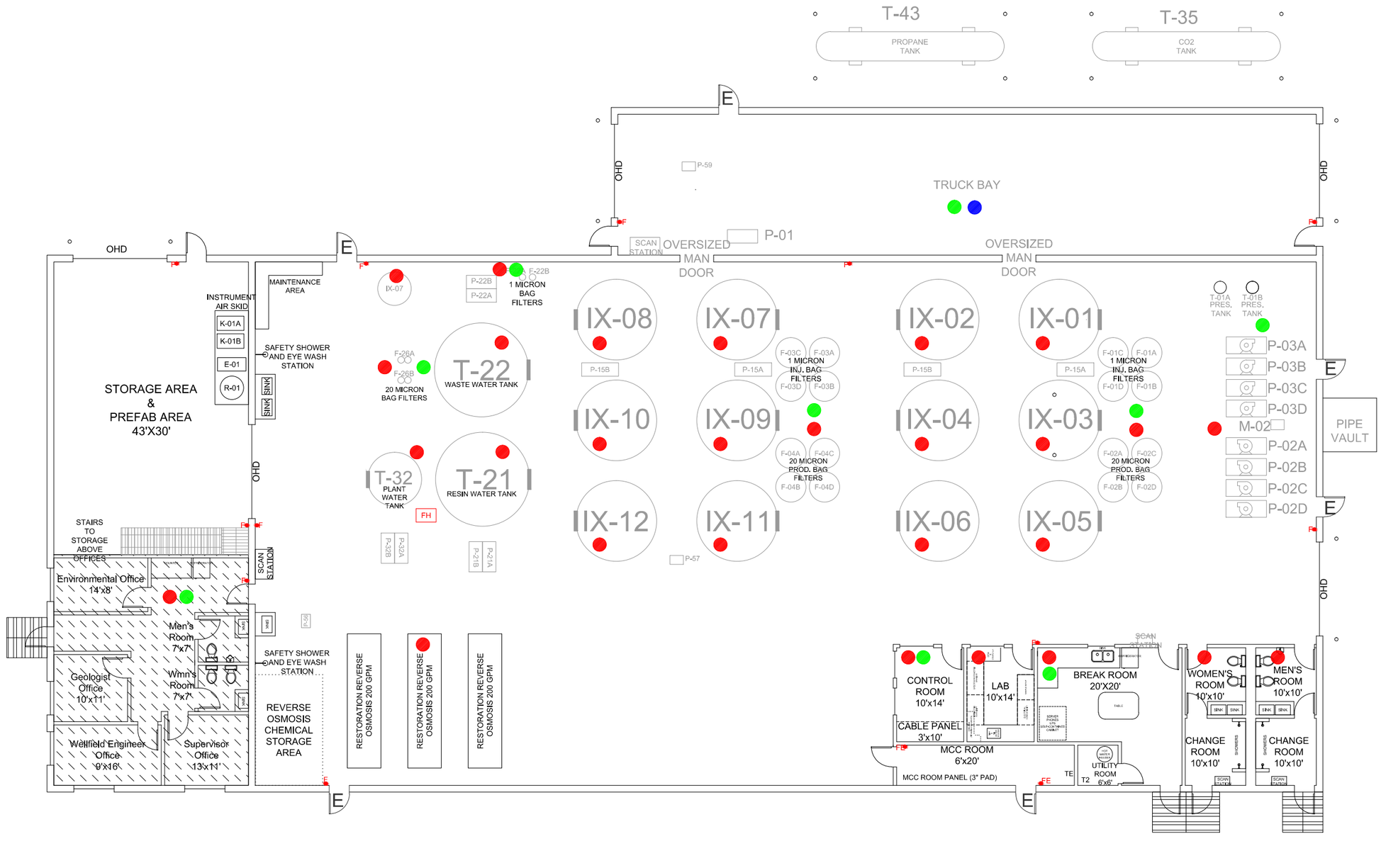
Formulation of RAI

Provide the location of airborne particulate sampling in the satellite facilities.

RAI-87 Response

Uranium One believes NRC meant to reference criterion (1) of SRP Section 5.7.3.1 rather than 5.7.2.3. As stated in Uranium One's response to RAI 86, airborne particulate sampling locations will be added to the satellite resin transfer bay areas and will be consistent with existing sampling locations at the Christensen Ranch Satellite facility which operates under SUA-1341.

Figure 5.2 of the TR was modified and is shown below:



DRAWING ISSUE TYPES: PRB = PRE-BID POB = POST-BID IFC = ISSUED FOR CONSTRUCTION POI = POST ISSUED FOR CONSTRUCTION

NO:	DATE	CADD	CHECK	APP'D	ISSUE / REVISION DESCRIPTION	NO:	DATE	CADD	CHECK	APP'D	ISSUE / REVISION DESCRIPTION

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IF THIS BAR DOES NOT EQUAL ONE INCH ADJUST SCALES ACCORDINGLY

PROJECT NO.:	CADD:	CHECKED BY:	APPROVED BY:	PLOT DATE:
8201-2013-103	DDJ	AJE	RD	6/6/2013

LUDEMAN SATELLITE PLANT
RADIOLOGICAL SAMPLING LOCATIONS
LUDEMAN ISR PROJECT
JOHNSON COUNTY, WY

FIGURE

20

DRAWING: Z:\CURRENT PROJECTS\8201 URANIUM ONE\8201-2013-103 LUDEMAN POND DESIGN\020-CAD\BASE\8201-2013-103-CDX-01-FACILITY-LAYOUT.DWG

RAI-88

Description of Deficiency

The information provided in TR Section 5.7.6 is not consistent with SRP Section 5.7.6.3 acceptance criterion (4).

Basis for Request

Acceptance criterion (4) in SRP Section 5.7.6.3, states the applicant should describe monitoring equipment by type, specification of the range, sensitivity, calibration methods and frequency.

TR Section 5.7.6 states that Uranium One will perform surveys for surface contamination in operating and clean areas in accordance with the guidelines contained in Regulatory Guide 8.30.

Uranium One states that it will conduct surveys for contamination of skin and personal clothing and surveys for release of equipment and materials in accordance with the current program approved in SUA-1341. The staff notes that current program approved in SUA-1341 does not address beta surveys. However, License SUA-1341 is currently under review for renewal and it does address the need for beta surveys.

Formulation of RAI

Provide a description of beta survey equipment and procedures to be used for contamination control and release of personnel and equipment.

RAI-88 Response

As stated in the response to RAI 85, Uranium One will utilize the guidance as provided in Regulatory Guide 8.30, Table 2, which lists 1,000 dpm/100cm^2 for alpha contamination of personnel and clothing utilized for uranium and its daughters in uranium recovery facilities.

For equipment release Uranium One will adhere to SUA-1341, License Condition 11.9, which requires beta surveys for release of equipment. The beta monitoring equipment is referenced in Section 5.7.2.1 of the TR.

RAI-89

Description of Deficiency

The information provided in TR Section 5.7.6 is not consistent with SRP Section 5.7.6.3 acceptance criteria (1) and (2).

Basis for Request

SRP Section 5.7.6.3 acceptance criteria (1) states that radiation surveys of workers will be conducted to prevent contaminated employees from entering clean areas or from leaving the site in conformance with guidance in Regulatory Guide 8.30.

SRP Section 5.7.6.3 acceptance criteria (2) states Requirements for a contamination control program are included in standard operating procedures or are discussed in the application.

The TR does not provide any details on requirements for a contamination control program, such as maintaining change areas and personal radiation monitoring before leaving radiation areas. Further, the TR does not discuss a contamination control program will prevent contaminated employees from entering clean areas or from leaving the site to ensure contamination limits comply with Regulatory Guide 8.30.

Formulation of RAI

Provide a description of radiation surveys of workers that will be conducted to prevent contaminated employees from entering clean areas or from leaving the site in conformance with guidance in Regulatory Guide 8.30 and 10 CFR 20.1501.

RAI-89 Response

The proposed Ludeman Project is an amendment to SUA-1341 which includes License Condition 9.8 requiring a Contamination Control Program. A Contamination Control Program will be developed for Ludeman in compliance with SUA-1341 once the Ludeman application is approved.

Section 5.7.6 of the TR states the Contamination Control Program will follow the guidance contained in Regulatory Guide 8.30. Table 5-1 provides a summary of the Radiological Monitoring Program which is consistent with Table 3 of Regulatory Guide 8.30.

To remain compliant with SUA-1341, Uranium One will establish SOPs for the Ludeman Project as required by License Condition 9.6. These SOPs will address surveys of clean areas and personal contamination surveys which will help establish action limits and contamination level limits consistent with Regulatory Guide 8.30.

RAI-90

Description of Deficiency

The information provided in TR Section 5.7.7 is not consistent with SRP Section 5.7.7.3 acceptance criteria (1) and (2).

Basis for Request

SRP Section 5.7.7.3 acceptance criterion (1) says the proposed airborne effluent and environmental monitoring program is consistent with Regulatory Guide 4.14, Sections 1.1 and 2.1 (NRC, 1980) and ALARA requirements as described in Regulatory Guide 8.37, Section 3.

SRP Section 5.7.7.3 acceptance criterion (2) says the proposed locations of the effluent monitoring stations are consistent with guidance in Regulatory Guide 4.14, Sections 1.1.1 and 2.1.2. Uranium One should consider site-specific aspects of climate and topography in determining the number and locations of off-site airborne monitoring stations and environmental sampling areas. The criteria used in selecting sampling locations should be given. All sampling locations should be clearly shown relative to the proposed facility, nearest residences, and population centers on topographic maps of the appropriate scale.

TR Section 5.7.7 implies that environmental monitoring is effluent monitoring and does not describe effluent monitoring stations that are consistent with guidance in Regulatory Guide 4.14, Sections 2.1, which states that stacks other than dryers should be sampled at least semiannually and adequate for the determination of the release rates and concentrations of uranium, thorium-230, radium-226, and lead-210.

The applicant must demonstrate compliance with 10 CFR 40, Appendix A, Criterion 8, which requires licensees ensure that all effluent releases are reduced ALARA. Uranium One states it will use MILDOS-Area to calculate effluent releases and describes environmental monitoring locations. However, models need to be validated with sampling to confirm calculations. Therefore, Uranium One is not consistent with SRP Section 5.7.7.3 acceptance criteria (1) and (2), which requires following sampling and ALARA recommendations in Regulatory Guides 4.14 and 8.37.

Formulation of RAI

Provide a description of how, in accordance with 10 CFR 40.65, the quantity of the principal radionuclides from all point and diffuse sources will be accounted for, and verified by, surveys and/or monitoring.

RAI-90 Response

Uranium One believes the concerns raised by the reviewer are covered by SUA-1341, License Condition 11.3 However, a brief discussion follows.

Regulatory Guide 4.14, Section 1.1.1, states "Air particulate samples should be collected continuously at a minimum of three locations at or near the site boundary. If there are residences or occupational structures within 10 kilometers of the site, a continuous outdoor air sample should be collected at or near at least one structure in any area where predicted doses exceed 5 percent of the standards in 40 CFR Part 190." That reference listed in 40 CFR Part 190 specifically excludes radon and its daughters, and limits exposure to 25 millirem per year to the whole body.

Because yellowcake drying will not occur at the Ludeman project satellite plant, the potential to be above the aforementioned 5 percent, 25 millirem limit with radon excluded, is minimal as shown by MILDOS modeling. Consequently, at a satellite facility such as Ludeman, the principal airborne radionuclide to be sampled is radon. In addition, 10 CFR 40.65 states reporting "must specify the quantity of each of the principal radionuclides released…"

Section 5.7.7.2 of the Ludeman application describes the monitoring proposed for the principal radionuclide or radon associated with a satellite facility. Additionally, direct gamma radiation is proposed as part of this environmental monitoring program.

RAI-91

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.1 discusses baseline monitoring programs for the wellfields. The TR does not state the density of wellfield baseline wells to be sampled to establish restoration target values. Staff generally recommends one well per acre of wellfield. Uranium One stated each well will be sampled four times at least 2 weeks apart. The first and second sample events will include all of the WDEQ Guideline 8 constituents. The third and fourth samples will have a reduced list of constituents known as Assay Suite B. Staff requires that all samples be analyzed for all WDEQ Guideline 8 constituents unless they were non-detect in the first two samples. Staff cannot have reasonable assurance that the wellfield ground water baseline has been statistically established without knowledge of the density of baseline wells and with less than four complete rounds of Guideline 8 samples.

Formulation of RAI

Uranium one should provide the density of wellfield baseline water quality wells for each proposed wellfield and a commitment to sample all baseline wells four times at least two weeks apart for all Guideline 8 constituents unless a constituent was non-detect in both of the first two samples to establish baseline water quality for each wellfield.

RAI-91 Response

The following language was added to Sec. 5.7.8.2:

"Uranium One will adhere to the wellfield density for monitor wells as noted in SUA-1341 (License Condition 10.3), Those density numbers are consistent with NRC guidance and other NRC-approved ISR operations."

The language in Sec. 5.7.8.2.1 has been revised to reflect the commitment of sampling protocol and wellfield density. It now reads:

"The Restoration Target Values (RTV's) are determined from the baseline water quality data and are used to assess the effectiveness of ground water restoration activities. The

average and range of baseline values determined for the wells completed in the Production Zone within the wellfield area constitute the RTV's. These wells will be sampled four times with a minimum of 2 weeks between samplings. Wells will be selected based on the density values outlined in SUA-1341 (License Condition 10.3). The first and second sample events will include analyses for all WDEQ LQD Guideline 8 constituents of concern which are listed in Table 5-3. If specific constituents are not detected during the first and second sampling events, then analysis of those constituents will not be conducted during the third and fourth sample events. Those third and fourth sampling events will be analyzed for the Assay Suite B analytes approved in SUA-1341 (i.e., Total Dissolved Solids, sulfate, chloride, conductivity, total alkalinity, pH, arsenic, selenium, natural uranium, and Ra-226)."

RAI-92

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.2, states that if a well in a low permeability aquifer does not recover sufficiently to allow two casing volumes to be removed or maintain a rate to check for stability of pH, conductivity, temperature and main constant water levels, a sample will be retrieved by pumping the well dry once and then bailing the water. Staff does not find this method provides reasonable assurance that a representative sample has been retrieved.

Formulation of RAI

Uranium One should provide a commitment to remove two casing volumes or use low flow sampling approved by the WDEQ to obtain samples. If a low permeability aquifer is encountered, which cannot be sampled using these methods, Uranium One should provide evidence that it does not meet the definition of an "aquifer."

RAI-92 Response

The proposed sampling methodology is consistent with the sampling protocol described within EPA RCRA Groundwater Monitoring Technical Enforcement Guidance Document (September 1986), Section 4.2.3, for sampling of a low yielding well. This sampling option was included in the application as a provision if a low-yielding well is encountered.

RAI-93

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.3 states that the overlying aquifer, underlying aquifer and perimeter ring monitoring wells will be sampled four times at least two weeks apart. The first sample will be analyzed for all WDEQ Guideline 8 constituents. The last three will be analyzed for a reduced list of constituents known as Assay Suite B. Staff requires that all samples be analyzed for all WDEQ Guideline 8 constituents unless they were non-detect in the first two samples. Staff cannot have reasonable assurance that the wellfield ground water baseline has been statistically established for the perimeter ring, overlying and underlying aquifers with less than four complete rounds of Guideline 8 samples.

Formulation of RAI

Uranium One should provide a commitment to sample all wellfield perimeter ring, overlying and underlying aquifer monitoring wells four times at least two weeks apart for all Guideline 8 constituents unless a constituent was non-detect in both of the first two samples to establish baseline water quality in the perimeter ring, overlying and underlying aquifers associated with the wellfield.

RAI-93 Response

The following language was added to TR Sections 5.7.8.2.1 and 5.7.8.2.3:

"The first and second sample events will include analyses for all WDEQ/LQD Guideline 8 constituents of concern which are listed in Table 5-3. If specific constituents are not detected during the first and second sampling events, then analysis of those constituents will not be conducted during the third and fourth sample events. Those third and fourth sampling events will be analyzed for the Assay Suite B analytes approved in SUA-1341 (i.e., Total Dissolved Solids, sulfate, chloride, conductivity, total alkalinity, pH, arsenic, selenium, natural uranium, and Ra-226)."

RAI-94

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

The TR does not discuss the location of the screen interval for the wellfield baseline monitoring wells or for the perimeter ring, overlying aquifer or underlying aquifer monitoring wells. Staff cannot have reasonable assurance that the baseline water quality or excursion monitoring is being conducted to ensure the safe operation of the wellfields without this information.

Formulation of RAI

Uranium One should provide the proposed location of the screen interval for all wellfield baseline monitoring wells and for the perimeter ring, overlying aquifer or underlying aquifer monitoring wells for each proposed wellfield at the Leuenberger, North Platte and Peterson Satellites. Uranium One should also provide a commitment to provide the "as-built" screen intervals for the wellfield baseline monitoring wells and the perimeter ring, overlying aquifer or underlying aquifer monitoring wells for each wellfield in the wellfield hydrologic data package.

RAI-94 Response

The wellfield, perimeter ring, overlying and underlying monitor well screened intervals will be provided in the WDEQ Wellfield Hydrologic Data Package. Revised language has been added to TR Section 5.7.8.2.4 that describes information that will be contained in the wellfield hydrologic data package including summary tables showing location, construction and completion details for monitoring wells. The revised language reads:

"At a minimum, the Wellfield Hydrologic Data Package will contain the following (Per WDEQ Guideline No. 4):

- Geologic demonstration of the lack of hydraulic connection and confinement between the production zone and vertically adjacent aquifer;
- Sufficient information to show that wells in the monitor well ring are in adequate communication with the production patterns;
- Maps including:

  - Anticipated locations of areas that will have topsoil salvaged in long term stockpiles and areas where recovery operations will take place but the topsoil will not be salvaged. Depth and volume of soil material that will be salvaged will also be presented;
  - A description of the proposed Production Unit (location, extent, etc.);
  - Proposed production patterns and all monitor well locations
  - Geologic cross-sections and cross-section location maps;
  - Isopach maps of the Production Zone sand, overlying confining unit and underlying confining unit;
- Discussion of how the hydrologic test was performed, including well completion reports;
- Discussion of the results and conclusions of the hydrologic test including pump test raw data, drawdown match curves, potentiometric surface maps, water level graphs, drawdown maps and when appropriate, directional transmissivity data and graphs; Baseline water quality information including proposed UCLs for monitor wells and Production Unit restoration target values;
- Proposed Target Restoration Values in accordance with WS. § 35-11-428 (a)(iii), Ch. 11 Section 3 (xiii) and Section 4 (a)(ii)(B);
- Summary tables showing location, construction and completion details for monitoring wells;
- MIT records for Class III Injection wells;
- Exploration drill hole and well abandonment records; and
- Any other information pertinent to the area tested will be included and discussed.

Uranium One may use the following approach or similar approach in preparation in the development of the wellfield data package:

1) Increasing resolution of the geologic and groundwater models;
2) Preparing the initial wellfield design;
3) Preparing a work plan for WDEQ/LQD review before conducting extensive field activities;
4) Installing additional baseline monitor wells;
5) Measuring hydraulic properties of the production zone and demonstrating the extent of hydraulic connection between the ore zone and perimeter monitoring wells;

6) Confinement between the production zone and the deep monitor zone and shallow monitor zone aquifers. Also, demonstrating the hydraulic characteristics of any influencing boundaries in or near the wellfield.
7) Installing perimeter monitor wells;
8) Providing Notices of Completion of Construction for Class III wells;
9) Conducting wellfield pump tests;
10) Providing groundwater model verification; and
11) Preparing and submitting the final wellfield package."

RAI-95

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.4 states that Uranium One will provide all wellfield hydrologic data packages to WDEQ for review. NRC staff must also receive the wellfield packages to verify the wellfield characterization did not uncover any unexpected features which may impact the safe operation of the wellfield as approved in the license and to have a record of the "as-built" wellfield.

Formulation of RAI

Uranium One should provide a commitment to provide all wellfield hydrologic data packages for the Leuenberger, North Platte and Peterson Satellites to NRC for verification.

RAI-95 Response

SUA-1341 as approved by NRC with License Condition 9.4, allows the licensee a Performance Based License that allows the SERP to put new wellfields into operations without going through the NRC amendment or approval process provided the stipulations of the license condition are met. The wellfield hydrologic data package goes through WDEQ/LQD review and approval before a wellfield is allowed to begin lixivant injection. Typically copies of the wellfield hydrologic data package are provided to NRC at such time WDEQ/LQD receives these documents. Uranium One requests information on what the NRC verification process would consist of and what time constraints, given the current NRC review time, this action could involve.

RAI-96

Description of Deficiency

The information provided in the TR Section 7.2.5 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

The TR does not provide any commitment or plan to conduct private well groundwater quality monitoring in any portion of the proposed license area. In Section 7.2.5.2.1 Uranium One stated it would conduct private well monitoring at the Negley Subdivision as required by NRC. NRC generally requires monitoring for all private wells within 2 km of a wellfield for one year before operations and quarterly during operations for constituents listed in Regulatory Guide 4.14. This sampling is necessary to provide NRC with the background water quality and operational water quality in private wells to ensure that they are not being contaminated by wellfield operations.

Formulation of RAI

Uranium One should provide a commitment to sample all private wells within 2 km of the proposed wellfields at all satellites quarterly for one year before operations and quarterly during operations for the constituents listed in Regulatory Guide 4.14 and provide these results in the semi-annual environmental and effluent reports submitted to NRC.

RAI-96 Response

The following language was added to TR Section 5.7.8.2:

"Selected private wells used for drinking water, livestock watering or crop irrigation within two kilometers of all wellfield area boundaries will be sampled quarterly for one year to establish baseline values prior to operations, and on a quarterly basis during operations, given the owner's consent. Groundwater samples will be analyzed for parameters as identified in Regulatory Guide 4.14 (Table 2). When well conditions allow, the water levels of these wells will also be taken during each sampling event. The subsequent groundwater quality results and water levels will be included in the semi-annual environmental and effluent reports submitted to NRC."

RAI-97

Description of Deficiency

The information provided in TR Section 7.2.5 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

In Section 7.2.5.1 Uranium One provided a commitment to monitor the background water levels in selected private domestic and livestock water wells surrounding the project area before extraction begins and every three months during operation. The TR, however, did not specify which wells would be monitored or their location relative to the proposed wellfields at the Leuenberger, North Platte or Peterson Satellites. Staff is concerned that although the geological interpretation provided in Addendum 2.7-F purports that none of the Negley wells are completed in the 80 and 90 ore sands, substantial uncertainty remains, given the heterogeneity of these and the overlying sands in the Ft. Union and the lack of aquifer pumping tests in and near the Negley Subdivision. The staff cannot therefore conclude that all of the Negley wells are completely isolated from the targeted 80 and 90 ore sands. Staff is also concerned with the lack of characterization of private wells around the North Platte and Peterson Satellites which may be impacted (addressed in a prior RAI). Staff notes that a commitment to measure water levels quarterly in private wells within 2 km of the proposed wellfields at all of the satellites before and during operations would provide reasonable assurance that impacts to private wells from the operations in the targeted ore sands are being detected so they may be evaluated.

Formulation of RAI

Uranium One should provide a commitment to measure water levels quarterly in private wells within 2 km of the proposed wellfields at the Leuenberger, North Platte and Peterson Satellites before and during operations to provide reasonable assurance that the operations in the targeted ore sands are not impacting private wells. Uranium One should commit to provide these water level measurements in the semi-annual environmental and effluent reports submitted to NRC. Uranium One should provide the name, location, screen interval (s) and depths of all wells to be monitored.

RAI-97 Response

See RAI-96 for response to this RAI..

RAI-98

Description of Deficiency

The information provided in TR Addendum 2.7-F does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

The TR provided an analysis of the Negley Subdivision private wells and the historical and potential impact of ISR operations at the Leuenberger Satellite on these wells in Addendum 2.7-F. Staff determined that Uranium One had provided the incorrect ground surface elevations for the majority of these wells. Uranium One performed an elevation survey of the wells in early 2012, and provided the values to the NRC. However, not all tables and figures in Addendum 2.7-F and other parts of the application were updated to reflect corrected well ground surface elevations from the survey. Staff used the corrected elevations to re-evaluate the completion intervals and potential safety concerns with operation of the Negley wells; however, this information must be corrected in the application to provide reasonable assurance that all technical information in the application is valid.

Formulation of RAI

Uranium One should update all references, discussions, tables and figures in Addendum 2.7-F and the application to reflect corrected well ground surface elevations of the Negley Subdivision private wells from the early 2012 survey.

RAI-98 Response

Uranium One has updated the references, discussions and figures in TR Addendum 2.7-F of the application to reflect the correct well ground surface elevations of the Negley Subdivision private wells. The revised table is shown below:

Table 7: Summary of Negley Subdivision Wells

Well Name	SEO Well ID	Surface Elevation (ft amsl)	Casing ID (in.)	TD (ft bgs)	TD Elev (ft amsl)	Completion Interval (ft bgs)	Potential Completion Sand
N-1	Zwetzig #2	5220.0	5"	131	5089	71-131	110 Sand
N-2	Zwetzig #1	5237.7	5"	120	5117.7	80-120	110 Sand
N-3	Yoder Negley #6	5268.3	5"	120	5148.2	40-120	120 Sand
N-4	Yoder Bourquin #2	5256.1	5"	200	5056.1	140-200	110 Sand
N-5	Yoder Bourquin #1	5266.4	5"	125	5141.4	60-125	120 Sand
N-6	Yoder Teton MW KT2	5242.1	5"	196	5046.1	106-186	110/100 Sand
N-7	Yoder Negley #5	5271.7	6"	120	5151.7	80-120	110/120 Sand
N-8	Woeck	5215.0	10"	380	4835	340-380	80 Sand
N-9	Vollman Windmill #2	5370.7	5"	180	5190.7	SEO Doc NA	120 Sand
N-10	Vollman Windmill #1	5226.1	5"	150	5076.1	na	110 Sand
N-11	Vollman #1 (House)	5324.6	5"	140	5184.6	SEO Doc NA	120 Sand
N-12	Sexon	5261.9	5"	160	5101.94	120-160	110/100 Sand
N-13	Raney	5275.1	5"	210	5065.1	200-210	110 Sand - 100/110 Shale
N-14	Ossa #2	5272.7	6"	180	5100	135-175	110 Sand - 100/110 Shale
N-15	Ossa #1	5258.1	5"	195	5063.1	160-195	110 Sand - 100/110 Shale
N-16	Milligan #2	5251.4	6"	160	5091.4	120-160	100 Sand - 100/110 Shale
N-17	Milligan #1	5235.7	5"	180	5055.7	140-180	110 Sand - 100/110 Shale
N-18	Hull	5220.7	5"	130	5090.7	50-130	110 Sand
N-19	Hart	5204.7	5"	135	5069.7	95-135	110/100 Sand
N-20	Geho #2	5269.3	5"	180	5089.3	120-160	110 Sand
N-21	Geho #1	5277.8	5"	180	5097.8	140-180	110 Sand
N-22	Dunnahoe	5265.0	5"	180	5085	135-175	110 Sand
N-23	Albaugh	5242.1	5"	165	5077.1	na	110 Sand

RAI-99

Description of Deficiency

Section 5.7.11, Quality Assurance Program, is not consistent with the recommendations in Regulatory Guide 4.15.

Basis for Request

Section 5.7.11 states: "A Quality Assurance (QA) program will be implemented at the proposed Ludeman project consistent with the recommendations contained in Regulatory Guide 4.14 Sections 3 and 6 and Regulatory Guide 4.15 (NRC 1979)." The description of the QA Program in Section 5.7.11 should reference Regulatory Guide 4.15, Rev. 2, 2007. In addition, the description of the QA Program does not include: (1) records management; (2) environmental sampling quality control; (3) quality control for radioactive effluent monitoring system; (4) verification and validation; and (5) corrective actions.

Formulation of RAI

Uranium One should revise Section 5.7.11 of the TR, and all other applicable sections of the TR, to ensure that the discussion of the QA Program is consistent with Regulatory Guide 4.15.

RAI-99 Response

Regulatory Guide 4.15 (Revision 2, July 2007), Section D, clearly states, "Non-nuclear power reactor applicants and licensees may continue to use Revision 1 of Regulatory Guide 4.15, dated February 1979…" Uranium One believes both the reference to and guidance contained within RG 4.15 (Revision 1, 1979) remain valid and appropriate. Each of the concerns raised by the reviewer are contained in RG 4.15 (Revision 1). In addition, Uranium One will adhere to License Conditions 9.6 and 11.3 in SUA-1341. These license conditions contain stipulations which mirror some of the concerns raised by the reviewer.

Groundwater Restoration, Surface Reclamation, and Facility Decommissioning

RAI-100

Description of Deficiency
The information provided in Section 6.1 is incorrect.

Basis of Request
Sections 6.1.2 and 6.1.4.2 incorrectly identify the N sand at the Leuenberger Satellite as the "70" sand. The N sand is equivalent to the 90 sand at the proposed Leuenberger Satellite.

Formulation of RAI
Please correct the error with naming convention for sands at the Leuenberger Satellite in all of Section 6.1.

RAI-100 Response

Uranium One revised TR Section 6.1 with the correct naming convention for sands in the Leuenberger area. Uranium One is also further evaluating the geologic setting based on additional data that was not available during the development of the initial application.

RAI-101

Description of Deficiency
The information provided in Section 6.1 is incorrect.

Basis of Request
Section 6.1.4 refers to Figures 6-A-1 through 6-A-5 of the Irigaray Report (Cogema, 2004) to show that RO was often continued for several PVs beyond the point that groundwater quality had stabilized. NRC staff notes these figures are not in the Irigaray Restoration Report dated July 2004 or in the application.

Formulation of RAI
Please correct the reference to Figures 6-A-1 through 6-A-5 of the Irigaray Report (Cogema, 2004) in Section 6.1.4. These figures were not found in this report or in the application.

RAI-101 Response

The reference to Figures 6-A-1 through 6-A-5 is accurate. These figures are located in Addendum 6-A of the application. To clarify the location of the figures the following text was inserted in TR Sec. 6.1.4:

"Figures 6-A-1 through 6-A-5 of Addendum 6-A of the Irigaray report show that RO was often continued for several PVs beyond the point that groundwater quality had stabilized."

RAI-102

Description of Deficiency

The information provided in Section 6.1 is inconsistent with other sections of the TR.

Basis of Request

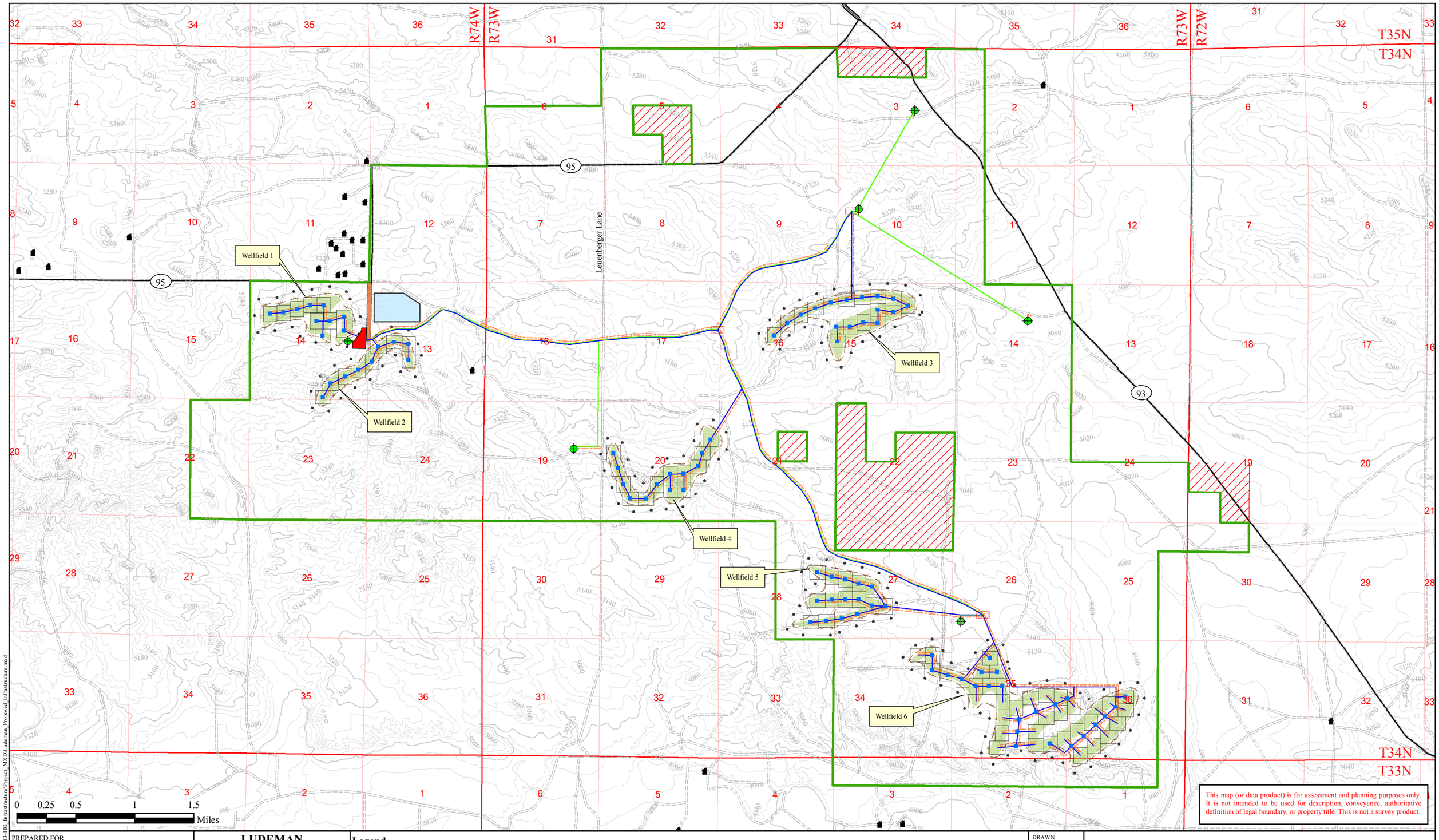
Section 6.1.5 provides a discussion of the restoration schedule. It estimates the restoration pore volumes and time for Wellfields 1 and 2 and then addresses Wellfields 3-7. The naming convention in the majority of the application is for Wellfields 1-3 for the Leuenberger Satellite, Wellfields 1-2 for the North Platte Satellite and Wellfields 1-2 for the Peterson Satellite.

Formulation of RAI

Please maintain the naming convention of Wellfields 1-3 for the Leuenberger Satellite, Wellfields 1-2 for the North Platte Satellite and Wellfields 1-2 for the Peterson Satellite throughout the application and in Section 6.1.5 and Figure 6-1.

RAI-102Response

Due to the elimination of the North Platte and Peterson Satellites the naming convention of the wellfields was revised to Wellfields 1-6 to remain consistent with the Ludeman Mine Permit Application submitted to WDEQ/LQD. In addition, Wellfield 3 at the Leuenberger Satellite has been incorporated into Wellfield 1. The figure below depicts the revised infrastructure and wellfield naming convention for the proposed project and will be inserted in TR Section 2.1.



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PREPARED FOR

uranium one
investing in our energy

LUDEMAN PROJECT
CONVERSE COUNTY, WY

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Engineering & Environmental Management
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Phone: (307) 265-0696
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Legend

- Ludeman Project Boundary
- Excluded Area
- Fenced Area
- Residence
- Header House
- Trunkline
- Deep Disposal Well
- Deep Disposal Well Pipeline
- Well Pattern
- Wellfield
- Monitor Well Ring
- Booster Station
- Primary Access
- Secondary Access Road
- Evaporation Ponds Area
- Satellite Plant Area

N W E S

DRAWN BY: RMD
CHECKED BY: CT
APPROVED BY: RMD

Conceptual Infrastructure

REV #	DESCRIPTION	BY	DATE	FIGURE
0	For Submittal	RMD	3-22-13	21
1	Revisions made - Final Draft for Review	CAT	4-9-13	

Path: O:\WY Projects\8201-2013-102_Infrastructure\Project MXD\Ludeman Proposed Infrastucture.mxd

RAI-103

Description of Deficiency
The information provided in Section 6.1 is incorrect.

Basis of Request
Sections 6.1.6 and 6.1.7 provide a discussion of effectiveness of the restoration techniques and impacts of groundwater restoration. These sections reference the post mining water quality in Section 6.1.2, when it appears the intent was to reference post-restoration water quality (e.g., reference to Table 6.-2).

Formulation of RAI
Please review these Sections 6.1.6 and 6.1.7 and consider a rewrite to improve the discussion and to present a table of post-restoration water quality as was done for post-mining water quality in Section 6.1.2.

RAI-103 Response

The following language and its associated table (shown below) were added to the two sections (TR 6.1.6 and 6.1.7) in question:

"6.1.6 Effectiveness of Groundwater Restoration Techniques

Monitor wells that were used to establish baseline water quality in the production zone for each wellfield prior to the start of ISR operations will be the same wells used to monitor groundwater restoration progress. Groundwater restoration methods described in this application have been successfully applied at other ISR operations in Wyoming's PRB. ISR operations that have utilized the proposed restoration techniques presented in this application have obtained regulatory approval for groundwater restoration. Several of the successful groundwater restoration operations have been located near the proposed Ludeman Project and have used the proposed restoration methods in similar formations with very similar operational techniques. The following information details the success of two ISR operations that have used the restoration methods proposed by Uranium One and are located within the Powder River Basin (PRB).

6.1.6.1 Irigaray Uranium Project

The Irigaray/Christensen Ranch Uranium Project operated by COGEMA Mining, Inc. has received both WDEQ and NRC approval for groundwater restoration for Wellfields 1

through 9 at Irigaray, following commercial operation of the wellfields and groundwater restoration. When restoration of the wellfields was completed, 27 of the 29 constituents were restored to their restoration target values. Only bicarbonate and manganese did not meet their restoration target value, but the two constituents did meet the WDEQ-WQD pre-operational class of use criteria. Based on these results, the WDEQ determined that the groundwater had been returned to its pre-mining class of use and that restoration was complete. Table 6.3-A reflects these values.

In 2006, the NRC agreed with the DEQ determination that restoration was complete and that Wellfields 1 through 9 had been restored in accordance with the applicable regulatory requirements.

6.1.6.2 Smith Ranch/Highland Uranium Project

The Smith Ranch-Highland Uranium Project currently operated by Cameco Resources, Inc. (formerly PRI) has had an R&D and a commercial wellfield approved as restored, by both the NRC and WDEQ. In 2004 the A-Wellfield was approved by both agencies as restored, after commercial operation, to applicable regulatory standards. Not all of the parameters were returned to baseline conditions, but the groundwater quality was consistent with the WDEQ/WQD pre-operational class of use. During the active phase of groundwater restoration of the A-Wellfield, PRI employed groundwater sweep and RO treatment with permeate injection, and used a sulfide (H_2S) as a reducing agent. These are some of the same methods proposed by AUC for groundwater restoration at the proposed project.

In 1987, the NRC confirmed the restoration of the Q-Sand Project. Although one well exhibited uranium and nitrate levels above the restoration target values, the wellfield water quality averages, as a whole, were below the target values.

Table 8: Effectiveness of Groundwater Restoration Techniques

Parameter (units)	Christensen Ranch Post-Reclamation Mean (MUs 2)	Christensen Ranch Post-Reclamation Mean (MUs 3)	Christensen Ranch Post-Reclamation Mean (MUs 4)	Christensen Ranch Post-Reclamation Mean (MUs5)	Range of Post Mining Mean Concentrations (MU2-MU5)	Range of Post Mining Mean Concentrations For All Projects
Dissolved Aluminum (mg/l)	0.1	0.1	0.11	0.11	0.11	0.105
Ammonia as N (mg/l)	0.1	0.11	0.2	0.1	0.13	0.1275
Dissolved Arsenic (mg/l)	0.008	0.01	0.006	0.008	0.008	0.008
Dissolved Barium (mg/l)	<0.50	<0.50	<0.50	<0.50	0.5	0
Boron (mg/l)	0.05	0.07	0.06	0.07	0.06	0.0625
Dissolved Cadmium (mg/l)	0.002	0.002	0.002	0	0.002	0.0015
Dissolved Chloride (mg/l)	9.6	5.6	19.3	11.4	11.5	11.475
Dissolved Chromium (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01
Dissolved Copper (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01
Fluoride (mg/l)	0.1	0.1	0.12	0.1	0.11	0.105
Dissolved Iron (mg/l)	0.43	0.28	0.36	0.1	0.29	0.2925
Dissolved Mercury (mg/l)	0.001	0.001	0.001	0.001	0.001	0.001
Dissolved Magnesium (mg/l)	7.6	6.2	9.1	7.2	7.6	7.525
Total Manganese (mg/l)	0.25	0.12	0.14	0.08	0.15	0.1475
Dissolved Molybdenum (mg/l)	0.02	0.02	0.02	0.02	0.02	0.02
Dissolved Nickel (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate + Nitrite as N (mg/l)	0.1	0.16	0.31	0.12	0.17	0.1725
Dissolved Lead (mg/l)	0.02	<0.02	0.02	0.02	0.02	0.015
Radium-226 (pCi/L)	223.9	195.6	114.1	238	192.9	192.9
Dissolved Selenium (mg/l)	0.01	0.01	0.21	0.41	0.16	0.16
Dissolved Sodium (mg/l)	109.8	109	226.6	157	150.6	150.6
Sulfate (mg/l)	154.4	174.8	210.5	159	174.7	174.675
Uranium (mg/l)	0.36	0.12	3.83	2.05	1.59	1.59
Vanadium (mg/l)	0.1	0.03	0.07	0.12	0.08	0.08
Dissolved Zinc (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01
Dissolved Calcium (mg/l)	73.6	46.6	42.7	35.6	49.6	49.625
Bicarbonate (mg/l)	330.3	222.6	446.5	356.6	339	339
Carbonate (mg/l)	1	5	1.7	1.2	2.2	2.225
Dissolved Potassium (mg/l)	1.4	1.6	3.6	4	2.75	2.65
Total Dissolved Solids (TDS) @ 180°F (mg/l)	560	492.6	774.7	589.2	604.1	604.125

6.1.7 Potential Environmental Impacts of Groundwater Restoration

Groundwater restoration, specifically other ISR operations in the PRB, has proven successful utilizing techniques discussed in the application. Uranium One expects that groundwater restoration at the proposed project will also be successful, utilizing the proven techniques that have been discussed. The goal of the groundwater restoration is to restore the affected groundwater consistent with the RTVs and Criterion 5 requirements. However, regardless of the restored groundwater quality in the production zone, the groundwater adjacent to the wellfields must be fully protected outside the aquifer exemption boundary, to applicable EPA Maximum Contaminant Levels (40 CFR 141 as amended July 1, 2001). If during groundwater restoration, a constituent cannot, using BPT and ALARA, be restored consistent with its RTV within the wellfield, Uranium One will apply for an ACL and will demonstrate that leaving the constituent at a higher concentration will not be a significant threat to public health and safety, to the environment, now or in the future. With the proven application of the best practicable technology and ALARA for groundwater restoration, and the in-place regulatory requirements of NRC and the WDEQ, there will be no adverse impact on the water quality of groundwater in adjacent, non-exempt aquifers (NRC, 2009). Effects of groundwater restoration are discussed in more detail for all aspects of the restoration process in Section 4 of the ER. Uranium One can conduct both uranium recovery and groundwater restoration effectively and in compliance with NRC requirements.

Uranium One has estimated post-mining groundwater quality restoration values based on the results achieved by COGEMA Mining, Inc. (Cogema, 2004). Results from Production Units 1 through 9 at the Willow Creek ISR project, located in the Powder River Basin near the proposed project, and is described in Section 6.1.6. The Irigary data was selected because of the availability of extensive quantities of relevant data, its general proximity to the proposed Ludeman Project, and the similar geologic conditions with respect to the proposed project site. COGEMA employed ammonium bicarbonate with hydrogen peroxide as the oxidant during early mining operations. In May 1980, the lixiviant system for the entire site was converted to sodium bicarbonate chemistry with gaseous oxygen as the oxidant. The water quality database is extensive because it represents nine production units located in a 30-acre site.

The groundwater quality of the Willow Creek Production Zone after mining was established by sampling each of the designated restoration wells. The post-mining values as shown in Table 6-2 can be compared to the ground water restoration values from the

Christensen Ranch Production Units 2 through 5 values as presented in presented Table 6-3-A. The chemical alteration of the Production Zone Aquifer can be observed through comparison of the post-mining mean concentrations with the baseline concentrations. Uranium One anticipates similar baseline and post-mining groundwater quality at the proposed Ludeman Project."

RAI-104

Description of Deficiency
The information provided in Section 6.1 is incorrect.

Basis of Request
Section 6.1.7.1 is stated to be a discussion of alternatives for groundwater quality restoration, but is actually a discussion of disposal alternatives for liquid wastes.

Formulation of RAI
Please review Section 6.1.7.1 and consider a rewrite to improve the discussion.

RAI-104 Response

Discussion of disposal alternatives for liquid waste has been removed from Section 6.1.7.1 and placed into Section 8.1.7 (Alternate Waste Management Options). Section 6.1.7.1 has been modified and reads as follows:

"6.1.7.1 Alternatives for Groundwater Quality Restoration

Various potentially viable groundwater restoration techniques have shown to be successful at other ISR recovery operations in the Powder River Basin. The groundwater sweep, permeate/reductant injection and groundwater treatment have been documented to successfully restored groundwater to pre-mining quality.

All the historical and proposed aquifer restoration methods consume some volume of groundwater. Groundwater recovered during groundwater sweeps is generally disposed directly into the wastewater treatment system. Approximately 20 to 25 percent of the groundwater treatment flow through the RO system is disposed as RO brine. This consumption of groundwater is an unavoidable consequence of groundwater treatment. Impacts and groundwater usage during operations and restoration are discussed in more detail in Section 7.2.5.1."

RAI-105

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

Uranium One did not provide a commitment to restore the production zone aquifer in all proposed wellfields and any groundwater impacted by excursions to standards in Criterion 5B(5) in Appendix A of 10 CFR Part 40.

Formulation of RAI

Uranium One should provide a commitment to restore the production zone aquifer in all proposed wellfields and any other groundwater impacted by excursions to the standards in Criterion 5B(5) in Appendix A of 10 CFR Part 40.

RAI-105 Response

The concerns raised by the reviewer are included in License Condition 10.15 of SUA-1341. This particular license condition outlines ground water restoration and includes reference to 10 CFR 40, Appendix A, Criterion 5(B)(6) which subsequently references Criterion 5(B)(5). Uranium One will adhere to the ground water restoration stipulations contained in SUA-1341. The following language was added to TR Section 6.1:

"Groundwater will be restored consistent with the groundwater protection standards contained in 10 CFR 40, Appendix A, Criterion 5(B)(5) on a constituent-by-constituent basis using BPT and ALARA. Criterion 5(B)(5) requires that the concentration of each constituent not exceed:

(a) The approved baseline conditions or Restoration Target Values (RTV), as described in TR Section 6.1.1, below;

(b) The respective value given in the table in paragraph 5C, Maximum Values for Ground-Water Protection, 10 CFR 40, Appendix A if the constituent is listed in the table and if the background level of the constituent is below the value listed; or

(c) An alternate concentration limit (ACL) established by the Commission.

Uranium One commits to a primary goal of groundwater restoration to return all constituents to the approved RTV within the range of statistical variability (NUREG

1569, Section 6.1.3 (4)(a)) for each wellfield (Criterion a, above). However, ISR operations will alter the groundwater geochemistry within the production zone; therefore, it is possible that some constituents will not be returned to RTV. If the primary goal cannot be achieved for some constituents after restoration efforts that are demonstrated to be both in accordance with BPT and ALARA, then Uranium One will attempt to restore the groundwater constituents which are listed in the table in paragraph 5C to those standards (Criterion b above). If during the application of BPT significant improvement in groundwater quality ceases, and some constituents have not been returned to RTV or the table in paragraph 5C standards, then Uranium One will submit a license amendment application requesting approval of ACLs pursuant to Criterion 5(B)(6), 10 CFR 40, Appendix A, for these constituents from the NRC (Criterion c above).

Uranium One recognizes that while prior Class-of-Use is not a standard in the context of Criterion 5(b)(5), NRC has recognized that demonstration of compliance with Wyoming's Class-of-Use standards can be a component of an application for an ACL."

RAI-106

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

In Section 6.1.4 the TR provides a discussion of estimates of the pore volumes required for complete restoration. However, the TR does not include any description of the methods which will be used to determine a pore volume and its flare factor for the confined aquifer or unconfined aquifers located in the targeted ore zones in the proposed wellfields at the Leuenberger, North Platte or Peterson Satellites. The TR also did not provide initial estimates of the pore volume and flare factors for ore zone aquifers in all the proposed wellfields. Staff requires an estimate of pore volume for each wellfield to review proposed restoration schedules using the estimated restoration/waste disposal rates to provide reasonable assurance that restoration will be conducted safely and in a timely manner.

Formulation of RAI

Uranium One should provide: (1) the methods which will be used to determine a pore volume and its flare factor for the targeted ore zone aquifers at each proposed wellfield; and (2) initial estimates of one pore volume and flare for each of the proposed wellfields for the Leuenberger, North Platte or Peterson Satellites.

RAI-106 Response

The following language was added to TR Section 6:

$$PV = A \times T \times FF \times P \times CF$$

Where:
A= wellfield pattern area (square feet)
T = average completed thickness (feet)
FF = flare factor (unit less)
P = effective porosity (percent)
CF = conversion factor (7.48 gallons per cubic foot)

The “average completed thickness” in this equation is the average screened interval of the production wells screened in the production sand unit for uranium recovery operations. Uranium One is using a flare factor of 1.44 for the surety estimate which is consistent with other ISR operations. Using the equation provided above, The initial estimates of one pore volume and flare for Wellfields 1-6 is provided in ER Appendix E.

RAI-107

Description of Deficiency

The information provided TR Section 6.1.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

TR Section 6.1.8.2 states that Uranium One will perform stability sampling for a restored wellfield at the beginning, middle, and end of a one year stability period. NRC requires at least four consecutive quarterly samples which show no statistically significant increasing trends to establish stability to provide reasonable assurance that the restoration is stable.

Formulation of RAI

Uranium One should provide a commitment to obtain at least four consecutive quarterly samples which show no statistically significant increasing trends to establish stability for each constituent in the restored wellfield.

RAI-107 Response

Uranium One reminds the reviewer that License Condition 10.15 of SUA-1341 does in fact outline the same sampling frequency raised in the RAI. In addition, the following language has been added to TR Section 6.1.8.2:

"As specified in the recently revised WDEQ/LQD Guideline 4 (Part IV)(B)(7)(b), a minimum 12-month groundwater stability monitoring period is required to show that the restoration goal has been adequately maintained. During this stability phase of groundwater restoration Uranium One will sample the same wells used for baseline groundwater characterization of each wellfield. The following restoration stability monitoring program will be performed during the stability period:

- The groundwater monitoring ring wells and the production zone wells will be sampled quarterly and analyzed for the excursion parameters (chloride, total alkalinity (or bicarbonate) and conductivity);
- Uranium One proposes to perform four rounds of stability monitoring sampling of the M-Wells and the MP Wells. This includes an initial sampling event at the end of active groundwater restoration, followed by additional rounds of sampling approximately three months apart. This will provide four samples over four

quarters. The M-Wells and the MP-Wells will be sampled and analyzed for the parameters in Table 6-4; and

- If necessary, Uranium One will continue stability monitoring until four consecutive quarters of data indicate that constituent concentrations of concern do not demonstrate any statistically significant increasing trends."

RAI-108

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

The TR does not specifically state that the wells used to determine restoration completion and stability in a wellfield would be the same wells used to establish the baseline water quality. This commitment is needed to remove any spatial uncertainty in the comparison of the restored water quality to baseline water quality.

Formulation of RAI

Uranium One should provide a commitment to use the same wells to determine restoration completion and stability in a wellfield as were used to establish the baseline water quality for the wellfield.

RAI-108 Response

See RAI-107 for response to this comment.

RAI-109

Description of Deficiency

The information provided in TR Section 6.1.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

TR Section 6.1.8 describes the monitoring which will be undertaken during restoration. However, it does not provide a commitment to continue excursion monitoring of the wellfield after restoration stability monitoring is completed and until the restoration is approved. This commitment is needed to provide reasonable assurance that excursion monitoring will continue until the wellfield is approved for unrestricted release.

Formulation of RAI

Uranium One should provide a commitment to continue excursion monitoring of the wellfield after restoration stability monitoring is completed and until the restoration is approved.

RAI-109 Response

Uranium One commits to continue excursion monitoring of the wellfield after restoration stability monitoring is completed and upon restoration approval. The following paragraph was added to TR Section 6.1.8.1:

"Uranium One will provide the NRC and WDEQ with each wellfield groundwater restoration report for review and approval. Uranium One will continue excursion monitoring of the wellfields following the stability monitoring phase until final approval of groundwater restoration is received or NRC approval is received. Uranium One proposes decreasing the sampling frequencies to once every 180 days during this review period, with wells being analyzed for the excursion parameters chloride, total alkalinity and conductivity. Water levels will also be measured at these wells prior to sampling."

RAI-110

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

The TR does not provide a commitment to maintain a hydrologic bleed sufficient to control the migration of process or restoration solutions from the production zone until active restoration is completed. This commitment is needed to have reasonable assurance that hydraulic control of fluids in the wellfield will be maintained until restoration stability is initiated.

Formulation of RAI

Uranium One should provide a commitment to maintain a hydrologic bleed sufficient to control the migration of process or restoration solutions from the production ore zone at all wellfields until active restoration is completed.

RAI-110 Response

This language was added to TR Section 6.1.8.1:

During groundwater restoration activities, lixiviant injection is discontinued and a bleed volume is maintained to ensure sufficient hydraulic control is maintained to prevent migration of solution from the production zone. This bleed volume will also help accelerate the restoration of groundwater quality back to RTV standards. As a result, the possibility of an excursion is greatly reduced; therefore, the monitor ring wells (M Wells), the overlying aquifer monitor wells (MO- or MS-Wells) and the underlying wells (MU- or MD-Wells) sampling frequencies will be decreased from once every two weeks to once every 60 days during restoration. Wells will be analyzed for excursion parameters chloride, total alkalinity and conductivity. Water levels will also be measured at these wells prior to sampling.

RAI-111

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

The TR does not provide a commitment to provide NRC with a restoration report for review and approval for each restored wellfield.

Formulation of RAI

Uranium One should provide a commitment to provide NRC with a restoration report for review and approval for each restored wellfield.

RAI-111 Response

See RAI-109 for response to this RAI.

RAI-112

Description of Deficiency

TR Section 6.2.4 is not consistent with SRP Acceptance Criteria 6.2.3(4).

Basis for Request

Section 6.2.4 states: "As a result, the pre-operation contours shown on Figure 2.1-1 will generally emulate post-production contour." SRP, Acceptance Criteria 6.2.3(4), requires that the application should include a pre-construction surface contour map and a description of planned surface reclamation activities that will be employed to restore the surface to pre-operations condition. The application includes a pre-operation surface contour map, Figure 2.1-1. However, the map scale does not allow the staff to read the contours and is insufficient to document pre-operation surface contours. In addition, Uranium One should commit to restoring the surface to pre-operation surface contours instead of "restored to a surface configuration that will blend in with the natural terrain, and be consistent with the post mining land use."

Formulation of RAI

Uranium One should revise Section 6.2.4 of the TR, and all other applicable sections of the TR, to ensure that the discussion of final surface contouring is consistent with SRP, Acceptance Criteria 6.2.3(4).

RAI-112 Response

Uranium One has revised the language in Section 6.2.4 of the TR to state reclamation contouring will be "*restored to a surface configuration that will blend in with the natural terrain, and be consistent with the pre-operational land use".* This language is consistent with previously NRC-approved license applications. In addition, TR Figure 2.1-1 has been 'scaled' properly to assess pre-operation contours. See RAI-102 for revised figure.

RAI-113

Description of Deficiency

The information provided in TR Section 6.4.3 is not consistent with SRP Section 6.4.3 acceptance criterion (5).

Basis for Request

SRP Section 6.4.3 acceptance criterion (5) states the survey method for verification of soil cleanup is designed to provide 95-percent confidence that the survey units meet the cleanup guidelines. In TR Section 6.4.3, the Uranium One states that the gamma survey method may not provide 95 percent confidence.

10 CFR 40, Appendix A, Criterion 6(6) requires licensees to ensure that radium concentrations in soil averaged over areas of 100 square meters, does not exceed background concentrations by more than 5 pCi/g or, 15 pCi/g averaged over the first 15 cm below the surface. Byproduct material containing concentrations of radionuclides other than radium in soil, must not result in a TEDE exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are ALARA.

Formulation of RAI

Revise TR Section 6.4.3. to include a survey method for verification of soil cleanup is designed to provide 95-percent confidence that the survey units meet the cleanup requirements in 10 CFR 40, Appendix A, Criterion 6(6).

RAI-113 Response

The reviewer's concern has been taken out of context from what is stated in Section 6.4.3 of the TR. The language states that gamma count rates by themselves may not be a reliable tool to provide a 95 percent confidence level; however, with the established gamma action level coupled with the pre-ISR survey results will provide sufficient evidence to indicate Ra-226 levels above cleanup standards. See TR Section 2.9 for additional discussion related to soil radiological conditions.

RAI-114

Description of Deficiency

Section 6.4.3, is not consistent with Sections 6.2.2, and 6.4.2 of the TR.

Basis for Request

Section 6.4.3 states: "Pre-reclamation surveys will also be conducted as described in Section 6.4.2 in areas where known contamination has occurred or the potential for unknown soil contamination exists. Cleanup of surface soils will be restricted to potentially contaminated areas. These potentially contaminated areas include areas where known spills have occurred and areas where there is potential for small unknown spills and other contamination including areas under and around header houses…"

This statement is inconsistent with Section 6.2.2(3) of the TR which states: "A final background gamma survey will be conducted over the entire wellfield area to identify any contaminated earthen materials requiring removal to disposal;"

The statement in Section 6.4.3 is also inconsistent with Section 6.4.2 which states: "Pre-reclamation radiological surveys will be conducted in a manner consistent with the baseline radiological surveys, described in Section 2.9, so that the data can be directly compared for identification of potentially contaminated areas." Section 2.9 does not indicate that baseline radiological surveys will be conducted only "in areas where known contamination has occurred or the potential for unknown soil contamination exists".

Formulation of RAI

Uranium One should revise Section 6.4.3 of the TR, and all other applicable sections of the TR, to ensure that the discussion of pre-reclamation surveys is consistent with survey descriptions provided in Sections 6.2.2(3) and 6.4.2 of the TR.

RAI-114 Response

Section 6.4.3 is consistent with Sections 6.2.2 and 6.4.2 of the TR in that Pre-reclamation surveys will also be conducted as described in Section 6.4.2 in areas where known contamination has occurred or the potential for unknown soil contamination exists. The potential for unknown contamination would exist in the wellfield areas and trunkline corridors therefore Uranium One does not find that this is inconsistent with Section 6.2.2(3) or 6.4.2 of the TR.

The reference to Section 2.9 that Pre-reclamation surveys will be conducted in a manner consistent with the baseline radiological surveys, is describing how the radiological survey data will be collected so there is consistency between the methodology of data collection between Pre-reclamation and Baseline data for determining areas of potential contamination.

RAI-115

Description of Deficiency

The TR does not explicitly specify that the cost estimate reflects third-party contractor costs.

Basis of Request

Appendix C of NUREG-1569 states that, "Cost estimates must be calculated on the basis of completion of all activities by a third party (a third party is an independent contractor or operator who is not financially affiliated with the licensee)." The TR does not explicitly specify that the cost estimate reflects third-party contractor costs.

Formulation of RAI

Confirm that cost estimate is based on completion of all decommissioning activities by a third party (Appendix C of NUREG-1569).

RAI-115 Response

Uranium One confirms that the cost estimate reflects a third-party contractor costs. Additionally, SUA-1341 License Condition 9.5 stipulates the finical surety arrangement to be consistent with 10 CFR 40, Appendix A, Criterion 9, and adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination, offsite disposal, and ground water restoration as warranted.

RAI-116

Description of Deficiency

Decommissioning costs associated with certain prospective work to be performed at the site are not included in the cost estimate.

Basis of Request

Appendix C of NUREG-1569 states that, "The annual surety estimate must be prospective of all work to be performed at the site. The licensee must provide estimated costs for all decommissioning, reclamation, and ground-water restoration work remaining to be performed at the site."

Page 6-41 of the Ludeman ISR Project TR states that: "the surety estimate presented in Appendix E was developed for the first year of the project. There will be no wellfield or satellite operations during the first year; therefore, no wellfield groundwater restoration, building or soil decontamination costs were carried through the cost estimate."

Based on this statement, decommissioning costs associated with certain prospective work to be performed at the site are not included in the cost estimate. Per NUREG-1569, the cost estimate must account for all work to be performed at the site, beyond the first year of the project.

Therefore, the licensee should revise or justify the assumption regarding the exclusion of wellfield groundwater restoration, building, and soil decontamination costs, and update the cost estimate as appropriate. Otherwise, the licensee will need to update its surety to capture these costs prior to injecting lixiviant and a license condition will be added to include this requirement.

Formulation of RAI

Revise or justify the assumption regarding the exclusion of wellfield groundwater restoration, building, and soil decontamination costs and update the cost estimate as appropriate.

RAI-116 Response

Uranium One has updated the surety for the proposed project to capture costs for wellfield groundwater restoration, building, and soil decontamination costs prior to beginning the injection of lixiviant. The updated surety also accounts for the reduction in satellite facilities, increased volume of trunkline, and option for site evaporation ponds.

Uranium One will revise the text on page 6-41 to indicate it is inclusive of all site operations and phases.

RAI-117

Description of Deficiency
Decommissioning cost information is incomplete.

Basis of Request
NUREG-1569 states that "Unit costs, calculations, references, assumptions, equipment and operator efficiencies, et cetera, must be provided."

Uranium One presents unit cost data, calculations, references, and assumptions in a series of eighteen worksheets. In many cases, these worksheets do not provide sufficient detail for the following unit cost data, calculations, references, and assumptions. Sufficient detail would include information that clearly demonstrates the source of the cost (e.g., Bureau of Labor Statistics data, quote/contract):

A. *Worksheet 1, No. II and III, Groundwater Restoration*
    1. *The unit cost of sulfuric acid, caustic soda, hydrochloric acid, hydrochloric sulfide, repair and maintenance, sampling and analysis, RO Antiscalent, WDW Antiscalent, corrosion inhibitor, and algacide are based on "Costs from operating ISR facility experience (Cogema)." In order to fully evaluate and compare these costs, the staff requests additional information on the relevance of the facilities for which the costs are based. What are the name and locations of these facilities?*
    2. *The unit cost for repair and maintenance is used three times in this worksheet. In its first occurrence, the unit cost value is $0.279 ($/Kgal), the second is $0.016 ($/Kgal), and the third is $0.23 ($/Kgal). Please clarify why different unit cost estimates are used for repair and maintenance in this worksheet.*
    3. *The unit cost for sulfuric acid is used two times in this worksheet. In its first occurrence, the unit cost value is $0.076 ($/Kgal), while the second is $0.28 ($/Kgal). Please clarify why different unit cost estimates are used for sulfuric acid.*

B. *Worksheet 1, No. IV and V, Groundwater Restoration*

    The submittal does not document the source of the cost assumptions for labor. Please provide a basis for the labor cost assumptions used in the estimate.

C. *Worksheet 1, No. VI, VII and Summary*

The Total Restoration Capital Requirements in No. VI is identified as $140,000. However, in the Summary, "VI. Capital" is identified as $75,000 for the North Platte Plant and the Peterson Plant. Please revise the Total Groundwater Restoration Cost to account for $140,000 in capital costs for the North Platte and Peterson Plants.

D. *Worksheet 2b, Satellite Plant Building Demolition and Disposal*

The submittal does not document the source of the cost assumptions for the unit cost of demolition, transportation unit cost (ton-mile), structure disposal cost ($/ton), decontamination ($/ft2), and demolition ($/ft2). Please provide a basis for these unit cost assumptions used in the estimate.

E. *Worksheet 3, Soil Removal and Disposal*

1. *The submittal does not document the source of the cost assumption for the soil disposal fee ($/ton). Please provide a basis for this unit cost assumption used in the estimate.*
2. *The cost estimate does not include any costs associated with radiation surveys. Please revise or justify the basis for this assumption.*

F. *Worksheet 5, No. I, Wellfield Equipment Removal and Disposal*

The submittal does not document the source of the cost assumptions for the disposal fee per Yd3. Please provide a basis for this unit cost assumption used in the estimate.

G. *Worksheet 5, No. II, Wellfield Equipment Removal and Disposal*

The submittal does not document the source of the cost assumptions for the cost of removal of pump and tubing ($/well), cost for decontamination ($/load), and cost of removal of chipped volume ($/ft). Please provide a basis for these unit cost assumptions used in the estimate.

H. *Worksheet 5, No. III, Wellfield Equipment Removal and Disposal*

The submittal does not document the source of the cost assumptions for the pipeline removal unit cost ($/ft of trench). Please provide a basis for this unit cost assumption used in the estimate.

I. *Worksheet 6, No. II, III, IV, and V, Topsoil Replacement and Revegetation*

The unit cost for radiation survey and soil analysis ($/ac) is used four times in this worksheet. The unit cost value is referenced twice as $1,200 ($/ac), and twice as $800 ($/ac). Please clarify why different unit cost estimates are used for

radiation survey and soil analysis, and provide a basis for the unit cost assumptions.

J. *Worksheet 7, Nos. I-VII, Miscellaneous Reclamation*

The submittal does not document the source of the cost assumptions for the cost of fence removal/disposal ($/ft) and the cost of powerline removal and disposal ($/ft). Please provide a basis for these unit cost assumptions used in the estimate.

K. *Worksheet 8, Nos. I-VIII, Pond Reclamation Cost*

The submittal does not document the source of the cost assumptions for the sludge handling cost per load ($/load), transportation cost per truckload, labor crew cost per hour ($/hour), and liner handling cost per load ($/load). Provide a basis for these unit cost assumptions used in the estimate.

Formulation of RAI

Revise or justify unit costs, calculations, references, and assumptions.

RAI-117 (A) Response

1. Response: These Unit costs are from Willow Creek Operations while performing restoration activities under Cogema Mining with inflation adjustments as provided in the current approved SUA-1341 surety estimate of which the Ludeman project is an amendment.

2. Response: The unit costs for repair and maintenance are used three times for three specific actions Groundwater Sweep, Wellfield Operations Cost Power, and Groundwater Treatment RO. The repair and maintenance cost for each of these activities will vary as they are three separate activities with varying equipment and associated costs.

3. Response: Based on cost estimate used from Moore Ranch surety estimate the cost estimate varies due to amount utilized for the different applications larger acid amounts smaller volume of water for deep disposal wells and smaller acid amount and larger water volume for RO ground water treatment usage. Costs are based on operating experience at Willow Creek ISR.

RAI-117 (B) Response

Cost assumptions were derived from 2011 Heavy Equipment and Highway Prevailing Wages referenced in WDEQ Guideline 12 I.

RAI-117 (C) Response

Uranium One will change the values for capital cost for deep well abandonment for the North Platte and Peterson areas from $75,000 to $140,000.

RAI-117 (D) Response

Basis for the cost estimate has been added in the notes section of the surety estimate provided in Appendix E.

1. The unit cost is based on WDEQ Appendix K
2. Estimate from local trucking company
3. Structure disposal costs and decontamination are based on Moore Ranch and Willow Creek surety estimates
4. The demolition costs ($/ft 2) are based on WDEQ Guideline 12 Appendix K

RAI-117 (E) Response

1. Response: Unit cost of $300/ton is based on contract cost of $11/cu ft which converted to cu/yd assuming soil is 1 ton per cubic yard cost would be approximately $300/ ton. Cost assumption has been added to notes on surety estimate.

2. Response: The cost associated with radiation surveys is shown in worksheet 6 II and III Item B Radiation Surveys and Soil analysis.

RAI-117 (F) Response

Disposal fee for non-radiological materials is from WDEQ Guideline 12. Disposal fee for radiological contaminated equipment is based on current cost for disposal at NRC licensed facility. These assumptions have been documented in the surety document.
See response to RAI-11(E) above for rad survey disposal costs.

RAI-117 (G) Response

Cost estimates utilized were from the Willow Creek surety for removal of pump and tubing, decontamination cost ($/load) and cost for removal of chipped volume. The sources for these estimates have been added to the Ludeman surety estimate.

RAI-117 (H) Response

Cost utilized for removal of pipeline was from the Moore Ranch surety estimate. Source reference will be added to the Ludeman surety estimate.

RAI-117 (I) Response

Unit costs are $1200/acre based on work performed by Tetra Tech at other locations. Costs in the surety spreadsheet have been modified to reflect the use of this number.

RAI-117 (J) Response

Cost for fence removal comes from WDEQ Guideline 12, Appendix H, Powerline removal Based on Guideline 12 Appendix H footnote. References noted have been added to the surety estimate.

RAI-117 (K) Response

Estimates provided related to pond sludge handling cost, labor crew cost per hour, liner handling cost and transportation costs were based on estimates used in the Willow Creek surety estimate. Reference to this cost estimate source has been included on in the Ludeman surety estimate.

RAI-118

Description of Deficiency

The cost estimate does not appear to include sufficient labor overhead, contractor profit, and contingency.

Basis of Request

NUREG-1569 states the following:
"Overhead costs for labor and equipment and contractor profit may be calculated as separate items or loaded into hourly rates. If included in hourly rates, the unit costs must identify the percentages applied for each area….All costs (unit and total) are to be estimated on the basis of third party, independent contractor costs (include overhead and profit in unit costs or as a percentage of the total)."

NUREG-1569 also addresses the use of a contingency factor by stating:
"The licensee should include a contingency amount to the total cost estimate for the final site closure. The staff considers a 15-percent contingency to be an acceptable minimum amount."

The "Restoration and Reclamation Cost Estimates at the End of Year 1" worksheet, which contains the restoration cost (i.e., the total decommissioning cost estimate), includes a line for "Administration, Overhead and Contingency (25%)," which is applied and added to the cost estimate subtotal. By grouping administration, overhead and contingency together, it is difficult to evaluate the sufficiency of the amount included for overhead, contractor profit, and contingency (minimum 15 percent).

The term "overhead" includes those costs that are not directly traceable to any particular product produced or project conducted by the firm. Overhead typically includes "period costs" such as, for example, insurance, utilities, rent, supplies, property taxes, and depreciation, as well as the costs of any wages, salaries, and benefits incurred as a result of the corporation's officers and support staff (e.g., accounting staff, legal staff, janitorial staff, security staff). These costs also are commonly considered "administrative" costs.

Unless overhead costs, contractor profit, and a contingency of at least 15 percent are fully included, the cost estimate does not account for the full cost of decommissioning. In this case, the labor cost in the estimate would be lower than what a third party would require to decommission the site.

Formulation of RAI

Revise or justify the decommissioning cost estimate as necessary to reflect all overhead costs, contractor profit, and contingency. Please separate these into two separate line items, one line item for Administration and Overhead and another line item for Contingency in order to more clearly show the dollar amount that is attributed to each of these costs.

RAI-118 Response

The decommissioning cost estimates for administration/overhead and contingency are now separate line items on the summary page of the surety:

- Project Managing: 2%
- Contingency: 15%

Environmental Effects

RAIs included under the Environmental Report Response Package

Alternatives

RAIs included under the Environmental Report Response Package

Cost-Benefit Analysis

RAIs included under the Environmental Report Response Package

Environmental Approval and Consultations

RAIs included under the Environmental Report Response Package