



August 29, 2018

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**NRC License SUA-1548, Docket No. 40-8964, Semi-Annual Effluent and Environmental Monitoring Report, January 1 through June 30, 2018**

Document Control Desk:

In accordance with 10 CFR 40.65 and per License Condition No. 12.2 of Source Materials License SUA-1548, please find enclosed the Semi-Annual Effluent and Environmental Monitoring Report for the period January 1 through June 30, 2018. Copies of this report are also being forwarded to the Deputy Director, Division of Decommissioning, USNRC, Mr. Douglas Mandeville, USNRC Headquarters and Division Director, Division of Nuclear Material Safety, Region IV.

The air particulate results for the second quarter of the reporting period were unavailable and will be submitted in an addendum once received from the contracted laboratory. Review of data collected during quarter one (1) shows that the concentrations of all parameters are less than the 10 CFR 20, Appendix B, Effluent Concentration Limits.

If you have questions regarding the report, please contact me at (307) 358-6541 ext. 438 or by email at [Lawrence\\_Reimann@cameco.com](mailto:Lawrence_Reimann@cameco.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Larry Reimann".

Larry Reimann  
Manager, Compliance and Licensing

Attachments: Semi-Annual Effluent and Environmental Monitoring Report

LR/th

cc: Deputy Director, NRC w/ att CERTIFIED MAIL #7015 1520 0000 2613 4304  
Mr. Doug Mandeville, NRC w/att CERTIFIED MAIL #7015 0640 0001 4722 6434  
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File SR 4.6.4.1 w/att

IE48  
IE25  
NM5520  
NM55

**POWER RESOURCES, INC.  
D/B/A CAMECO RESOURCES**

**USNRC SOURCE MATERIAL LICENSE  
NO. SUA-1548**

**DOCKET NO. 40-8964**

**SEMI-ANNUAL EFFLUENT AND  
ENVIRONMENTAL MONITORING REPORT**

**FOR THE PERIOD**

**JANUARY 1 THROUGH  
JUNE 30, 2018**

## Table of Contents

<b>1</b>	<b>INJECTION RATES, RECOVERY RATES, AND INJECTION TRUNK-LINE PRESSURES FOR EACH SATELLITE FACILITY .....</b>	<b>3</b>
1.1	SATELLITE No. 1.....	3
1.2	SATELLITES AND CENTRAL PROCESSING PLANT.....	3
1.3	NORTH BUTTE SATELLITE FACILITY.....	4
<b>2</b>	<b>RESULTS OF EFFLUENT AND ENVIRONMENTAL MONITORING INCLUDING WATER QUALITY ANALYSES AND MONITORING REQUIRED BY THE WDEQ PERMIT FOR THE OPERATING IRRIGATION SYSTEMS .....</b>	<b>4</b>
2.1	STACK EMISSION SURVEYS.....	4
2.2	AIR PARTICULATE, RADON, AND GAMMA RADIATION MONITORING .....	4
2.2.1	Smith Ranch-Highland .....	4
2.2.2	NB Satellite Facility .....	5
2.3	WATER SAMPLING DATA.....	6
2.3.1	SRH Groundwater and Surface Water Monitoring Stations.....	6
2.3.2	NB Groundwater and Surface Water Monitoring Stations.....	7
2.4	SRH WASTEWATER LAND APPLICATION FACILITIES MONITORING.....	7
2.4.1	Soil and Vegetation Sampling .....	7
2.4.2	Irrigation Fluid .....	7
2.4.3	Radium Treatment Systems.....	7
2.4.4	Soil Water Samples .....	8
2.4.5	Satellite No. 1 Purge Storage Reservoir Monitor Well .....	8
2.4.6	Satellite No. 2 Purge Storage Reservoir Shallow Wells.....	8
<b>3</b>	<b>SAFETY AND ENVIRONMENTAL EVALUATIONS .....</b>	<b>9</b>
<b>4</b>	<b>NRC SEMI-ANNUAL INSPECTION .....</b>	<b>9</b>
<b>5</b>	<b>GAS HILLS AND RUTH ISL PROJECTS .....</b>	<b>9</b>

## **1 INJECTION RATES, RECOVERY RATES, AND INJECTION TRUNK-LINE PRESSURES FOR EACH SATELLITE FACILITY**

Tables 1A through 1C of Attachment A contain rate and pressure data at the satellite facilities for the period of the report.

### **1.1 Satellite No. 1**

Satellite No. 1 did not operate during the report period, as restoration activities in the A and B Wellfield are complete. NRC issued the Technical Evaluation Report for the restoration of Mine Unit A. NRC concurred with the Wyoming Department of Environmental Quality (WDEQ) and concluded that the Mine Unit had been restored. Mine Unit A has been in long term monitoring since 2005. WDEQ approved the restoration of Mine Unit B on March 31, 2008. An alternate concentration limit (ACL) license amendment for the completion of restoration of Mine Unit B was submitted May 22, 2013. Since the submittal of the ACL application Cameco has sampled the mine unit MP wells quarterly until 2017. Cameco will begin sampling the mine unit on an annual basis beginning in 2018 and will continue to evaluate well sample data for the Mine Unit. There are no injection or recovery rates for the report period.

### **1.2 Satellites and Central Processing Plant**

The operating information for Satellite No. 2, Satellite No. 3, Satellite SR-1, Satellite SR-2, and the Central Processing Plant (CPP) are contained in Tables 1A, 1B, and 1C. The injection rates listed are the total recovery rates minus the purge flow bleed. The bleed from Satellites No. 2 and No. 3 are treated for uranium, radium, and selenium removal and pumped to Purge Storage Reservoir #2 (PSR-2) prior to land application at the Satellite No. 2 Land Application Facility (Irrigator #2). Waste water brine from the reverse osmosis (RO) system at Satellite No. 2 is disposed by either deep well injection through a permitted waste disposal well, or treated and pumped to PSR-2 for further land application at Irrigator #2. Additionally, because of the installation of a new water transfer pipeline from Satellite SR-1 to the selenium treatment plant at Satellite SAT-2, bleed and waste water brine can be disposed by land application or deep well injection. The new pipeline allows the site to optimize the water disposal capacity across the entire site. Bleed from Satellites and the CPP is disposed of by deep well injection through permitted waste disposal wells.

On February 5, 2018 Cameco Resources announced its plan to cease production at its U.S. operations due to continued low uranium prices. A letter was written to the NRC dated April 2, 2018 providing information on what steps have been taken, and will be taken in the future, as a result of this action. As of February 8, 2018 Smith Ranch-Highland had shut off all production and injection flow to Mine Units 3, 7, 9, 10, 10 extension, 15, 15A and J. Each of these mine units continue to operate a limited number of wells to maintain a small "bleed" flow for control of mining fluids.

### **1.3 North Butte Satellite Facility**

The operational data for North Butte Satellite is contained in Tables 1A, 1B, and 1C. The injection rates represent the total recovery rates minus the purge flow bleed. The bleed from the satellite is pumped to the deep disposal well for disposal or stored in the storage pond prior to deep well injection.

As of February 13, 2018, the North Butte mine had shut off all production and injection flow to Mine Units 1 and 2. Both of these mine units continue to operate a limited number of wells to maintain a small “bleed” flow for control of mining fluids.

## **2 RESULTS OF EFFLUENT AND ENVIRONMENTAL MONITORING INCLUDING WATER QUALITY ANALYSES AND MONITORING REQUIRED BY THE WDEQ PERMIT FOR THE OPERATING IRRIGATION SYSTEMS**

### **2.1 Stack Emission Surveys**

All yellowcake processing activities (elution, drying and packaging) were conducted at the Smith Ranch CPP. The dryers at the CPP are zero emission vacuum dryers and do not require stack testing.

The Central Processing Facility (CPF) at the Highland Uranium Project has been refurbished with zero emission vacuum dryers, which will not require stack testing, and is on stand-by status.

### **2.2 Air Particulate, Radon, and Gamma Radiation Monitoring**

#### **2.2.1 *Smith Ranch-Highland***

Smith Ranch-Highland (SRH) maintains an air monitoring program at six (6) locations on and around the licensed area. The air monitoring stations are used to monitor air particulates, passive radon gas, and passive gamma radiation. Due to the completion of construction activities of the Highland CPF, monitoring at air stations AS-4 and AS-5 was discontinued at the end of 2014 and will resume monitoring one year prior to the Highland CPF becoming operational. One additional station (AS-6) will be used to monitor conditions downwind of the Reynolds Ranch Satellite Facility during construction and once the facility becomes operational.

The air stations are located as follows:

- Air Station No. 1 (AS-1; Dave’s Water Well): This station monitors background conditions, upwind of both the Smith Ranch and HUP wellfields and yellowcake processing facilities.
- Air Station No. 2 (AS-2; Smith Ranch Restricted Area): This station monitors

conditions downwind of the Smith Ranch CPP Restricted Area Boundary.

- Air Station No. 3 (AS-3; Vollman Ranch): This station monitors the nearest downwind resident to the Smith Ranch CPP Restricted Area.
- Air Station No. 4 (AS-4; HUP Restricted Area): This station monitors conditions downwind of the HUP CPF Restricted Area Boundary.
- Air Station No. 5 (AS-5; Fowler Ranch): This station monitors the nearest downwind resident to the HUP CPF Restricted Area.
- Air Station No. 6 (AS-6; Reynolds Ranch Satellite Area): This station will monitor conditions downwind of the Reynolds Ranch Satellite Facility once the facility is constructed and becomes operational.

Table 2 shows the air particulate and radon data collected at stations AS-1 through AS-3 during the report period. The air particulate results for the second quarter of the reporting period were unavailable and will be submitted in an addendum once received from the contracted laboratory. Review of data collected during quarter one (1) shows that the concentrations of all parameters are less than the 10 CFR 20, Appendix B, Effluent Concentration Limits. Non-detect at the reporting limit (ND) sample results are labeled as such in Table 2.

Table 3 shows the gamma radiation data collected at stations AS-1, AS-2, AS-3, and AS-6 during the report period. Review of data collected during the report period shows that gamma radiation levels were within the range of previously reported values and comparable to upwind background values at station AS-1.

### ***2.2.2 NB Satellite Facility***

North Butte maintains an Air Monitoring Station program at six (6) various locations on and around the licensed area. The air monitoring stations are used to monitor air particulates, passive radon gas, and passive gamma radiation. Two (2) additional passive gamma and passive radon gas environmental stations are included in the license area.

The air stations, passive gamma, and passive radon gas monitoring stations are located as follows:

- Air Station NB8 (Phister Ranch): This station monitors the nearest public residence to North Butte Satellite Area.
- Air Station NB9 (West Air Station): This station monitors background conditions, upwind from the North Butte Satellite Area.
- Air Station NB11 (North Butte): This station monitors the north side of the

#### North Butte Licensed Area.

- Air Station NB12 (North East Air Station): This station monitors downwind conditions from North Butte Satellite and Well Fields.
- Air Station NB13 (Anedarko Rd): This Station monitors the south side of the North Butte Licensed Area.
- Air Station SatPad (Satellite pad next to man camp): This station monitors the exposure to the off-shift operations staff that remain on-site during off shift hours.
- Environmental Station (Fence line near Frac Tanks): This station monitors radon gas and gamma radiation only.
- Environmental station (Fence line on Christensen Rd): This station monitors radon gas and gamma radiation only.

Table 2 shows the air particulate and radon data collected at air stations NB8, NB9, NB11, NB12, NB13, and Satellite Pad. The air particulate results for the second quarter of the reporting period were unavailable and will be submitted in an addendum once received from the contracted laboratory. In addition to the six (6) air stations there are two (2) additional environmental stations with gamma and radon data only. Review of data collected during quarter one (1) shows that the concentrations of all parameters are less than the 10 CFR 20, Appendix B, Effluent Concentration Limits. Non-detect at the reporting limit (ND) sample results are labeled as such in Table 2.

Table 3 shows the gamma radiation data collected at the six (6) air stations and the two (2) environmental stations for the report period. Review of data collection during the report period shows that gamma radiation levels are within range of previously reported values and comparable to upwind background values at station NB9 and the control badge.

## **2.3 Water Sampling Data**

### ***2.3.1 SRH Groundwater and Surface Water Monitoring Stations***

During the report period, monitoring was completed at twenty two (22) water wells, ten (10) stock ponds, and one (1) creek throughout the permit area. Water samples are collected from water wells, stock ponds and a creek on a quarterly basis for analysis of uranium and radium-226. Sampling constituents for environmental ground water and surface water monitoring programs is detailed in NRC License Application Section 5.3.5 and 5.3.6, respectively. Table 4 provides the analytical data for samples collected during the report period. A review of data collected during the report period shows two (2) stock ponds (SW-1 and SW-3) and ten (10) water wells (GW-5, GW-6, GW-8, GW-9, GW-10,

GW-11, GW-18, GW-21, GW-32, and GW-33) did not run during the report period. A review of data collected from the available water wells, stock ponds and creek show that the concentrations of uranium and radium-226 are below the 10 CFR 20, Appendix B, Effluent Concentration Limits of  $3.0\text{E-}07$  and  $6.0\text{E-}08$   $\mu\text{Ci/mL}$ , respectively. As shown in Table 4 the acronyms of “ND” denotes levels as “Not Detected at the Reporting Limit” and “NA” denotes levels as “Not Applicable”.

### ***2.3.2 NB Groundwater and Surface Water Monitoring Stations***

During the report period, monitoring was completed at two (2) impoundments and eight (8) surface water sites. Water samples are collected from water wells (within 1 km from active mine unit), impoundments, and surface water sites on a quarterly basis for analysis of uranium and radium-226. Table 4 provides the analytical data for samples collected during the report period. A review of Table 4 shows that during the report period all impoundments and surface water sites were dry and there was no water available for sampling. As shown in Table 4 the acronyms of “ND” denotes levels as “Not Detected at the Reporting Limit” and “NA” denotes levels as “Not Applicable”.

## **2.4 SRH Wastewater Land Application Facilities Monitoring**

### ***2.4.1 Soil and Vegetation Sampling***

In accordance with License Condition 12.2 for the Satellite No. 1 and Satellite No. 2 Wastewater Land Application Facilities, soil and vegetation sampling of the irrigation areas is conducted in late summer of each year. The soil and vegetation data are collected to monitor and evaluate any adverse effects to the irrigation areas. The 2018 soil and vegetation sampling at the irrigation areas will be conducted in August 2018 and results will be included with the July 1 through December 31, 2018 semi-annual report.

### ***2.4.2 Irrigation Fluid***

Cameco monitors the treated irrigation fluid that is disposed of at both irrigation facilities per the approved license application. Grab samples are collected at the discharge of PSR-2 during each month of operation and analyzed for various parameters. Irrigator No. 2 was operational for the month of May and June while Irrigator No. 1 was not operational for the entire reporting period, as noted in Table 5 and Table 6, respectively. For the June analysis the sample had been inadvertently preserved with nitric acid preventing the lab to sample for alkalinity and pH.

### ***2.4.3 Radium Treatment Systems***

Cameco collects grab samples each month to ensure that the radium-226 treatment systems are adequately treating wastewater from Satellites No. 2 and No. 3 prior to discharge into PSR-2. No samples were collected from the Satellite No. 1 radium treatment system since Satellite No. 1 did not operate during the report period. The monthly radium-226 grab



samples for Satellite No. 2 and No. 3 are collected at the discharge point of the selenium treatment plant. Review of the monitoring data provided in Table 7 shows that radium-226 concentrations were less than the 10 CFR 20, Appendix B, Effluent Concentration Limit of  $6.00\text{E-}8$   $\mu\text{Ci/mL}$ .

#### ***2.4.4 Soil Water Samples***

In accordance with the approved license application, Cameco collects soil water samples at the irrigation areas in June of each year and analyzes them for various parameters, referenced in Tables 8A and 8B. In June 2018, sampling of the lysimeters at Irrigator #2 was attempted per the standard sampling method, however, insufficient water was present to collect and perform an analysis. Irrigator #1 did not operate during the report period.

Cameco submitted letter "Non-significant Revision (NSR), Land Application Monitoring Program, Soil Water Sampling, Permit 633, Smith Ranch-Highland, Cameco Resources" dated May 31, 2018 to the Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD) requesting that the soil water sampling requirements be discontinued in the Land Application Monitoring Program, Operations Plan, Permit 633. WDEQ-LQD responded to Cameco with letter dated July 2, 2018 allowing the cessation of lysimeter soil water testing.

#### ***2.4.5 Satellite No. 1 Purge Storage Reservoir Monitor Well***

Monitoring for shallow monitor well, located southwest of the Satellite No. 1 Purge Storage Reservoir (PSR-1), has been discontinued as detailed in letter dated September 29, 2014, titled Discontinuation of Monitoring Plan, Purge Storage Reservoir No. 1 (PSR-1) Smith Ranch – Highland Uranium Project, Permit 633, Cameco Resources, as Cameco has fulfilled all requirements of Permit 633.

#### ***2.4.6 Satellite No. 2 Purge Storage Reservoir Shallow Wells***

Shallow Wells No. 1 and No. 2 are located adjacent to the south and east sides of the reservoir, respectively. Water levels are measured on a quarterly basis and ground water samples are required on a semi-annual basis from the two shallow monitoring wells located adjacent to PSR-2. Water levels were taken March 31, 2018 while sampling and water levels were conducted April 12, 2018. Table 9 contains the data for water levels and samples taken during this period. On the laboratory chain of custody Cameco did not request an analysis for sulfate and boron for the April sample.

### **3 SAFETY AND ENVIRONMENTAL EVALUATIONS**

All safety and environmental evaluations made by the Safety and Environmental Review Panel (SERP) and resulting changed pages to the Operations Plan and Reclamation Plan of the approved license must be submitted on an annual basis, along with one of the semi-annual effluent and environmental monitoring reports. All SERP evaluations completed during 2018 will be submitted in the second half 2018 semi-annual report.

### **4 NRC SEMI-ANNUAL INSPECTION**

An inspection was conducted June 25-28, 2018 at Smith Ranch Highland and North Butte. Based on the results of this inspection, the NRC determined two Severity Level IV violations of NRC requirements occurred. The NRC determined the two violations are associated with: (1) a failure to post a radiation area; and (2) a failure to control access to radioactive material. Both violations were addressed during the time of the inspection and closed.

As part of the inspection, the NRC reviewed the status of the licensee's actions required by Confirmatory Order EA-16-051 dated September 30, 2016. Based on the inspector's initial review and continued evaluation of the required actions during the June 25-28, 2018 inspection, the NRC concluded that the Confirmatory Order commitments have all been met.

### **5 GAS HILLS AND RUTH ISL PROJECTS**

The Gas Hills and Ruth ISL Projects are licensed for commercial ISL uranium recovery activities as satellite facilities to the Smith Ranch-Highland Uranium Project. The projects remained non-operational during the report period

Other activities conducted during the report period consisted of quarterly inspections of the Ruth evaporation ponds in accordance with License Condition 10.2.2 of SUA-1548. Inspection of the perimeter fence, pond embankments, and pond liners yielded no deficiencies during the report period.

By letter dated July 13, 2017 Cameco submitted "Wildlife Monitoring Plan, Gas Hills ISR Project" to Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD). Guideline No. 5 (HH/5-80; ST/2-87 revised; Rules Update/8-94), is designed to obtain data sufficient detail to evaluate the effect of mining on specific wildlife species to develop mitigation proposals. Cameco has suspended all active mining development activities in the Gas Hills and has therefore proposed to suspend annual wildlife monitoring beginning in 2017. By letter dated August 22, 2017 Cameco received agreement from the Wyoming Game and Fish Department to suspend wildlife monitoring under the stipulation that wildlife monitoring is resumed in the event mining operations recommence.

**ATTACHMENT A**

**DATA TABLES 1-9**

**TABLE 1**  
**RATES AND PRESSURES**  
**SATELLITE FACILITIES**  
**1st and 2nd Quarters 2018**

**TABLE 1A**  
**AVERAGE INJECTION RATES (GPM)**

<b>MONTH</b>	<b>Satellite No. 2</b>	<b>Satellite No. 3</b>	<b>Central Processing Plant</b>	<b>Satellite SR-1</b>	<b>Satellite SR-2</b>	<b>North Butte</b>
Jan-18	0	1,209	0	912	1,549	1,118
Feb-18	0	242	0	0	2,243	429
Mar-18	0	0	0	2,396	2,013	0
Apr-18	0	0	0	2,479	2,041	0
May-18	0	0	0	2,416	1,955	0
Jun-18	0	0	0	2,336	1,710	0

**TABLE 1B**  
**AVERAGE RECOVERY RATES (GPM)**

<b>MONTH</b>	<b>Satellite No. 2</b>	<b>Satellite No. 3</b>	<b>Central Processing Plant</b>	<b>Satellite SR-1</b>	<b>Satellite SR-2</b>	<b>North Butte</b>
Jan-18	0	1,257	0	934	1,558	1,128
Feb-18	0	293	0	0	2,256	465
Mar-18	0	0	0	2,411	2,025	84
Apr-18	0	0	0	2,494	2,058	88
May-18	0	0	0	2,443	1,970	90
Jun-18	0	0	0	2,354	1,726	78

**TABLE 1C**  
**INJECTION TRUNK LINE PRESSURES (PSI)**

<b>MONTH</b>	<b>Satellite No. 2</b>	<b>Satellite No. 3</b>	<b>Central Processing Plant</b>	<b>Satellite SR-1</b>	<b>Satellite SR-2</b>	<b>North Butte</b>
Jan-18	0	61	0	35	154	106
Feb-18	0	12	0	0	127	43
Mar-18	0	0	0	67	143	0
Apr-18	0	0	0	74	153	0
May-18	0	0	0	73	160	0
Jun-18	0	0	0	69	160	0

**TABLE 2**  
**AIR SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE PERIOD	RADIONUCLIDE (μCi/ml)	CONCENTRATION (μCi/ml)	ERROR EST. +/- (μCi/ml)	L.L.D. (μCi/ml)	EFF. CONC. LIMIT (μCi/ml)	% EFF. CONC. LIMIT %		
AS-1									
DAVE'S WATER WELL	1st Quarter	U-Nat	ND	NA	1.00E-16	9.00E-14	NA		
Air Station		Th-230	ND	NA	1.00E-16	3.00E-14	NA		
Background		Ra-226	ND	NA	1.00E-16	9.00E-13	NA		
Site		Pb-210	1.40E-14	6.40E-16	2.00E-15	6.00E-13	2.3		
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0		
		Th-230	*	*	1.00E-16	3.00E-14	0.0		
		Ra-226	*	*	1.00E-16	9.00E-13	0.0		
		Pb-210	*	*	2.00E-15	6.00E-13	0.0		
	All Period	Rn-222	4.60E-10	9.00E-11	3.00E-10	1.00E-08	4.6		
AS-2									
FENCE LINE	1st Quarter	U-Nat	1.20E-16	NA	1.00E-16	9.00E-14	0.1		
Air Station		Th-230	ND	NA	1.00E-16	3.00E-14	NA		
Restricted Area		Ra-226	ND	NA	1.00E-16	9.00E-13	NA		
Boundary (Background not deducted)		Pb-210	1.20E-14	5.80E-16	2.00E-15	6.00E-13	2.0		
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0		
		Th-230	*	*	1.00E-16	3.00E-14	0.0		
		Ra-226	*	*	1.00E-16	9.00E-13	0.0		
		Pb-210	*	*	2.00E-15	6.00E-13	0.0		
	All Period	Rn-222	5.70E-10	1.10E-10	3.00E-10	1.00E-08	5.7		
AS-3									
VOLLMAN RANCH	1st Quarter	U-Nat	ND	NA	1.00E-16	9.00E-14	NA		
Air Station		Th-230	ND	NA	1.00E-16	3.00E-14	NA		
Downwind Nearest Residence (Background not deducted)		Ra-226	ND	NA	1.00E-16	9.00E-13	NA		
		Pb-210	1.50E-14	6.20E-16	2.00E-15	6.00E-13	2.5		
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0		
		Th-230	*	*	1.00E-16	3.00E-14	0.0		
		Ra-226	*	*	1.00E-16	9.00E-13	0.0		
		Pb-210	*	*	2.00E-15	6.00E-13	0.0		
	All Period	Rn-222	4.60E-10	9.00E-11	3.00E-10	1.00E-08	4.6		
AS-4									
HUP RESTRICTED AREA	1st Quarter	U-Nat	MONITORING DISCONTINUED, WILL RESUME MONITORING WHEN THE HIGHLAND CPF BECOMES OPERATIONAL		1.00E-16	9.00E-14	0.0		
Air Station		Th-230			1.00E-16	3.00E-14	0.0		
HUP Overlook (Background not deducted)		Ra-226			1.00E-16	9.00E-13	0.0		
		Pb-210			2.00E-15	6.00E-13	0.0		
	2nd Quarter	U-Nat			1.00E-16	9.00E-14	0.0		
		Th-230			1.00E-16	3.00E-14	0.0		
		Ra-226			1.00E-16	9.00E-13	0.0		
		Pb-210			2.00E-15	6.00E-13	0.0		
	All Period	Rn-222			3.00E-10	1.00E-08	0.0		
AS-5									
FOWLER RANCH	1st Quarter	U-Nat	MONITORING DISCONTINUED, WILL RESUME MONITORING WHEN THE HIGHLAND CPF BECOMES OPERATIONAL		1.00E-16	9.00E-14	0.0		
Air Station		Th-230			1.00E-16	3.00E-14	0.0		
Downwind (HUP) Nearest Residence (Background not deducted)		Ra-226			1.00E-16	9.00E-13	0.0		
		Pb-210			2.00E-15	6.00E-13	0.0		
	2nd Quarter	U-Nat			1.00E-16	9.00E-14	0.0		
		Th-230			1.00E-16	3.00E-14	0.0		
		Ra-226			1.00E-16	9.00E-13	0.0		
		Pb-210			2.00E-15	6.00E-13	0.0		
	All Period	Rn-222			3.00E-10	1.00E-08	0.0		
AS-6									
REYNOLDS SATELLITE		NOT CONSTRUCTED							

ND = Non-detect at the reporting limit

NA = Not Applicable

\* Reference section 2.2 Air Particulate, Radon, and Gamma Radiation Monitoring; 2.2.1 Smith Ranch-Highland

**TABLE 2**  
**AIR SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - NB**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE PERIOD	RADIONUCLIDE ( $\mu\text{Ci}/\text{ml}$ )	CONCENTRATION ( $\mu\text{Ci}/\text{ml}$ )	ERROR EST. +/- ( $\mu\text{Ci}/\text{ml}$ )	L.L.D. ( $\mu\text{Ci}/\text{ml}$ )	EFF. CONC. LIMIT ( $\mu\text{Ci}/\text{ml}$ )	% EFF. CONC. LIMIT %
NB8							
Pfister Ranch	1st Quarter	U-Nat	2.00E-16	NA	1.00E-16	9.00E-14	0.2
Air Station		Th-230	1.00E-16	8E-17	1.00E-16	3.00E-14	0.3
Nearest Residence		Ra-226	1.10E-16	4E-17	1.00E-16	9.00E-13	0.0
(Background not deducted)		Pb-210	2.00E-14	1.30E-15	2.00E-15	6.00E-13	3.3
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0
		Th-230	*	*	1.00E-16	3.00E-14	0.0
		Ra-226	*	*	1.00E-16	9.00E-13	0.0
		Pb-210	*	*	2.00E-15	6.00E-13	0.0
	All Period	Rn-222	3.80E-10	9.00E-11	3.00E-10	1.00E-08	3.8
NB9							
West Airstation	1st Quarter	U-Nat	4.50E-17	NA	1.00E-16	9.00E-14	0.1
Air Station		Th-230	6.90E-17	6.5E-17	1.00E-16	3.00E-14	0.2
Upwind		Ra-226	8.00E-17	3.3E-17	1.00E-16	9.00E-13	0.0
(Background not deducted)		Pb-210	1.10E-14	9.80E-16	2.00E-15	6.00E-13	1.8
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0
		Th-230	*	*	1.00E-16	3.00E-14	0.0
		Ra-226	*	*	1.00E-16	9.00E-13	0.0
		Pb-210	*	*	2.00E-15	6.00E-13	0.0
	All Period	Rn-222	2.40E-10	9.00E-11	3.00E-10	1.00E-08	2.4
NB11							
North Butte	1st Quarter	U-Nat	1.60E-17	NA	1.00E-16	9.00E-14	0.0
Air Station		Th-230	0.00E+00	6.5E-17	1.00E-16	3.00E-14	0.0
North Side of Licenced Area		Ra-226	6.70E-17	3.2E-17	1.00E-16	9.00E-13	0.0
(Background not deducted)		Pb-210	1.00E-14	8.80E-16	2.00E-15	6.00E-13	1.7
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0
		Th-230	*	*	1.00E-16	3.00E-14	0.0
		Ra-226	*	*	1.00E-16	9.00E-13	0.0
		Pb-210	*	*	2.00E-15	6.00E-13	0.0
	All Period	Rn-222	2.70E-10	9.00E-11	3.00E-10	1.00E-08	2.7
NB12							
North East Airstation	1st Quarter	U-Nat	1.80E-17	NA	1.00E-16	9.00E-14	0.0
Air Station		Th-230	7.50E-17	9.8E-17	1.00E-16	3.00E-14	0.3
Downwind		Ra-226	6.00E-17	3.3E-17	1.00E-16	9.00E-13	0.0
(Background not deducted)		Pb-210	1.60E-14	9.50E-16	2.00E-15	6.00E-13	2.7
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0
		Th-230	*	*	1.00E-16	3.00E-14	0.0
		Ra-226	*	*	1.00E-16	9.00E-13	0.0
		Pb-210	*	*	2.00E-15	6.00E-13	0.0
	All Period	Rn-222	3.20E-10	9.00E-11	3.00E-10	1.00E-08	3.2
NB13							
Anedarko Road	1st Quarter	U-Nat	0.00E+00	NA	1.00E-16	9.00E-14	0.0
Air Station		Th-230	8.70E-17	7E-17	1.00E-16	3.00E-14	0.3
Downwind		Ra-226	6.70E-17	3.5E-17	1.00E-16	9.00E-13	0.0
(Background not deducted)		Pb-210	1.40E-14	1.00E-15	2.00E-15	6.00E-13	2.3
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0
		Th-230	*	*	1.00E-16	3.00E-14	0.0
		Ra-226	*	*	1.00E-16	9.00E-13	0.0
		Pb-210	*	*	2.00E-15	6.00E-13	0.0
	All Period	Rn-222	2.70E-10	9.00E-11	3.00E-10	1.00E-08	2.7
Satellite Pad							
Operations Mancamp	1st Quarter	U-Nat	1.70E-17	NA	1.00E-16	9.00E-14	0.0
Air Station		Th-230	7.10E-17	4E-17	1.00E-16	3.00E-14	0.2
Mancamp		Ra-226	1.30E-16	4E-17	1.00E-16	9.00E-13	0.0
(Background not deducted)		Pb-210	1.40E-14	1.10E-15	2.00E-15	6.00E-13	2.3
	2nd Quarter	U-Nat	*	*	1.00E-16	9.00E-14	0.0
		Th-230	*	*	1.00E-16	3.00E-14	0.0
		Ra-226	*	*	1.00E-16	9.00E-13	0.0
		Pb-210	*	*	2.00E-15	6.00E-13	0.0
	All Period	Rn-222	3.00E-10	9.00E-11	3.00E-10	1.00E-08	3.0
Christensen Rd							
Environmental Station	All Period	Rn-222	3.80E-10	9.00E-11	3.00E-10	1.00E-08	3.8
Fence Line							
Frac Tanks							
Enironmental Station	All Period	Rn-222	3.50E-10	9.00E-11	3.00E-10	1.00E-08	3.5
FenceLine							

ND = Non-detect at the reporting limit

NA = Not Applicable

\* Reference Section 2.2 Air Particulate, Radon, and Gamma Radiation Monitoring; 2.2.2 North Butte Satellite Facility

**TABLE 3**  
**DIRECT RADIATION (GAMMA) MEASUREMENT DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st & 2nd QUARTERS 2018**

SAMPLE LOCATION	SAMPLE PERIOD	EXPOSURE RATE (mR/qtr)
AS-1		
DAVE'S WATER WELL		
Air Station	1st Quarter	42
Background		
Site	2nd Quarter	42
AS-2		
FENCE LINE		
Air Station	1st Quarter	51
Restricted Area		
Boundary	2nd Quarter	42
AS-3		
VOLLMAN'S RANCH		
Air Station	1st Quarter	39
Downwind		
Nearest Residence	2nd Quarter	37
AS-4		
HUP RESTRICTED AREA		
Air Station	1st Quarter	MONITORING DISCONTINUED, WILL RESUME MONITORING WHEN THE HIGHLAND CPF BECOMES OPERATIONAL
HUP Overlook	2nd Quarter	
AS-5		
FOWLER RANCH		
Air Station	1st Quarter	MONITORING DISCONTINUED, WILL RESUME MONITORING WHEN THE HIGHLAND CPF BECOMES OPERATIONAL
Downwind of HUP		
Nearest Residence	2nd Quarter	
AS-6		
REYNOLDS SATELLITE		
	1st Quarter	40
	2nd Quarter	40
CONTROL		
	1st Quarter	40
	2nd Quarter	42

Background has not been deducted from any readings

TABLE 3

**DIRECT RADIATION (GAMMA) MEASUREMENT DATA  
ENVIRONMENTAL MONITORING SITES - NB  
1st & 2nd QUARTERS 2018**

<b>SAMPLE LOCATION</b>	<b>SAMPLE PERIOD</b>	<b>EXPOSURE RATE (mR/qtr)</b>
<b>NB8</b>		
<b>Phister Ranch</b>		
Air Station	1st Quarter	35
Nearest Residence	2nd Quarter	42
<b>NB9</b>		
<b>West Air Station</b>		
Air Station	1st Quarter	36
Upwind	2nd Quarter	33
Background		
<b>NB11</b>		
<b>North Butte</b>		
Air Station	1st Quarter	35
Downwind	2nd Quarter	36
North Side of Licenced Area		
<b>NB12</b>		
<b>North East Air Station</b>		
Air Station	1st Quarter	35
Downwind	2nd Quarter	34
<b>NB13</b>		
<b>Anedarko Road</b>		
Air Station	1st Quarter	35
Downwind	2nd Quarter	41
<b>Satellite Pad</b>		
Air Station	1st Quarter	33
	2nd Quarter	37
<b>Environmental Station</b>		
<b>Frac Tanks</b>		
Fence Line	1st Quarter	36
Upwind	2nd Quarter	35
Background		
<b>Environmental Station</b>		
<b>Christensen Rd.</b>		
Fence Line	1st Quarter	37
Downwind	2nd Quarter	37
<b>CONTROL</b>		
	1st Quarter	36
	2nd Quarter	46

Background has not been deducted from any readings



**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE DATE	RADIONUCLIDE	CONCENTRATION (mg/L)	CONCENTRATION (pCi/L)	ERROR EST. +/- (pCi/L)	CONCENTRATION (µCi/ml)	EFF. CONC. LIMIT (µCi/ml)	% EFF. CONC. LIMIT
<b>SW-1</b> Stock Pond Section 3 T35N, R74W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>SW-2</b> Stock Pond Section 2 T35N, R74W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	0.0445	0.70	2.00E-01	3.0E-08 7.0E-10	3.0E-07 6.0E-08	10.0 1.2
<b>SW-3</b> Stock Pond Section 35 T36N, R74W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>SW-4</b> Stock Pond Section 36 T36N, R74W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	0.002	0.40	2.00E-01	1.4E-09 4.0E-10	3.0E-07 6.0E-08	0.5 0.7
<b>SW-5</b> Stock Pond Section 21 T36N, R73W	1st Quarter	U-Nat Ra-226	0.0013	0.20	1.00E-01	8.8E-10 2.0E-10	3.0E-07 6.0E-08	0.3 0.3
	2nd Quarter	U-Nat Ra-226	0.0015	0.40	1.00E-01	1.0E-09 4.0E-10	3.0E-07 6.0E-08	0.3 0.7

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

<b>SAMPLE LOCATION</b>	<b>SAMPLE DATE</b>	<b>RADIONUCLIDE</b>	<b>CONCENTRATION (mg/L)</b>	<b>CONCENTRATION (pCi/L)</b>	<b>ERROR EST. +/- (pCi/L)</b>	<b>CONCENTRATION (µCi/ml)</b>	<b>EFF. CONC. LIMIT (µCi/ml)</b>	<b>% EFF. CONC. LIMIT</b>
<b>SW-6</b> Stock Pond Section 22 T36N, R73W	1st Quarter	U-Nat Ra-226	0.0005			3.4E-10	3.0E-07	0.1
				0.60	2.00E-01	6.0E-10	6.0E-08	1.0
	2nd Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>SW-7</b> Stock Pond Section 22 T36N, R73W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
						ND	3.0E-07	NA
	2nd Quarter	U-Nat Ra-226	ND	0.40	1.00E-01	4.0E-10	6.0E-08	0.7
<b>SW-8</b> Stock Pond Section 18 T36N, R72W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
						3.4E-10	3.0E-07	0.1
	2nd Quarter	U-Nat Ra-226	0.0005	0.40	1.00E-01	4.0E-10	6.0E-08	0.7
<b>SW-9</b> Stock Pond Section 18 T36N, R72W	1st Quarter	U-Nat Ra-226	ND	0.30	1.00E-01	NA 3.0E-10	3.0E-07 6.0E-08	NA 0.5
						NA	3.0E-07	NA
	2nd Quarter	U-Nat Ra-226	ND	0.40	1.00E-01	4.0E-10	6.0E-08	0.7
<b>SW-10</b> Stock Pond Section 19 T36N, R72W	1st Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
						6.8E-10	3.0E-07	0.2
	2nd Quarter	U-Nat Ra-226	0.0010	0.70	2.00E-01	7.0E-10	6.0E-08	1.2

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE DATE	RADIONUCLIDE	CONCENTRATION (mg/L)	CONCENTRATION (pCi/L)	ERROR EST. +/- (pCi/L)	CONCENTRATION (µCi/ml)	EFF. CONC. LIMIT (µCi/ml)	% EFF. CONC. LIMIT
<b>GW-1</b> Windmill Section 1 T35N, R74W	1st Quarter	U-Nat Ra-226	0.0270	1.20	3.00E-01	1.8E-08 1.2E-09	3.0E-07 6.0E-08	6.1 2.0
	2nd Quarter	U-Nat Ra-226	0.0252	1.40	3.00E-01	1.7E-08 1.4E-09	3.0E-07 6.0E-08	5.7 2.3
<b>GW-2</b> Solar Well Section 35 T36N, R74W	1st Quarter	U-Nat Ra-226	0.0400	0.90	2.00E-01	2.7E-08 9.0E-10	3.0E-07 6.0E-08	9.0 1.5
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-3</b> Windmill Section 27 T36N, R74W	1st Quarter	U-Nat Ra-226	0.144	1.70	4.00E-01	9.7E-08 1.7E-09	3.0E-07 6.0E-08	32.5 2.8
	2nd Quarter	U-Nat Ra-226	0.1530	1.90	4.00E-01	1.0E-07 1.9E-09	3.0E-07 6.0E-08	34.5 3.2
<b>GW-4</b> Windmill Section 23 T36N, R74W	1st Quarter	U-Nat Ra-226	0.1260	1.10	3.00E-01	8.5E-08 1.1E-09	3.0E-07 6.0E-08	28.4 1.8
	2nd Quarter	U-Nat Ra-226	0.0764	0.90	2.00E-01	5.2E-08 9.0E-10	3.0E-07 6.0E-08	17.2 1.5
<b>GW-5</b> Windmill Section 30 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

<b>SAMPLE LOCATION</b>	<b>SAMPLE DATE</b>	<b>RADIONUCLIDE</b>	<b>CONCENTRATION (mg/L)</b>	<b>CONCENTRATION (pCi/L)</b>	<b>ERROR EST. +/- (pCi/L)</b>	<b>CONCENTRATION (μCi/ml)</b>	<b>EFF. CONC. LIMIT (μCi/ml)</b>	<b>% EFF. CONC. LIMIT</b>
<b>GW-6</b> Windmill Section 28 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-8</b> Windmill Section 23 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-9</b> Windmill Section 14 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-10</b> Water Well Section 14 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-11</b> Water Well Section 11 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE DATE	RADIONUCLIDE	CONCENTRATION (mg/L)	CONCENTRATION (pCi/L)	ERROR EST. +/- (pCi/L)	CONCENTRATION (µCi/ml)	EFF. CONC. LIMIT (µCi/ml)	% EFF. CONC. LIMIT
<b>GW-12</b> Water Well Section 7 T36N, R72W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	ND	0.30	1.00E-01	NA 3.0E-10	3.0E-07 6.0E-08	ND 0.5
<b>GW-13</b> Water Well Section 9 T36N, R72W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	0.0155	1.20	3.00E-01	1.0E-08 1.2E-09	3.0E-07 6.0E-08	3.5 2.0
<b>GW-14</b> Water Well Section 10 T36N, R72W	1st Quarter	U-Nat Ra-226	0.0102	0.90	2.00E-01	6.9E-09 9.0E-10	3.0E-07 6.0E-08	2.3 1.5
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-15</b> Water Well Section 15 T36N, R72W	1st Quarter	U-Nat Ra-226	0.0180	0.90	2.00E-01	1.2E-08 9.0E-10	3.0E-07 6.0E-08	4.1 1.5
	2nd Quarter	U-Nat Ra-226	0.0175	1.30	3.00E-01	1.2E-08 1.3E-09	3.0E-07 6.0E-08	3.9 2.2
<b>GW-16</b> Water Well Section 11 T36N, R72W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	0.1220	2.20	5.00E-01	8.3E-08 2.2E-09	3.0E-07 6.0E-08	27.5 3.7

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE DATE	RADIONUCLIDE	CONCENTRATION (mg/L)	CONCENTRATION (pCi/L)	ERROR EST. +/- (pCi/L)	CONCENTRATION (µCi/ml)	EFF. CONC. LIMIT (µCi/ml)	% EFF. CONC. LIMIT
<b>GW-17</b> Water Well Section 8 T36N, R72W	1st Quarter	U-Nat Ra-226	0.0028	0.90	2.00E-01	1.9E-09 9.0E-10	3.0E-07 6.0E-08	0.6 1.5
	2nd Quarter	U-Nat Ra-226	0.0034	0.90	2.00E-01	2.3E-09 9.0E-10	3.0E-07 6.0E-08	0.8 1.5
<b>GW-18</b> Water Well Section 2 T36N, R72W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-20</b> Water Well Section 27 T36N, R73W	1st Quarter	U-Nat Ra-226	ND	0.40	2.00E-01	NA 4.0E-10	3.0E-07 6.0E-08	ND 0.7
	2nd Quarter	U-Nat Ra-226	ND	0.50	1.00E-01	NA 5.0E-10	3.0E-07 6.0E-08	ND 0.8
<b>GW-21</b> Water Well Section 17 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-31</b> Water Well Section 24 T36N, R74W	1st Quarter	U-Nat Ra-226	0.0484	1.20	3.00E-01	3.3E-08 1.2E-09	3.0E-07 6.0E-08	10.9 2.0
	2nd Quarter	U-Nat Ra-226	0.0500	1.00	2.00E-01	3.4E-08 1.0E-09	3.0E-07 6.0E-08	11.3 1.7

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - SRH**  
**1st and 2nd Quarters 2018**

<b>SAMPLE LOCATION</b>	<b>SAMPLE DATE</b>	<b>RADIONUCLIDE</b>	<b>CONCENTRATION (mg/L)</b>	<b>CONCENTRATION (pCi/L)</b>	<b>ERROR EST. +/- (pCi/L)</b>	<b>CONCENTRATION (µCi/ml)</b>	<b>EFF. CONC. LIMIT (µCi/ml)</b>	<b>% EFF. CONC. LIMIT</b>
<b>GW-32</b> Water Well Section 19 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
<b>GW-33</b> Water Well Section 21 T36N, R73W	1st Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	2nd Quarter	U-Nat Ra-226	NOT RUNNING			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0
	1st Quarter	U-Nat Ra-226	0.0782	0.20	1.00E-01	5.3E-08 2.0E-10	3.0E-07 6.0E-08	17.6 0.3
	2nd Quarter	U-Nat Ra-226	DRY			NA 0.0E+00	3.0E-07 6.0E-08	NA 0.0

**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - NB**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE DATE	RADIONUCLIDE	CONCENTRATION (mg/L)	CONCENTRATION (pCi/L)	ERROR EST. +/- (pCi/L)	CONCENTRATION (µCi/ml)	EFF. CONC. LIMIT (µCi/ml)	% EFF. CONC. LIMIT
<b>NBSWS1</b> Surface Water Section 25 T43N, R76W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBSWS2</b> Surface Water Section 26 T43N, R77W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBI2</b> Impoundment Section 25 T43N, R76W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBI6</b> Impoundment Section 24 T44N, R76W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBSU1</b> Upstream Section 18 T45N, R75W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA



**TABLE 4**  
**WATER SAMPLING DATA**  
**ENVIRONMENTAL MONITORING SITES - NB**  
**1st and 2nd Quarters 2018**

SAMPLE LOCATION	SAMPLE DATE	RADIONUCLIDE	CONCENTRATION (mg/L)	CONCENTRATION (pCi/L)	ERROR EST. +/- (pCi/L)	CONCENTRATION (µCi/ml)	LIMIT (µCi/ml)	LIMIT
<b>NBSU2</b> Upstream Section 13 T45N,R76W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBSD1</b> DownStream Section 19 T44N, R75W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBSD2</b> Downstream Section 24 T44N, R76W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBSD3</b> Downstream Section 19 T44N, R75W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
<b>NBSU4</b> Upstream Section 24 T44N, R76W	1st Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA
	2nd Quarter	U-Nat	DRY			0.0E+00	3.0E-07	NA
		Ra-226				0.0E+00	6.0E-08	NA

TABLE 5

SATELLITE NO. 1  
 LAND APPLICATION FACILITY (IRRIGATOR NO. 1)  
 MONTHLY IRRIGATION FLUID DATA  
 1st and 2nd Quarters 2018

## IRRIGATION CYCLE

DATE SAMPLED	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18
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## VOLUME (AF)

## MAJOR IONS (mg/L)

Reporting  
Limit

Calcium	1.0
Magnesium	1.0
Sodium	1.0
Potassium	1.0
Bicarbonate	1.0
Sulfate	1.0
Chloride	1.0

IRRIGATOR DID NOT OPERATE ALL REPORTING PERIOD

## NON-METALS

TDS @ 180° C (mg/L)	10.0
pH (standard units)	0.010
SAR	0.01

## TRACE METALS (mg/L)

Arsenic	0.001
Barium	0.10
Boron	0.10
Selenium	0.001

## RADIOMETRIC

U-nat (uCi/mL)	2.03E-10
Ra-226 (uCi/mL)	2.00E-10
Ra Err. Est. +/-	

TABLE 6

SATELLITE NO. 2  
LAND APPLICATION FACILITY (IRRIGATOR NO. 2)  
MONTHLY IRRIGATION FLUID DATA  
1st and 2nd Quarters 2018

## IRRIGATION CYCLE

DATE SAMPLED		Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18
VOLUME (AF)						5.40	28.1
MAJOR IONS (mg/L)	Reporting Limit						
Calcium	1.0					398	289
Magnesium	1.0					131	104
Sodium	1.0					90	75
Potassium	1.0					37	30
Bicarbonate	5.0					252	*
Sulfate	2.0					742	721
Chloride	1.0					599	615
IRRIGATOR DID NOT OPERATE							
NON-METALS							
TDS @ 180° C (mg/L)	17.0					2410	3020
pH (standard units)	0.010					8.04	*
SAR	0.1					1.0	1
TRACE METALS (mg/L)							
Arsenic	0.001					ND	ND
Barium	0.1					ND	ND
Boron	0.1					0.18	0.21
Selenium	0.001					0.020	0.016
RADIOMETRIC							
U-nat (uCi/mL)	2.03E-10					4.90E-07	4.49E-07
Ra-226 (uCi/mL)	2.00E-10					1.8E-09	2.40E-09
Ra Err. Est. +/- (uCi/mL)						4.0E-10	6.00E-10

\*Reference Section 2.4.2, Irrigation Fluid

TABLE 7

**SELENIUM PLANT  
RADIUM TREATMENT SYSTEM DISCHARGE - SRH  
MONTHLY RADIUM GRAB SAMPLES  
1st and 2nd Quarters 2018**

<b>SAMPLE DATE</b>	<b>Jan-18</b>	<b>Feb-18</b>	<b>Mar-18</b>	<b>Apr-18</b>	<b>May-18</b>	<b>Jun-18</b>
<b>RADIOMETRIC</b>						
Ra-226 ( $\mu\text{Ci/mL}$ )	1.50E-09	9.80E-09	2.90E-09	7.20E-09	2.40E-09	5.80E-09
Ra Err. Est. +/-	4.00E-10	1.90E-09	6.00E-10	1.50E-09	5.00E-10	1.20E-09
<b>Eff. Con. Limit</b>	<b>6.00E-08</b>					

**TABLE 8A**

**SATELLITE NO. 1  
LAND APPLICATION FACILITY (IRRIGATOR NO. 1)  
ANNUAL SOIL WATER DATA  
1st and 2nd Quarters 2018**

SAMPLE SITE	2'	4'	6'
	NW¼	NW¼	NW¼
	NE¼	NE¼	NE¼
	SW¼	SW¼	SW¼
	SE¼	SE¼	SE¼
	Lysimeter Composite	Lysimeter Composite	Lysimeter Composite

**SAMPLE DATE**

MAJOR IONS (mg/L)	LABORATORY REP. LIMIT
Bicarbonate	1.0
Sulfate	1.0
Chloride	1.0

**NON-METALS**

Cond (umho/cm)	1.0
pH (standard units)	0.010

Irrigator did not run  
No sample water available to  
report

**TRACE METALS (mg/L)**

Boron	0.10
Selenium	0.001

Lysimeter sampling discontinued  
as approved by WDEQ-LQD  
on July 2, 2018  
Reference Section 2.4.4, Soil Water Samples

**RADIOMETRIC**

U-nat: (mg/L)	0.0003
Ra-226: (pCi/L)	0.2
Ra Err. Est. +/-	
U-nat: (uCi/mL)	2.03E-10
Ra-226: (uCi/mL)	2.00E-10
Ra Err. Est. +/-	

TABLE 8B

SATELLITE NO. 2  
LAND APPLICATION FACILITY (IRRIGATOR NO. 2)  
ANNUAL SOIL WATER DATA  
1st and 2nd Quarters 2018

SAMPLE SITE	2'	4'	6'
	NW¼	NW¼	NW¼
	NE¼	NE¼	NE¼
	SW¼	SW¼	SW¼
	SE¼	SE¼	SE¼
	Lysimeter Composite	Lysimeter Composite	Lysimeter Composite

## SAMPLE DATE

MAJOR IONS (mg/L)	LABORATORY REP. LIMIT
Bicarbonate	1.0
Sulfate	1.0
Chloride	1.0

## NON-METALS

Cond (umho/cm)	1.0
pH (standard units)	0.010

Lysimeter replaced May 2014  
No sample water available to  
report

## TRACE METALS (mg/L)

Boron	0.10
Selenium	0.001

Lysimeter sampling discontinued  
as approved by WDEQ-LQD  
on July 2, 2018  
Reference Section 2.4.4, Soil Water Samples

## RADIOMETRIC

U-nat: (mg/L)	0.0003
Ra-226: (pCi/L)	0.2
Ra Err. Est. +/-	
U-nat: (uCi/mL)	2.03E-10
Ra-226: (uCi/mL)	2.00E-10
Ra Err. Est. +/-	

TABLE 9

**SATELLITE NO. 2  
PURGE STORAGE RESERVOIR (PSR-2)  
SHALLOW MONITORING WELLS  
WATER LEVEL AND WATER QUALITY DATA  
1st and 2nd Quarters 2018**

SAMPLE SITE		Shallow Well (No. 1 South)		Shallow Well (No. 2 East)	
SAMPLE DATE		3/31/18	4/12/18	3/31/18	4/12/18
<b>WATER LEVEL (DTW)</b>	Laboratory Reporting Limit	13.5	12.29	11.1	9.72
<b>MAJOR IONS (mg/L)</b>					
Bicarbonate	5.0		371		363
Sulfate	8.0		*		*
Chloride	2.0		473		455
<b>NON-METALS</b>					
Cond ( $\mu\text{mho/cm}$ )	5.0		4670		5340
pH (standard units)	0.01		8.10		7.90
<b>TRACE METALS (mg/L)</b>					
Boron	0.050		*		*
Selenium	0.001		1.12		0.016
<b>RADIOMETRIC</b>					
U-nat (uCi/mL)	6.77E-10		3.43E-07		4.50E-08
Ra-226 (uCi/mL)	2.00E-10		7.30E-09		2.00E-09
Ra-226 Err. Est. +/- (uCi/mL)			3.00E-10		2.00E-10

\*Reference Section 2.4.6, Satellite No. 2 Purge Storage Reservoir Monitor Well