HOMESTAKE MINING COMPANY OF CALIFORNIA

Grants Reclamation Project

SEMI-ANNUAL
ENVIRONMENTAL MONITORING REPORT

Reporting Period
July- December 2016

U.S. Nuclear Regulatory Commission License SUA-1471
State of New Mexico DP-200

100002071

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1.0 INTRODUCTION

This Semi-Annual Environmental Monitoring Report summarizes effluent monitoring data recorded for Homestake Mining Company of California - Grants Project (Homestake) from July through December 2016. The submittal of this report to the appropriate Nuclear Regulatory Commission (NRC) Regional Office and State of New Mexico within 60 days after January 1 and July 1 for each year of operation is required for all uranium mill facilities pursuant to 10 CFR Part 40.65. The monitoring data and the report format have been selected by Homestake to satisfy the requirements of 10 CFR Part 40.65 and Discharge Permit No. 200, dated September 18, 2014.

Homestake's monitoring and surveillance program for radioactive effluent releases have been designed to ensure the project's compliance with 10 CFR Part 40 and Part 20 U.S. NRC Standards for Protection Against Radiation; and closely approximates programs as described in NRC's Regulatory Guide 4.14, Radiological Effluent and Environmental Monitoring at Uranium Mills. Some effluent monitoring activities differ from those presented in Regulatory Guide 4.14, as required by Homestake's Radioactive Materials License (SUA-1471).

Recontouring reclamation activities began in September 1993 and mill demolition commenced in late October 1993 and was completed December 10, 1995. A mill decommissioning completion report was submitted to the NRC in February 1996 and approved on January 28, 1999. The large tailings pile (LTP) has been re-contoured and covered with an interim cover on the top and radon barrier on the outslopes. Bedding and erosion protection was placed on the outslopes after placement of the radon barrier. Soil cleanup verification of the off-pile contaminated soil (windblown tailings) is complete: the completion report was submitted to the NRC on December 18, 1995 and approved on January 29, 1999.

A summary of the operations of groundwater treatment technologies, as required by DP-200 is provided in Section 3.0.

Homestake's groundwater monitoring program, as outlined in License Condition No. 35, continued throughout the report period. The requirements set forth in Condition No. 35 include the reporting of both radiological and non-radiological water quality parameters for specified wells; and the documentation of water injection and collection volumes of the groundwater cleanup system. The performance review of the corrective action program is submitted annually as a separate document and contains the groundwater monitoring information for January 1 through December 31 of each year. To meet NRC's requirement for semi-annual reporting, groundwater-monitoring data for the point-of-compliance (POC) wells and background well P is included in this report. It should be noted that while the POC wells will eventually be used to demonstrate groundwater restoration, they are not currently representative of off-site groundwater quality conditions.

2.0 ENVIRONMENTAL MONITORING PROGRAMS

The monitoring requirements for the site are summarized in Table 2-1, Table 2-2, and Table 2-3 (attached). Details of the monitoring program are discussed in the following sections:

2.1 Air Particulate Monitoring

Homestake continuously samples total suspended particulate at seven locations around the reclamation site (see Figure 1). The locations identified as HMC-1, HMC-1A, HMC-2 and HMC-3 are areas at the property boundary expected to have the highest predictable concentrations of airborne radioactive particulate. The predominant wind direction is from the southwest; accordingly, HMC-1, HMC-2 and HMC-3 are generally located down wind of Homestake's reclamation activities. HMC-1A is northeast of EP-3 located north of the mill site. Location HMC-6 represents background conditions and is sited due west of the LTP at the western most side of the property boundary. Locations HMC-4 and HMC-5 are sites proximal to the nearest residences. HMC-7 is a blank filter that is analyzed as a lab and filter manufacturer quality check sample. The results are presented in Attachment 1.

Homestake uses Sierra Instruments Model #305-200 High Volume Air Samplers (or equivalent) to continuously sample the ambient air at the locations shown in Figure 1. The samples are collected on 8-inch by 10-inch Whatman® glass fiber filters (or equivalent), which are changed weekly or more frequently as required by dust loading. Energy Laboratories, Inc. analyzes the collected samples quarterly for Natural Uranium, Radium-226, Thorium-230 and Vanadium.

2.2 Radon Gas Monitoring

Radon gas concentrations are monitored on a continuous basis at the nine locations identified in Figure 1. The background station for radon gas is HMC #16, located northwest of the site. Landauer track-etch passive radon monitors (PRM), or the equivalent, are used to continuously monitor radon gas at each sampling location. Homestake personnel place new PRMs quarterly at the monitoring locations and the exposed detectors are retrieved and returned to Landauer for analysis. The technique by which the PRM detectors measure radon gas concentrations consists of exposing an alpha-particle sensitive plastic detector, which is mounted in a plastic container, to ambient air. A filter is placed over the container opening to inhibit the entrance of any alpha-emitting dust particles. The decay of radon gas contained in the ambient air imprints tracks on the alpha-sensitive detector that can be counted after collection. The radon gas concentration can subsequently be calculated by determining the number of tracks per unit area of the detector. The semi-annual average results are presented in Attachment 2.

2.3 Effluent and Radon Flux Monitoring

Regulations in 10 CFR 40.65 require licensees to estimate and report the quantities of principal radionuclides released to unrestricted areas in gaseous effluents every six months.

Radon-222 was the only radionuclide released to unrestricted areas in gaseous effluents in 2015. The principal sources of radon-222 at the site are the LTP and Small Tailings Pile (STP). Radon-222 releases from components of the water treatment system (the Reverse Osmosis [RO] building and evaporation ponds) are insignificant when compared to those of the LTP and STP.

Attachment 3 reports the radon-222 flux results for the LTP and STP measured in 2016. Average radon-222 fluxes of 21.7 and 7.9 picocuries per square meter per second (pCi m^{-2} s^{-1}) for the LTP and STP, respectively were reported. The average for the STP meets the radon-222 flux standard in 10 CFR40, Appendix A, criterion 6 (1). The average radon flux for the LTP does not meet this

standard as required by SUA-1471, condition 36E. Consistent with past mitigation practices, additional interim cover was placed on areas of the LTP to reduce the radon flux but subsequent measurement could not be made due to freezing temperatures going into the winter months. Follow-up measurements will be made in the spring of 2017. The areas of the LTP and STP are approximately 1.18 and 0.22 square kilometers respectively. Multiplying the areas by their associated flux rates, the radon emissions in 2016 from the LTP and STP are estimated to be 807 and 54 curies, respectively. The amount of radon-222 released in the second half of 2016 is estimated to be half of the quantities presented for the LTP and STP.

3.0 OPERATIONS

3.1 Flow Rates

The monthly influent totals to each of the evaporation ponds are presented in Table 3.1-1 for the second half of 2016. Inputs to Evaporation Pond 2 were RO brine, tailings dewatering, tailings sumps, and transfers from the collection pond. Transfers from Evaporation Pond 2 to Evaporation Pond 1 and transfers from Evaporation Pond 1 to Evaporation Pond 3 also are presented in this table. The influent into the collection ponds was from well 802, and miscellaneous flow from the RO plant which includes any diverted flow, flow from the RO sumps, backwash from the microfiltration system, and blow down from the clarifiers. The freeboard measurements taken from the evaporation and collection ponds are tabulated in Table 3.1-2. The readings on the West Collection Pond are taken as either overflowing (O/F) into the East Collection Pond via a spillway or not overflowing (Not O/F). The leak detection meters from Evaporation Ponds 2 and 3 are presented in Tables 3.1-3 through 3.1-5.

The collection and injection totals for the LTP are presented in Table 3.1-6. Injection into the LTP ceased in July 2015. The monthly collection totals broken out by aquifer and restoration area are shown in Table 3.1-7. The monthly injection totals broken out by aquifer and area are presented in Table 3.1-8. The On-Site, South Off-Site, and North Off-site injection water is a combination of San Andres water, zeolite treated water, and RO Product water. The monthly totals for the low concentration and in-situ injectate are presented in Table 3.1-9.

Table 3.1-10 presents the influent totals for the active treatment systems. The inflow to the RO plant averaged 434 gpm in the second half of 2016 while the inputs to the 300 zeolite and 1200 zeolite cells were 158 and 249, respectively. Table 3.1-11 presents the total volumes of treated effluent. It also presents the regeneration and brine effluents that were discharged into Evaporation Pond 2 from the treatment systems. The fresh water injection totals from each of the three restoration areas are also presented in this table.

3.2 Reversal Wells

The depth to water measurements for the Reversal Wells are presented in Table 3.2-1. Water levels in alluvial well S5 have been used in place of well S1 for the S1-S2 reversal pair due to the effects of the nearby S injection line on water levels in well S1. Because the operation of the S injection line results in water level changes in both S1 and S2, it is necessary to monitor water levels in well S5 which is closer to the collection area to effectively monitor gradient reversal.

3.3 Pond and Pipeline Maintenance

No liner repair work was done in the second half of 2016. Installation of a main trunk line extension to supply the South Off-Site area was completed in the second half of 2016.

There were no discharges from conveyance pipelines to non-authorized areas and no major pipeline repairs were done during this time period.

3.4 Well Drilling and Closures

Table 3.4-1 presents the wells that were drilled in the period from July through December of 2016.

4.0 WATER QUALITY MONITORING

4.1 Groundwater Quality Monitoring

Table 2-2 outlines the water quality sampling frequency and parameters monitored. In addition, the volumes of water injected and recovered as part of the ground-water cleanup program are monitored weekly and the rates documented. A performance review report is submitted by March 31 of each year according to License Condition 35E. The groundwater monitoring data for the POC wells, as required to comply with 10 CFR 40.65, are reported in Tables 4.1-1 through 4.1-3. A sample from background well P was not taken in the second half of 2016. The water quality of the POC wells is currently being restored and therefore the reported levels currently are not representative of steady state aquifer conditions. The concentration levels are therefore not compared to 10 CFR 20 effluent limits. A hydraulic barrier forces the water in the aquifer near these POC wells to move in the direction of the collection wells where the water is withdrawn and treated. Due to these conditions, water level data on these wells are also not reflective of steady state conditions, and therefore are not reported here.

4.2 Pond Water Quality Monitoring

Table 4.2-1 presents the water quality data associated with the collection and evaporation ponds. The water quality data for the Evaporation Pond alluvial monitoring wells are presented in Table 4.2-2. This table highlights the concentrations that exceed the alluvial site standards in blue. The sulfate concentrations naturally exceed the site standard in wells DD and DD2. The TDS in well DD also exceeds the site standard. The uranium concentration in well DD2 naturally exceeds the alluvial site standard as it has since this well was drilled. Table 4 from the Discharge Permit DP-200 requests uranium activity as one of the analytes for monitoring but is not included because it is a calculated value from the uranium concentrations.

4.3 Treated Water Quality Monitoring

Table 4.3-1 presents the effluent water quality analysis from the Post Treatment Tank (SP2). The SP2 sample is collected after mixing of the RO product, zeolite treated and fresh water. This table also shows that all of the SP2 concentrations in the second half of 2016 were less than the alluvial site standards since none of the values are highlighted with blue. All of the second half 2016 Post Treatment Tank discharge samples meet the standards for injection of this water into the ground water.

Table 4.3-2 presents the treated water quality data for the RO product (SP1) and the zeolite treated water (300Z, 1200Z Trains 1 & 2, and 1200Z Trains 3 & 4) with sample constituent concentrations that exceed the alluvial site standards highlighted in blue. All of the RO product constituent concentrations measured in 2016 were less than the corresponding alluvial site standards. The uranium and molybdenum concentrations from the low pressure RO Unit 2 (LPRO No.2) exceeded the site standards on September 1 sample and adjustment of this unit's RO membranes were made after this sample. Table 4.3-2 also presents the treated water quality for the zeolite treatment process. In the second half of 2016, zeolite was used to treat Off-site water for uranium in the 300 zeolite system and four trains in the 1200 zeolite systems. The zeolite treated water is monitored for the discharge from the 300 zeolite and Trains 1 & 2 and Trains 3 & 4 from the 1200 systems. The uranium concentration for two samples from the 300Z exceeded the standard in August while the uranium concentration in the first sample of treated water from the two 1200Z monitoring locations also exceeded the alluvial aquifer standard. The uranium concentration in the SP2 August 16th integrated sample was less than the site standard but was higher than typical values. Additional monitoring of the treated zeolite water discharged to the Post Treatment Tank has been implemented with more frequent measurements of the approximate uranium concentration using the Kinetic Phosphorescence Analyzer (KPA) instrument. The KPA samples can be processed within a few hours of collection. In conjunction with other field water quality measurements, the frequent KPA sample results allow adjustments of the pretreatment and also provide an indication of the uranium loading condition within the zeolite. With the improved system management allowed by the frequent KPA samples, the uranium concentrations in the zeolite treated water were below the site standard for the remainder of the second half of 2016.

The molybdenum concentration exceeded the site standard in the 300Z sample taken on August 2. This value is thought to be anomalous because all of the North Off-site collection wells supplying water to the 300Z during this period have molybdenum concentrations less than detection. The molybdenum concentrations in the samples before and after the August 2 sample were consistent with the typical concentration of below detection to only slightly above the detection limit of 0.03 mg/l.

The sulfate and TDS concentration site standards were exceeded in a sample taken on November 9th for the 1200Z Trains 1&2 and a sample taken on November 11th for the 1200Z Trains 3&4. These higher sulfate and TDS concentrations occurred after large changes in the flows to these trains were made following regeneration or other operational changes. The corresponding uranium concentration for these samples and associated KPA samples indicates the operating trains were effectively removing uranium, and this in turn indicates that the pretreatment was operating correctly. In addition, the pretreatment acid pumps are equipped with pH monitoring probes and should automatically adjust for changes in the zeolite process flow. With continuing

refinement of the regeneration procedures to produce a more uniform fluid distribution during regeneration and subsequent rinsing, along with additional field water quality measurements after operational changes, the likelihood of a future sulfate or TDS concentration exceedance should be significantly reduced.

The Radium226 plus radium228 activity site standard was also exceeded in the November 14th sample for the 1200Z Trains 1&2. The Off-Site collection water does not contain significant radium levels and it has been demonstrated that significant levels of radium only exist very near the tailings pile. This exceedance is thought to be a laboratory outlier.

5.0 DIRECT RADIATION

Gamma dose rates are continuously monitored through the use of optically stimulated luminescence (OSL) dosimeter badges placed at each of the eight locations identified in Figure 1. HMC #16 is considered the background location for direct radiation. Each OSL badge consists of an aluminum oxide detector within a plastic holder. The plastic provides adequate protection from weather for these badges to be used outdoors. The OSL's are exchanged semi-annually and analyzed by an approved independent laboratory (currently Landauer). The levels of direct environmental radiation are recorded for each of the eight locations. Pertinent sample data are reported in Attachment 4.

6.0 SURFACE CONTAMINATION

The Occupational Monitoring Program requirements are summarized in Table 2-3. The aspects related to contamination control are discussed briefly below.

6.1 Personnel Skin and Clothing

The monitoring of personnel for alpha contamination is required as part of all radiation work permits using standard operating procedures. No releases of personnel or clothing above administrative limits were reported during this reporting period.

6.2 Survey of Equipment Prior to Release for Unrestricted Use

Equipment surveys are required for all equipment that is to be removed from contaminated areas as specified in radiation work permits. Standard Operating Procedures are used for these surveys. No releases of contaminated material above NRC release criteria were reported.

7.0 DATA SUMMARY AND CONCLUSIONS

The summaries of Homestake's effluent monitoring program included in this submittal contain data for each of the regulated parameters released to unrestricted areas. DP-200 and 10 CFR Part 40.65 requires that Homestake submit effluent release monitoring data to the State of New Mexico and the NRC within 60 days of the end of the six-month period ending July 1 and December 31 of each year. Homestake is submitting this report to satisfy the regulatory requirements cited above. The attachments included in this report summarize the results of the effluent monitoring activities conducted by Homestake and pertinent to the required monitoring time period.

The data collected in Homestake's effluent (air particulate and radon) monitoring program can be readily compared to 10 CFR Part 20 values. During the report period, Homestake has not exceeded 10 CFR Part 20 values in any of their effluents covered by this report. This, of course, does not include the ground water values at the POC wells as discussed earlier.

Table 2-1
Environmental Monitoring Program Excluding Groundwater Monitoring

Table 2-1 - Environmental Monitoring Program Excluding Groundwater Monitoring

Type of Sample	Number	Locations	Method	Frequency	Analytical Parameters
Air Particulates	4	HMC-1, HMC-1A, HMC-2, HMC-3 at or near the site boundary in sectors that have the highest predicted concentrations of radioactive airborne particulates.	Continuous (High Vol.)	Weekly filter change or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230 Vanadium
	2	HMC-4, HMC-5 at site boundary nearest occupied residences	Continuous (High Vol.)	Weekly filter change, or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230 Vanadium
	1	HMC-6 background location	Continuous (High Vol.)	Weekly filter change, or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230 Vanadium
Radon Gas	9	Locations described in Air - Particulates & HMC-7 on S boundary, HMC-1A near Evaporation Pond (EP-3), & HMC-16 as a background	Continuous Track-etch	Quarterly	Rn-222
Direct Radiation	8	Locations described in Air - Particulates & HMC-16 as a background	OSL	Semi-Annual	Gamma Exposure Rate

Table 2-2
Groundwater Monitoring Program (8-99, as modified by Amendment 34)

Table 2-2 Groundwater Monitoring Program (8-99 as modified by Amendment 34)

Well Number	Parameters to be Monitored	Frequency of Monitoring
#1 & #2 Deepwells	D	Annually
Broadview Acres Wells 446, SUB1, SUB2, SUB3	G	Annually
Felice Acres Wells 490, 492, 493, 494	G	Annually
Murray Acres Wells 802, 844	G	Annually
Pleasant Valley Wells 688, 846	G	Annually
Regional Wells 920, 942	G	Annually
Site Monitoring Wells F, FB, GH, MO, CW2	G	Annually
Collection System Wells	Total Volume	Monthly
Injection System Wells	Total Volume	Monthly
Reversal Wells B, BA, KZ, DZ, SO, SP, S1, S2	Water Level	Weekly
Point of Compliance Wells D1, X, S4	B, F	Annually
Background Well P	B	Annually

B = Water Level, pH, TDS, SO_4, Cl, HCO_3, CO_3, Na, Ca, Mg, K, NO_3, U, Se, Mo, Ra-226
D = Ca, Mg, K, Na, HCO_3, CO_3, Cl, SO_4, pH, TDS, Al, As, Ba, Cd, Co, Cu, CN, F, Fe, Pb, Mn, Hg, Mo, Ni, NO_3 as N, Se, Ag, Zn, U, Filtered Ra-226
F = V, Ra-228, Th-230
G = Water Level, SO_4, U, Se, TDS, Mo

Table 2-3
Occupational Monitoring Program (6-00)

Table 2-3 Occupational Monitoring Program (6-00)

Type of Sample	Number	Locations	Method	Frequency	Analytical Parameters
Lapel Personal Air Sample	As required by RWP	As required by RWP (2 L/min or equivalent)	HP-1	As required by RWP	Alpha, U-Nat
Lapel Personal Air Sampler Calibration	As required by RWP	N/A	HP-1	As required by RWP	Flow rate
Release of Equipment	As required by RWP	Potentially Contaminated Equipment and Materials	HP-4	As required by RWP	Alpha, beta gamma
ALARA	N/A	As required by RPA	HP-6	N/A	As required by RPA
Respiratory Protection	As required by RWP	As required by RWP	HP-7	N/A	N/A
Bioassay	As required by RWP	As required by RWP	HP-8 after mill decommissioning; termination	Baseline, Semi-annual	U-Nat in urine
Instrument Calibration	Variable	Radiation Detection Instruments in use	HP-10	Annually	N/A
Personnel Gamma (OSL)	Variable	Personnel	HP-11	Quarterly	Gamma
Personnel Contamination	As required by RWP	As required by RWP	HP-12	As required by RWP	Alpha
Radiation Protection Training	As required	Mill Site taught by RPA (certified individual) subjects as per Reg Guide 8.31	HP-14 for people working with groundwater or physical work with tailings sand/ slimes	Initial & annual refresher	Training Class & Written Test

HP-# = Homestake procedure number; RPA = Radiation Protection Administrator;
RWP = Radiation Work Permit; OSL = Optically Stimulated Luminescence dosimeter

Tables 3.1-1 through 3.1-11
Flow Rates

Table 3.1-1. Evaporation and Collection Pond Monthly Influent Totals

Evap Pond 1

July	Interval Gallons
Transfer EP-2 to EP-1	19,771,000

August	Interval Gallons
Transfer EP-2 to EP-1	10,917,000

Septebmer	Interval Gallons
Transfer EP-2 to EP-1	4,533,000

October	Interval Gallons
Transfer EP-2 to EP-1	701,000

November	Interval Gallons
Transfer EP-2 to EP-1	0

December	Interval Gallons
Transfer EP-2 to EP-1	9,010,000

Evap Pond 2

July	Interval Gallons
R.O. Flow to Evaporation Ponds	3,668,092
Tailings Sumps	0
Tailings Pile	0
Zeolite Regeneration & Overflow	0
E Coll Pond to EP-2	428,348
August	Interval Gallons
R.O. Flow to Evaporation Ponds	3,207,998
Tailings Sumps	0
Tailings Pile	0
Zeolite Regeneration & Overflow	0
E Coll Pond to EP-2	2,328,856
September	Interval Gallons
R.O. Flow to Evaporation Ponds	3,793,521
Tailings Sumps	0
Tailings Pile	0
Zeolite Regeneration & Overflow	0
E Coll Pond to EP-2	0
October	Interval Gallons
R.O. Flow to Evaporation Ponds	9,335,885
Tailings Sumps	0
Tailings Pile	0
Zeolite Regeneration & Overflow	0
E Coll Pond to EP-2	0
November	Interval Gallons
R.O. Flow to Evaporation Ponds	5,669,306
Tailings Sumps	0
Tailings Pile	0
Zeolite Regeneration & Overflow	4,259,800
E Coll Pond to EP-2	1,799,944
December	Interval Gallons
R.O. Flow to Evaporation Ponds	2,091,338
Tailings Sumps	0
Tailings Pile	0
Zeolite Regeneration & Overflow	6,918,662
E Coll Pond to EP-2	0

Evap Pond 3

July	Interval Gallons
Transfer EP-1 to EP-3	0

August	Interval Gallons
Transfer EP-1 to EP-3	7,574,000

September	Interval Gallons
Transfer EP-1 to EP-3	9,625,000

October	Interval Gallons
Transfer EP-1 to EP-3	0

November	Interval Gallons
Transfer EP-1 to EP-3	0

December	Interval Gallons
Transfer EP-1 to EP-3	0

Collection Ponds

July	Interval Gallons
Miscellanous RO and Clarifier Flow	240,000
Tailings Sumps	536,256
802	142,590

August	Interval Gallons
Miscellanous RO and Clarifier Flow	428,000
Tailings Sumps	771,120
802	183,470

September	Interval Gallons
Miscellanous RO and Clarifier Flow	336,000
Tailings Sumps	560,448
802	135,990

October	Interval Gallons
Miscellanous RO and Clarifier Flow	417,000
Tailings Sumps	705,600
802	165,080

November	Interval Gallons
Miscellanous RO and Clarifier Flow	380,000
Tailings Sumps	592,704
802	132,660

December	Interval Gallons
Miscellanous RO and Clarifier Flow	2,100,000
Tailings Sumps	567,936
802	7,550

Table 3.1-2. Evaporation and Collection Pond Weekly Freeboard Measurements (feet)

	EP1	EP2	EP3A	EP3B	W Coll	E Coll
7/4/2016	4.1	4.15	9.3	7.3	No O/F	2.3
7/11/2016	4.1	4.41	9.3	7.4	No O/F	2.37
7/18/2016	4.25	4.58	9.35	7.5	No O/F	3.77
7/25/2016	4.25	4.6	9.4	8.1	No O/F	4.3
8/1/2016	4.25	4.75	9.4	8.1	No O/F	4.7
8/8/2016	4.1	4.9	9.3	8.1	O/F	4.44
8/15/2016	3.8	5.08	9.1	8.1	No O/F	4.13
8/22/2016	4.25	5.41	7.6	8.1	O/F	4.8
8/29/2016	4.32	5.79	6.6	8.1	O/F	3.63
9/5/2016	6.1	6.05	6.75	7.25	O/F	3.05
9/12/2016	6.1	6.3	6	7.3	O/F	3.1
9/19/2016	6	6.15	5.94	7.3	No O/F	4.05
9/26/2016	6.2	6.1	6.2	7.5	No O/F	3.97
10/3/2016	6.3	7.15	6.3	7.6	No O/F	5
10/10/2016	6	5.62	6.25	7.6	No O/F	4.35
10/17/2016	6.5	5.21	6.3	7.65	No O/F	4.6
10/24/2016	6.5	4.97	6.35	8.1	No O/F	4.55
10/31/2016	6.5	4.48	6.4	8.1	O/F	4.57
11/7/2016	6.6	3.9	6.5	7.8	No O/F	5.2
11/14/2016	6.6	3.24	4.8	7.3	O/F	3.85
11/21/2016	6.6	2.93	6.5	7.3	O/F	3.55
11/28/2016	6.6	2.52	6.5	7.3	O/F	4.3
12/5/2016	6.6	2.34	6.5	7.3	O/F	4.68
12/12/2016	6.4	2.39	6.6	7.4	O/F	4.55
12/19/2016	6	2.61	6.8	7.5	O/F	4.25
12/26/2016	5.44	2.49	6.6	7.4	O/F	4.9

Table 3.1-3. Evaporation Pond 2 Leak Detection

Date	No. 1		No. 2		No. 3		No. 4		No. 5	
	Reading	Gallons	Reading	Gallons	Reading	Gallons	Reading	Gallons	Reading	Gallons
Previous Reading	84,450		617,740		241,920		1,049,620		333,920	
7/4	84,450	0	617,740	0	241,920	0	1,041,620	-8,000	333,920	0
7/11	84,450	0	617,740	0	241,920	0	1,041,620	0	333,920	0
7/18	84,450	0	617,740	0	241,920	0	1,049,690	8,070	333,920	0
7/25	84,450	0	617,740	0	241,920	0	1,049,650	-40	333,920	0
8/1	84,450	0	617,740	0	241,920	0	1,049,690	40	333,920	0
8/8	84,450	0	617,740	0	241,920	0	1,049,690	0	333,970	50
8/15	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	-50
8/22	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	0
8/29	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	0
9/5	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	0
9/12	84,450	0	617,740	0	241,920	0	1,049,690	0	333,910	-10
9/19	84,450	0	617,740	0	241,920	0	1,049,690	0	333,910	0
9/26	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	10
10/3	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	0
10/10	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	0
10/17	84,450	0	617,740	0	241,920	0	1,049,690	0	333,920	0
10/24	84,450	0	617,740	0	246,570	4,650	1,049,690	0	343,290	9,370
10/31	84,450	0	617,740	0	246,570	0	1,049,690	0	370,370	27,080
11/7	84,450	0	617,740	0	246,570	0	1,049,690	0	410,870	40,500
11/14	84,450	0	617,740	0	292,340	45,770	1,049,690	0	438,320	27,450
11/21	84,450	0	617,740	0	292,350	10	1,049,690	0	438,320	0
11/28	84,450	0	617,740	0	292,520	170	1,049,690	0	438,320	0
12/5	84,450	0	617,740	0	292,520	0	1,049,690	0	438,320	0
12/12	84,450	0	617,740	0	292,520	0	1,049,690	0	438,320	0
12/19	84,450	0	617,740	0	292,520	0	1,049,690	0	438,320	0
12/26	84,450	0	617,740	0	292,520	0	1,049,690	0	438,320	0

NOTE: Totalizer readings that result in minor positive or negative volumes should not be given any significance.

Table 3.1-4. Evaporation Pond 3A Leak Detection

Cell A Sumps	A-1		A-2		A-3		A-4		A-5	
	Reading	Gallons	Reading	Gallons	Reading	Gallons	Reading	Gallons	Reading	Gallons
Previous Reading	9,999,650		129,930		127,230		21,700		278,010	
7/4	9,999,620	-30	129,930	0	127,230	0	21,700	0	278,210	200
7/11	9,999,620	0	129,930	0	127,230	0	21,700	0	278,210	0
7/18	9,999,620	0	129,930	0	127,230	0	21,700	0	278,210	0
7/25	9,999,620	0	129,930	0	127,270	40	21,700	0	278,210	0
8/1	9,999,620	0	129,930	0	127,270	0	21,700	0	278,210	0
8/8	9,999,620	0	129,930	0	127,270	0	21,700	0	278,210	0
8/15	9,999,620	0	129,930	0	127,270	0	21,700	0	278,210	0
8/22	9,999,620	0	129,930	0	127,270	0	21,700	0	278,220	10
8/29	9,999,620	0	129,930	0	127,270	0	21,700	0	278,220	0
9/5	9,999,620	0	129,930	0	127,270	0	21,700	0	278,220	0
9/12	9,999,620	0	129,930	0	127,280	10	21,700	0	278,220	0
9/19	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
9/26	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
10/3	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
10/10	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
10/17	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
10/24	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
10/31	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
11/7	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
11/14	9,999,620	0	129,930	0	127,280	0	21,700	0	278,220	0
11/21	9,999,620	0	129,930	0	127,300	20	21,700	0	278,220	0
11/28	9,999,620	0	129,930	0	127,300	0	21,700	0	278,220	0
12/5	9,999,620	0	129,930	0	127,300	0	21,700	0	278,220	0
12/12	9,999,620	0	129,930	0	127,300	0	21,400	-300	278,220	0
12/19	9,999,620	0	129,930	0	127,300	0	21,400	0	278,220	0
12/26	9,999,620	0	129,930	0	127,300	0	21,400	0	278,220	0

NOTE: Totalizer readings that result in minor positive or negative volumes should not be given any significance

Table 3.1-5. Evaporation Pond 3B Leak Detection

Cell B Sumps	B-1		B-2		B-3		B-4		B-5	
	Reading	Gallons	Reading	Gallons	Reading	Gallons	Reading	Gallons	Reading	Gallons
Previous Reading	1,128,380		420,730		903,740		198,810		279,220	
7/4	1,128,380	0	420,730	0	903,740	0	198,810	0	279,220	0
7/11	1,128,380	0	420,730	0	903,740	0	198,810	0	279,220	0
7/18	1,128,380	0	420,730	0	903,740	0	198,810	0	279,220	0
7/25	1,173,520	45,140	420,800	70	913,330	9,590	35,020	35,020	284,660	5,440
8/1	1,181,330	7,810	420,800	0	913,370	40	47,920	12,900	284,200	-460
8/8	1,185,900	4,570	424,400	3,600	913,370	0	54,400	6,480	284,200	0
8/15	1,190,580	4,680	428,010	3,610	913,400	30	60,870	6,470	284,730	530
8/22	1,192,500	1,920	428,010	0	913,540	140	61,430	560	284,930	200
8/29	1,195,410	2,910	428,010	0	915,030	1,490	63,930	2,500	287,200	2,270
9/5	1,195,410	0	428,010	0	915,030	0	63,930	0	287,200	0
9/12	1,198,020	0	428,010	0	915,780	750	64,320	0	287,700	0
9/19	1,198,020	0	428,010	0	915,780	0	64,320	0	287,700	0
9/26	1,198,030	10	428,010	0	915,780	0	64,320	0	287,700	0
10/3	1,201,460	3,430	428,010	0	916,650	870	64,320	0	287,700	0
10/10	1,201,470	10	428,010	0	916,650	0	64,320	0	287,700	0
10/17	1,201,480	10	428,010	0	916,660	10	64,320	0	287,700	0
10/24	1,201,480	0	428,010	0	916,660	0	64,320	0	287,710	10
10/31	1,201,490	10	428,010	0	916,660	0	64,320	0	288,780	1,070
11/7	1,206,420	4,930	428,010	0	917,300	640	64,320	0	288,780	0
11/14	1,206,420	0	428,010	0	917,300	0	64,320	0	288,780	0
11/21	1,206,420	0	428,010	0	917,300	0	64,320	0	288,780	0
11/28	1,206,420	0	428,010	0	917,300	0	64,320	0	288,780	0
12/5	1,206,400	-20	428,010	0	917,300	0	64,320	0	288,780	0
12/12	1,206,420	20	428,010	0	917,320	20	64,320	0	288,780	0
12/19	1,206,420	0	428,010	0	917,320	0	64,320	0	288,780	0
12/26	1,206,420	0	428,010	0	917,320	0	64,320	0	288,780	0

NOTE: Totalizer readings that result in minor positive or negative volumes should not be given any significance.

Table 3.1-6. Monthly Tailings Collection and Injection Totals

	Sumps (gallons)	Dewatering (gallons)	Injection (gallons)
July	536,256	80,640	0
August	771,120	50,400	0
September	560,448	80,640	0
October	705,600	95,760	0
November	592,704	0	0
December	567,936	0	0

Table 3.1-7. Monthly Collection Totals by Aquifer and Area (gallons)

	On-Site Collection			South Off-Site Collection				North Off-Site Collection
	Alluvial	Upper Chinle	Middle Chinle	Alluvial	Upper Chinle	Middle Chinle	Lower Chinle	Alluvial
July	18,771,850	1,475,740	2,205,900	2,165,160	0	600,440	210,400	7,865,100
August	18,528,422	3,240,420	1,532,200	4,264,155	86,620	0	0	5,305,700
September	16,757,406	1,668,520	1,085,040	412,760	0	166,240	0	2,794,300
October	22,613,186	2,985,490	1,815,746	11,140,985	405,510	2,882,505	0	11,478,000
November	16,847,090	300,160	1,795,414	18,738,940	867,210	5,036,050	0	7,185,100
December	9,776,574	845,510	569,900	14,826,215	306,630	3,530,155	0	6,880,800

Table 3.1-8. Monthly Injection Totals by Aquifer and Area (gallons)

	On-Site Injection			South Off-Site Injection				North Off-Site Injection
	Alluvial	Upper Chinle	Middle Chinle	Alluvial	Upper Chinle	Middle Chinle	Lower Chinle	Alluvial
July	24,455,520	1,453,180	295,860	2,738,195	0	776,860	0	7,734,770
August	30,533,760	704,540	360,820	2,939,045	0	1,856,755	0	9,031,300
September	20,805,120	600,590	239,880	4,042,575	0	2,724,925	0	3,185,900
October	28,526,400	713,400	316,110	8,596,770	0	1,917,230	0	16,461,700
November	22,861,440	782,350	256,520	11,915,877	0	2,827,923	0	21,483,900
December	18,624,960	515,570	280,930	7,532,198	0	6,630,402	0	17,436,200

Table 3.1-9. Monthly Totals of Low-concentration and In-situ Injectate (gallons)

	L well Collection for Reinjection	*In-situ* Injection
July	895,300	0
August	0	0
September	0	0
October	0	0
November	0	0
December	0	0

Table 3.1-10. Treatment System Influents Monthly Totals (gallons)

	300 GPM Zeolite	1200 GPM Zeolite	RO Plant
July	7,865,100	2,976,000	19,540,460
August	5,305,700	4,308,840	19,724,862
September	2,794,300	579,000	18,832,516
October	11,478,000	14,429,000	25,331,386
November	7,185,100	24,642,200	18,717,250
December	6,880,800	18,663,000	12,223,254

Table 3.1-11. Treatment System Effluent and Fresh Water Monthly Totals (gallons)

	Treatment Systems				Fresh Water Injection		
	Zeolite		RO Plant				
	Treated	Regeneration	Treated	Brine	On-Site	South Off-Site	North Off-Site
July	10,841,100	0	15,632,368	3,668,092	11,830,192	0	463,000
August	9,614,540	0	16,088,864	3,207,998	18,339,752	0	82,000
September	3,373,300	0	14,702,995	3,793,521	9,690,528	3,565,400	230,000
October	25,907,000	0	15,578,501	9,335,885	8,493,648	1,259,600	5,281,000
November	31,827,300	4,259,800	12,667,944	5,669,306	9,592,208	0	6,070,000
December	18,570,338	6,918,662	9,921,916	2,091,338	12,682,000	0	6,353,000

Table 3.2-1
Reversal Wells

Table 3.2-1. Depth to Water in Reversal Wells

Well Name	B	BA	DZ	KZ	S2	S5	SM	SN	SO	SP
MP Elev.	6570.9	6571.58	6590.53	6571.72	6573.72	6574.69	6578.74	6579.26	6578.79	6578.66
7/4/2016	33.35	35.6	52.15	30.25	35.85	42.43	40.38	41.1	39.45	39.37
7/11/2016	33.35	35.46	52.45	29.62	34.84	41.96	38.88	38.87	38.97	39.20
7/18/2016	33.52	35.66	52.44	29.61	32.81	42.02	38.48	39.98	39.06	39.24
7/25/2016	33.34	35.39	51.70	29.44	34.28	41.84	38.33	39.87	38.82	39.15
8/1/2016	33.46	36.50	34.87	29.51	32.84	42.01	38.39	39.90	39.04	38.39
8/15/2016	33.76	36.50	50.57	29.74	32.98	40.45	38.51	39.23	39.32	38.49
8/22/2016	33.98	35.83	51.22	29.96	34.87	42.52	38.70	29.41	39.51	39.66
9/6/2016	34.45	36.64	52.44	30.17	35.31	43.46	30.92	39.70	39.82	40.01
9/19/2016	33.93	35.83	52.41	30.15	35.60	42.03	36.61	39.26	39.54	39.45
9/26/2016	34.01	35.71	51.13	29.97	36.00	42.97	38.85	39.53	39.96	39.87
10/3/2016	34.3	37.16	50.84	30.04	35.68	42.43	38.87	39.55	39.93	39.88
10/10/2016	34.70	37.72	51.38	30.55	35.27	43.15	39.15	39.81	40.25	40.18
10/17/2016	34.34	36.44	51.10	30.28	34.72	42.80	37.93	39.87	40.08	40.00
10/24/2016	34.32	36.87	57.70	30.01	40.20	42.59	39.05	39.75	40.11	40.00
10/31/2016	37.75	36.38	51.93	30.79	35.82	52.17	38.79	39.49	39.84	39.73
11/7/2016	34.42	36.51	53.58	31.40	41.20	42.49	38.88	39.57	39.93	39.79
11/14/2016	34.29	36.10	51.53	31.50	35.72	42.15	38.80	39.47	39.83	39.67
11/21/2016	34.00	35.70	45.75	31.50	35.10	41.80	31.51	39.20	39.53	39.40
11/28/2016	33.82	35.52	50.40	31.59	37.13	41.73	38.40	39.06	39.46	39.31
12/5/2016	34.07	35.78	50.80	31.79	35.10	41.93	38.57	39.26	39.63	39.47
12/12/2016	34.10	35.65	50.62	31.43	35.67	41.98	38.73	39.40	39.80	39.63
12/19/2016	34.43	35.88	49.80	31.33	43.10	42.22	42.50	39.60	38.94	39.87
12/27/2016	34.2	35.52	50.54	30.94	35.88	42.05	38.9	39.47	40.01	39.78

Note: Numbers are depth to water, ft.

Table 3.4-1
Wells Drilled

Table 3.4-1. Wells Drilled

Well Name	Restoration Area
R50A	South Off-Site
R60A	South Off-Site
R61A	South Off-Site
R66A	South Off-Site
R70A	South Off-Site
V1	South Off-Site
V2	South Off-Site
V3	South Off-Site
V4	South Off-Site
V6	South Off-Site
B17	On-Site
B26	On-Site
B33	On-Site
B36	On-Site
B41	On-Site
B48	On-Site
CE16A	On-Site
S32	On-Site
S33	On-Site
S34	On-Site
S40	On-Site

Table 4.1-1
Water Quality Analysis for Well D1

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16070481-002
Client Sample ID: D1

Report Date: 08/17/16
Collection Date: 07/11/16 08:57
Date Received: 07/15/16
Matrix: Aqueous

Analyses		Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS								
175	Alkalinity, Total as CaCO3	324	mg/L		5		A2320 B	07/19/16 22:29 / wc
206	Carbonate as CO3	<5	mg/L		5		A2320 B	07/19/16 22:29 / wc
505	Bicarbonate as HCO3	396	mg/L		5		A2320 B	07/19/16 22:29 / wc
001	Calcium	205	mg/L		0.5		E200.8	07/19/16 03:30 / sf
007	Chloride	135	mg/L		1		E300.0	07/22/16 21:12 / ljl
002	Magnesium	38.0	mg/L		0.5		E200.8	07/19/16 03:30 / sf
310	Nitrogen, Nitrate+Nitrite as N	1.3	mg/L	D	0.2		E353.2	07/20/16 12:53 / ljl
003	Potassium	3.6	mg/L		0.5		E200.8	07/19/16 03:30 / sf
004	Sodium	331	mg/L		0.5		E200.8	07/19/16 03:30 / sf
108	Sulfate	863	mg/L	D	2		E300.0	07/22/16 21:12 / ljl
PHYSICAL PROPERTIES								
009	pH	7.49	s.u.	H	0.01		A4500-H B	07/15/16 17:16 / wc
010	Solids, Total Dissolved TDS @ 180 C	1800	mg/L	DH	20		A2540 C	07/22/16 16:52 / smm
METALS - DISSOLVED								
036	Molybdenum	2.05	mg/L		0.03		E200.7	07/19/16 13:52 / sf
040	Selenium	0.074	mg/L		0.005		E200.8	07/19/16 03:30 / sf
015	Uranium	1.38	mg/L		0.0003		E200.8	07/19/16 03:30 / sf
244	Uranium Precision (±)	0.224	mg/L		0.00005		E200.8	07/19/16 03:30 / sf
113	Uranium, Activity	9.4E-07	uCi/mL		2.0E-10		E200.8	07/19/16 03:30 / sf
114	Uranium, Activity precision (±)	1.5E-07	uCi/mL		3.0E-11		E200.8	07/19/16 03:30 / sf
042	Vanadium	<0.01	mg/L		0.01		E200.8	07/19/16 03:30 / sf
RADIONUCLIDES - DISSOLVED								
045	Radium 226	0.43	pCi/L				E903.0	08/15/16 13:02 / dmf
245	Radium 226 precision (±)	0.15	pCi/L				E903.0	08/15/16 13:02 / dmf
	Radium 226 MDC	0.16	pCi/L				E903.0	08/15/16 13:02 / dmf
256	Radium 226 altu	4.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
258	Radium 226 altu precision (±)	1.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
	Radium 226 altu MDC	2.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
057	Radium 228	0.5	pCi/L	U			RA-05	08/09/16 13:50 / plj
257	Radium 228 precision (±)	1	pCi/L				RA-05	08/09/16 13:50 / plj
	Radium 228 MDC	1.6	pCi/L				RA-05	08/09/16 13:50 / plj
359	Radium 228 altu	5.0E-10	uCi/mL				RA-05	08/09/16 13:50 / plj
360	Radium 228 altu precision (±)	1.0E-09	uCi/mL				RA-05	08/09/16 13:50 / plj
	Radium 228 altu MDC	2.0E-09	uCi/mL				RA-05	08/09/16 13:50 / plj
DATA QUALITY								
079	Solids, Total Dissolved - Calculated	1800	mg/L				A1030 E	07/26/16 08:31 / kbh
192	A/C Balance	-0.89	%				A1030 E	07/26/16 08:31 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16070481-002
Client Sample ID: D1

Report Date: 08/17/16
Collection Date: 07/11/16 08:57
Date Received: 07/15/16
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
194 Anions	28.4	meq/L				A1030 E	07/26/16 08:31 / kbh
195 Cations	27.8	meq/L				A1030 E	07/26/16 08:31 / kbh
200 TDS Ratio	0.99	unitless				A1030 E	07/26/16 08:31 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Table 4.1-2
Water Quality Analysis for Well S4

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16070481-003
Client Sample ID: S4

Report Date: 08/17/16
Collection Date: 07/09/16 10:15
Date Received: 07/15/16
Matrix: Aqueous

Analyses		Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS								
175	Alkalinity, Total as CaCO3	455	mg/L		5		A2320 B	07/19/16 22:37 / wc
206	Carbonate as CO3	<5	mg/L		5		A2320 B	07/19/16 22:37 / wc
505	Bicarbonate as HCO3	555	mg/L		5		A2320 B	07/19/16 22:37 / wc
001	Calcium	282	mg/L		0.5		E200.8	07/19/16 03:36 / sf
007	Chloride	244	mg/L		1		E300.0	07/22/16 21:31 / ljl
002	Magnesium	63.9	mg/L		0.5		E200.8	07/19/16 03:36 / sf
310	Nitrogen, Nitrate+Nitrite as N	<0.1	mg/L		0.1		E353.2	07/20/16 12:54 / ljl
003	Potassium	5.1	mg/L		0.5		E200.8	07/19/16 03:36 / sf
004	Sodium	295	mg/L		0.5		E200.8	07/19/16 03:36 / sf
108	Sulfate	885	mg/L	D	4		E300.0	07/22/16 21:31 / ljl
PHYSICAL PROPERTIES								
009	pH	7.38	s.u.	H	0.01		A4500-H B	07/18/16 10:42 / wc
010	Solids, Total Dissolved TDS @ 180 C	2030	mg/L		10		A2540 C	07/15/16 17:50 / wc
METALS - DISSOLVED								
036	Molybdenum	0.55	mg/L		0.03		E200.7	07/19/16 13:56 / sf
040	Selenium	<0.005	mg/L		0.005		E200.8	07/19/16 03:36 / sf
015	Uranium	0.475	mg/L		0.0003		E200.8	07/19/16 03:36 / sf
244	Uranium Precision (±)	0.0766	mg/L		0.00005		E200.8	07/19/16 03:36 / sf
113	Uranium, Activity	3.2E-07	uCi/mL		2.0E-10		E200.8	07/19/16 03:36 / sf
114	Uranium, Activity precision (±)	5.2E-08	uCi/mL		3.0E-11		E200.8	07/19/16 03:36 / sf
042	Vanadium	<0.01	mg/L		0.01		E200.8	07/19/16 03:36 / sf
RADIONUCLIDES - DISSOLVED								
045	Radium 226	0.56	pCi/L				E903.0	08/15/16 13:02 / dmf
245	Radium 226 precision (±)	0.16	pCi/L				E903.0	08/15/16 13:02 / dmf
	Radium 226 MDC	0.16	pCi/L				E903.0	08/15/16 13:02 / dmf
256	Radium 226 altu	6.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
258	Radium 226 altu precision (±)	2.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
	Radium 226 altu MDC	2.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
057	Radium 228	0.9	pCi/L	U			RA-05	08/09/16 13:50 / plj
257	Radium 228 precision (±)	1.0	pCi/L				RA-05	08/09/16 13:50 / plj
	Radium 228 MDC	1.7	pCi/L				RA-05	08/09/16 13:50 / plj
359	Radium 228 altu	9.0E-10	uCi/mL				RA-05	08/09/16 13:50 / plj
360	Radium 228 altu precision (±)	1.0E-09	uCi/mL				RA-05	08/09/16 13:50 / plj
	Radium 228 altu MDC	2.0E-09	uCi/mL				RA-05	08/09/16 13:50 / plj
DATA QUALITY								
079	Solids, Total Dissolved - Calculated	2100	mg/L				A1030 E	07/26/16 08:31 / kbh
192	A/C Balance	-3.13	%				A1030 E	07/26/16 08:31 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16070481-003
Client Sample ID: S4

Report Date: 08/17/16
Collection Date: 07/09/16 10:15
Date Received: 07/15/16
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
194 Anions	34.4	meq/L				A1030 E	07/26/16 08:31 / kbh
195 Cations	32.3	meq/L				A1030 E	07/26/16 08:31 / kbh
200 TDS Ratio	0.98	unitless				A1030 E	07/26/16 08:31 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Table 4.1-3
Water Quality Analyses for Well X

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16070481-001
Client Sample ID: X

Report Date: 08/17/16
Collection Date: 07/09/16 11:09
Date Received: 07/15/16
Matrix: Aqueous

Analyses		Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS								
175	Alkalinity, Total as CaCO3	350	mg/L		5		A2320 B	07/19/16 22:21 / wc
206	Carbonate as CO3	<5	mg/L		5		A2320 B	07/19/16 22:21 / wc
505	Bicarbonate as HCO3	427	mg/L		5		A2320 B	07/19/16 22:21 / wc
001	Calcium	149	mg/L		0.5		E200.8	07/19/16 03:23 / sf
007	Chloride	92	mg/L		1		E300.0	07/22/16 20:54 / ljl
002	Magnesium	29.9	mg/L		0.5		E200.8	07/19/16 03:23 / sf
310	Nitrogen, Nitrate+Nitrite as N	1	mg/L	D	0.2		E353.2	07/20/16 12:51 / ljl
003	Potassium	4.5	mg/L		0.5		E200.8	07/19/16 03:23 / sf
004	Sodium	147	mg/L		0.5		E200.8	07/19/16 03:23 / sf
108	Sulfate	370	mg/L	D	2		E300.0	07/22/16 20:54 / ljl
PHYSICAL PROPERTIES								
009	pH	7.43	s.u.	H	0.01		A4500-H B	07/15/16 17:13 / wc
010	Solids, Total Dissolved TDS @ 180 C	997	mg/L		10		A2540 C	07/15/16 17:49 / wc
METALS - DISSOLVED								
036	Molybdenum	0.10	mg/L		0.03		E200.7	07/19/16 13:40 / sf
040	Selenium	0.012	mg/L		0.005		E200.8	07/19/16 03:23 / sf
015	Uranium	0.0634	mg/L		0.0003		E200.8	07/19/16 03:23 / sf
244	Uranium Precision (±)	0.0102	mg/L		0.00005		E200.8	07/19/16 03:23 / sf
113	Uranium, Activity	4.3E-08	uCi/mL		2.0E-10		E200.8	07/19/16 03:23 / sf
114	Uranium, Activity precision (±)	6.9E-09	uCi/mL		3.0E-11		E200.8	07/19/16 03:23 / sf
042	Vanadium	0.02	mg/L		0.01		E200.8	07/19/16 03:23 / sf
RADIONUCLIDES - DISSOLVED								
045	Radium 226	0.61	pCi/L				E903.0	08/15/16 13:02 / dmf
245	Radium 226 precision (±)	0.17	pCi/L				E903.0	08/15/16 13:02 / dmf
	Radium 226 MDC	0.16	pCi/L				E903.0	08/15/16 13:02 / dmf
256	Radium 226 altu	6.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
258	Radium 226 altu precision (±)	2.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
	Radium 226 altu MDC	2.0E-10	uCi/mL				E903.0	08/15/16 13:02 / dmf
057	Radium 228	0.4	pCi/L	U			RA-05	08/09/16 13:50 / plj
257	Radium 228 precision (±)	1	pCi/L				RA-05	08/09/16 13:50 / plj
	Radium 228 MDC	1.6	pCi/L				RA-05	08/09/16 13:50 / plj
359	Radium 228 altu	4.0E-10	uCi/mL				RA-05	08/09/16 13:50 / plj
360	Radium 228 altu precision (±)	1.0E-09	uCi/mL				RA-05	08/09/16 13:50 / plj
	Radium 228 altu MDC	2.0E-09	uCi/mL				RA-05	08/09/16 13:50 / plj
DATA QUALITY								
079	Solids, Total Dissolved - Calculated	1000	mg/L				A1030 E	07/26/16 08:31 / kbh
192	A/C Balance	-2.85	%				A1030 E	07/26/16 08:31 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16070481-001
Client Sample ID: X

Report Date: 08/17/16
Collection Date: 07/09/16 11:09
Date Received: 07/15/16
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
194 Anions	17.4	meq/L				A1030 E	07/26/16 08:31 / kbh
195 Cations	16.4	meq/L				A1030 E	07/26/16 08:31 / kbh
200 TDS Ratio	0.97	unitless				A1030 E	07/26/16 08:31 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants
Lab ID: C16101026-001
Client Sample ID: X

Report Date: 11/17/16
Collection Date: 10/20/16 13:46
Date Received: 10/31/16
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
007 Chloride	94	mg/L		1		E300.0	11/07/16 20:32 / ljl
108 Sulfate	331	mg/L	D	2		E300.0	11/07/16 20:32 / ljl
PHYSICAL PROPERTIES							
010 Solids, Total Dissolved TDS @ 180 C	922	mg/L	H	10		A2540 C	11/02/16 08:36 / bah
METALS - DISSOLVED							
036 Molybdenum	0.13	mg/L		0.03		E200.7	11/03/16 16:16 / sf
040 Selenium	0.015	mg/L		0.005		E200.8	11/11/16 11:19 / smm
015 Uranium	0.0606	mg/L		0.0003		E200.8	11/11/16 11:19 / smm
244 Uranium Precision (±)	0.00978	mg/L		0.00005		E200.8	11/11/16 11:19 / smm
113 Uranium, Activity	4.1E-08	uCi/mL		2.0E-10		E200.8	11/11/16 11:19 / smm
114 Uranium, Activity precision (±)	6.6E-09	uCi/mL		3.0E-11		E200.8	11/11/16 11:19 / smm

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

Table 4.2- 1
Lined Pond Water Quality

Table 4.2-1. Lined Pond Water Quality

Sample Point Name	Date	Temp (deg.C)	pH (f) (std. units)	Conductivity (micromhos/cm)	CO3 (mg/l)	Ca (mg/l)	Cl (mg/l)	HCO3 (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	SO4 (mg/l)	TDS (mg/l)	NO3 (mg/l)
arameter Code		12	109	51	6	1	7	5	2	3	4	8	10	39
E Coll Pond	8/17/16	21.50	8.32	9033	<5	103	462	727	103	9.2	2090	3820	6930	3.2
	10/17/16	19.80	8.15	6852			377					3040	5320	
Evap Pond 1	8/17/16	27.90	9.47	58730	5160	32	5580	2500	372	93.2	22100	32700	63500	<0.5
	10/17/16	20.10	9.05	59730			5440					33400	64900	
Evap Pond 2	8/17/16	21.60	9.13	29320	549	39.9	1780	2220	261	31.6	9090	14600	26700	<0.1
	10/17/16	20.10		27230			1810					15100	25200	
Evap Pond 3-A	8/17/16	22.00	9.57	83370	8150	22.7	14800	6030	369	297	34400	35100	92800	<0.5
	10/17/16	18.30		92980			20000					27500	92000	
Evap Pond 3-B	8/17/16	22.10	9.43	108100	15100	20.8	15400	13000	579	292	53100	50800	100000	<0.5
	10/17/16	7.50		100500			17900					30400	93600	
W Coll Pond	8/17/16	19.50	8.85	7244	63	58.3	368	620	81	7.3	1650	2770	5450	3.9
	10/17/16	19.40	8.47	7265			369					2990	5210	

f = field measurement
t = analyte, total

Table 4.2-1. Lined Pond Water Quality, cont.

Sample Point Name	Date	Mn(t) (mg/l)	Se (mg/l)	Se (t) (mg/l)	Mo (mg/l)	Mo (t) (mg/l)	Unat (mg/l)	Unat (t) (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	Ra226+ Ra228 (pCi/l)	Th230 (pCi/l)	V (mg/l)
arameter Code		134	40	140	36	136	15	115	45	57	372	48	42
E Coll Pond	8/17/16	0.052	0.354	0.389	17.2	17.8	8.65	9.12	3	5	8	0.9	<0.01
	10/17/16		0.309		11.2		5.75						
Evap Pond 1	8/17/16	0.045	0.59	0.49	220	181	120	122	22	6.5	28.5	59.4	0.06
	10/17/16		0.5		157		124						
Evap Pond 2	8/17/16	0.046	0 19	0.403	40 8	83	66.7	41.1	20	4.6	24.6	3	0.04
	10/17/16		0.64		35.1		68.2						
Evap Pond 3 A	8/17/16	0 26	0.7	0.671	656	537	198	198	40	32 5	72.5	348	0.13
	10/17/16		0.9		415		203						
Evap Pond 3 B	8/17/16	0.15	0.36	0.11	634	569	376	347	86	34.8	120.8	368	0.14
	10/17/16		0.6		525		311						
W Coll Pond	8/17/16	0.018	0.347	0.392	13.9	15	7.41	7.9	3.9	0.89	4.8	0.006	<0.01
	10/17/16		0.313		11.5		5.76						

f = field measurement
t = analyte, total

Table 4.2- 2
Evaporation Pond Monitoring Wells Water Quality

Table 4.2-2. Evaporation Pond Monitoring Wells Water Quality

Sample Point Name	Date	WL (feet)	Temp (deg.C)	pH (f) (std. units)	Conductivity (micromhos/cm)	CO3 (mg/l)	Ca (mg/l)	Cl (mg/l)	HCO3 (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)
arameter Code		13	12	109	51	6	1	7	5	2	3	4
Site Standard Qal aquifer								250				
DD	10/6/16	47.50	10.30	6.34	4368			75				
DD2	10/6/16	45.26	10.90	7.08	3108			71				
X	7/9/16	26.63	16.50	6.65	1476	<5	149	92	427	29.9	4.5	147
	10/20/16	27.50	16.10	7.11	1380	<5		94				

Concentrations greater than site standards are in **bold**.

f = field measurement

Table 4.2-2. Evaporation Pond Monitoring Wells Water Quality, cont.

Sample Point Name	Date	SO4 (mg/l)	TDS (mg/l)	NO3 (mg/l)	Se (mg/l)	Mo (mg/l)	Unat (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	Ra226+ Ra228 (pCi/l)	Th230 (pCi/l)	V (mg/l)
Parameter Code		8	10	39	40	36	15	45	57	372	48	42
Site Standard Qal aquifer		1500	2734	12	0.32	0.1	0 16			5	0.3	0.02
DD	10/6/16	2150	3560		0.109	<0.03	0.08					
DD2	10/6/16	1540	2630		<0 005	0.03	0.20					
X	7/9/16	370	1000	1	0.012	0.1	0.06	0.61	0.4	1		0.02
	10/20/16	331	922		0.015	0.13	0.06					

Concentrations greater than site standards are in bold.

f = field measurement

Table 4.3-1
Compliant Water Quality

Table 4.3-1. Compliant Water Quality

Sample Point Name	Date	Temp (deg.C)	pH (f) (std. units)	Conductivity (micromhos/cm)	CO3 (mg/l)	Ca (mg/l)	Cl (mg/l)	HCO3 (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)
Parameter Code		12	109	51	6	1	7	5	2	3	4
Site Standard Qal aquifer								250			
						Post Treatment Tank					
SP2	7/9/2016										
	8/16/2016	21.60	7.04	1647	<5	171	107	202	37.7	6.6	146
	8/30/2016										
	9/15/2016										
	9/26/2016										
	9/26/2016	17.60	6.75	845							
	10/4/2016	17.2	6.48	860	<5	63.1	54	59	18.4	2.3	75
	10/24/2016	16.3	6.65	1140							
	11/30/2016	16.7	6.46	3095	<5	150	118	113	33.9	7.6	197
	12/19/2016										

Concentrations greater than site standards are in **bold**.

f = field measurement

Table 4.3-1. Compliant Water Quality, cont.

Sample Point Name	Date	SO4 (mg/l)	TDS (mg/l)	NO3 (mg/l)	Se (mg/l)	Mo (mg/l)	Unat (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	Ra226+ Ra228 (pCi/l)	Th230 (pCi/l)	V (mg/l)
Parameter Code		8	10	39	40	36	15	45	57	372	48	42
Site Standard Qal aquifer			1500	2734	12	0.32	0.1	0.16			5	0.3
						Post Treatment Tank						
SP2	7/9/2016					0.07	0.04					
	8/16/2016	546	1200	1.7	0.017	0.05	0.15	0.21	0.1	0.3	0.02	<0.01
	8/30/2016					0.05	0.06					
	9/15/2016					0.04	0.02					
	9/26/2016					0.05	0.02					
	9/26/2016	219	543		<0.005	0.04	0.04					
	10/4/2016	265	526	0.8	0.01	<0.03	0.01	0.39	2.1	2.5	0.005	<0.01
	10/24/2016					<0.03	0.02					
	11/30/2016	696	1340	1.9	0.023	<0.03	0.05	0.26	-0.9	-0.64	0.07	<0.01
	12/19/2016					<0.03	0.07					

Concentrations greater than site standards are in bold

f = field measurement

Table 4.3-2
Treated Water Quality

Table 4.3-2. Treated Water Quality

Sample Point Name	Date	Temp (deg C)	pH (f) (std units)	Conductivity (micromhos/cm)	CO3 (mg/l)	Ca (mg/l)	Cl (mg/l)	HCO3 (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)
Parameter Code		12	109	51	6	1	7	5	2	3	4
Site Standard Qal aquifer							250				
						RO Product					
RO SP1	8/16/2016						154				
	8/30/2016										
	9/15/2016										
	9/26/2016										
	10/24/2016										
LPRO No 1 Product	9/1/2016						7				
LPRO No 2 Product	9/1/2016						24				
LPRO #3 Product	9/1/2016						4				
HPRO #1 Product	9/1/2016						7				
HPRO #2 Prod	9/1/2016						8				
						Zeolite Treated Water					
300Z	7/6/2016				<5	186	148	52	50 7	6 1	219
	7/13/2016				<5	201	171	61	56 3	6 3	228
	7/18/2016				<5	218	160	59	60 2	6 7	238
	8/2/2016				<5	188	174	207	54	7	250
	8/17/2016				<5	206	178	86	55	6 8	221
	9/23/2016				<5	226	201	<5	60 2	6 6	250
	9/26/2016				<5	208	186	9	61 3	5 9	248
	10/3/2016				<5	215	181	19	59 2	6 5	244
	10/10/2016				<5	217	175	43	60 9	6 5	259
	10/20/2016				<5	232	184	63	63 9	5 9	249
	10/25/2016				<5	223	170	56	62	6 1	251
	11/1/2016				<5	221	161	54	61 2	5 2	248
	11/8/2016				<5	207	159	48	57 3	5 6	234
	11/14/2016				<5	229	154	84	63 4	6 1	228
	12/6/2016				<5	198	146	76	54 4	5 2	232
	12/12/2016				<5	218	166	63	58 7	5 4	251
	12/19/2016				<5	247	190	46	65 9	5 6	267
	12/27/2016				<5	249	173	46	68 5	6 1	282
1200Z Trains 1&2	8/2/2016				<5	447	182	223	50 1	12	96 9
	8/3/2016				<5	454	164	342	50	14 7	138
	10/20/2016				<5	373	165	149	34 2	12 8	177
	10/25/2016				<5	255	170	138	34 3	16	263
	11/1/2016				<5	209	159	113	43	12 8	287
	11/8/2016				<5	192	157	107	41 3	12 3	297
	11/9/2016				<5	686	165	201	111	18 1	296
	11/14/2016				<5	205	141	122	47	12 1	263
	11/22/2016				<5	194	161	90	43 4	10 7	324
	11/30/2016				<5	186	148	34	43 1	10 3	317
	12/7/2016				<5	175	161	54	42 8	9 7	310
	12/12/2016				<5	184	142	76	44 8	9 1	295
1200Z Trains 3&4	8/2/2016				<5	483	182	327	50 8	12	93 1
	8/3/2016				<5	455	158	354	47 1	15 5	141
	10/19/2016				<5	347	167	157	40 9	13 1	213
	10/25/2016				<5	236	169	136	37 5	13 3	273
	11/4/2016				<5	220	152	108	43 5	11 3	273
	11/8/2016				<5	192	157	107	40 2	11 2	294
	11/11/2016				<5	608	152	120	82 3	15 2	280
	11/14/2016				<5	231	137	76	39 2	11 6	242
	12/16/2016				<5	218	134	107	37 4	10 8	267
	12/19/2016				<5	221	134	109	38 3	10 8	270
	12/27/2016				<5	215	148	89	47 2	11 6	312

Concentrations greater than site standards are in bold

f = field measurement

Table 4.3-2. Treated Water Quality, cont.

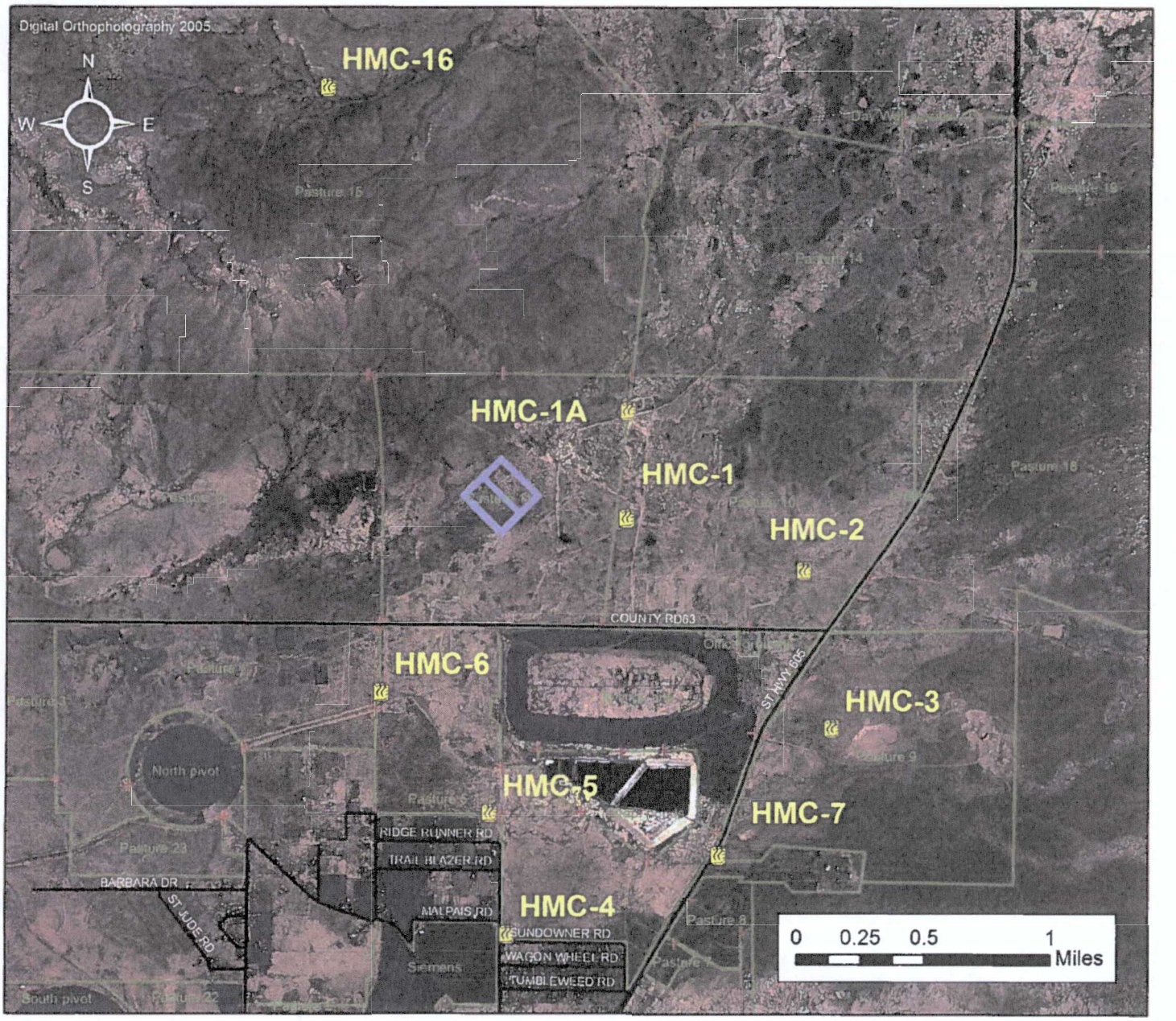
Sample Point Name	Date	SO4 (mg/l)	TDS (mg/l)	NO3 (mg/l)	Se (mg/l)	Mo (mg/l)	Unat (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	Ra226+ Ra228 (pCi/l)	Th230 (pCi/l)	V (mg/l)
Parameter Code		8	10	39	40	36	15	45	57	372	48	42
Site Standard Qal aquifer		1500	2734	12	0 32	0 1	0 16			5	0 3	0 02
							RO Product					
RO SP1	8/16/2016	480	1340	1 1	0 006	0 1	0 060	0 53				
	8/30/2016					0 06	0 011					
	9/15/2016					0 07	0 021					
	9/26/2016	31	108		<0 005	0 05	0 023					
	10/24/2016					<0 03	<0 0003					
LPRO No 1 Product	9/1/2016					0 049	0 0153					
LPRO No 2 Product	9/1/2016					**0 564**	**0 301**					
LPRO #3 Product	9/1/2016					0 036	0 0099					
HPRO #1 Product	9/1/2016					0 063	0 0215					
HPRO #2 Prod	9/1/2016					0 086	0 0314					
							Zeolite Treated Water					
300Z	7/6/2016	840	1740	2 6	0 037	<0 03	0 0648	0 24	0 6	0 84	0 02	<0 01
	7/13/2016	1010	1820	2 9	0 038	<0 03	0 0916	0 34	1 3	1 64	0 03	<0 01
	7/18/2016	1150	1820	2 8	0 038	<0 03	0 112	2 4	2	4 4	0 1	<0 01
	8/2/2016	794	1680	2 4	0 039	0 13	**0 447**	0 2	0 1	0 3	0 002	<0 01
	8/17/2016	934	1870	2 4	0 046	0 05	**0 277**	0 41	0 9	1 31	0 2	<0 01
	9/23/2016	1210	1990	2 9	0 044	<0 03	0 0837	0 42	3 1	3 52	0 06	<0 01
	9/28/2016	1150	2000	2 8	0 038	<0 03	0 0648	0 11	1 4	1 51	0 02	<0 01
	10/3/2016	1100	1920	2 8	0 038	0 03	0 0407	0 34	0 2	0 54	0 09	<0 01
	10/10/2016	1050	1910	2 8	0 037	<0 03	0 0459	0 57	2 3	2 87	0 07	<0 01
	10/20/2016	1100	1950	2 9	0 043	<0 03	0 0354	0 4	3 8	4 2	0 04	<0 01
	10/25/2016	1050	1950	3	0 038	<0 03	0 0409	0.29	1 3	1 59	0 05	<0 01
	11/1/2016	1030	1880	2 8	0 038	<0 03	0 036	0 08	1 3	1 38	0 04	<0 01
	11/8/2016	988	1830	2 6	0 035	<0 03	0 0409	0 11	0 6	0 71	0 2	<0 01
	11/14/2016	974	1930	2 5	0 042	0 03	0 105	0 32	4 1	4 42	0 03	<0 01
	12/6/2016	953	1850	2 6	0 028	<0 03	0 142	0 1	-2	-1 9	0 02	<0 01
	12/12/2016	986	1840	2 3	0 032	<0 03	0 121	0 19	-2	-1 81	0 06	<0 01
	12/19/2016	1180	2030	2 5	0 036	<0 03	0 0833	1 1	-0 3	0 8	0 04	<0 01
	12/27/2016	1070	2000	2 6	0 036	<0 03	0 102	1 3	0 02	1 32	0 1	<0 01
1200Z Trains 1&2	8/2/2016	1070	2090	0 4	0 042	<0 03	**0 297**	0 71	0 8	1 51	0 008	<0 01
	8/3/2016	976	2200	2 2	0 038	<0 03	0 124	0 33	0 3	0 63	-0 001	0 01
	10/20/2016	1190	2110	2 4	0 032	<0 03	0 0263	0 23	2 1	2 33	0 04	<0 01
	10/25/2016	1050	1920	2 6	0 033	<0 03	0 0131	0 41	-0 3	0 11	0 03	<0 01
	11/1/2016	1000	1830	2 8	0 035	<0 03	0 0098	0 31	-1	-0 69	0 1	<0 01
	11/8/2016	977	1870	2 6	0 038	<0 03	0 0253	0.25	0 7	0 95	0 2	<0 01
	11/9/2016	**2810**	**4510**	1 4	0 032	<0 03	0 0326	0 45	0 7	1 15	0 05	<0 01
	11/14/2016	957	1910	2 4	0 036	<0 03	0 045	0 26	5.2	**5 46**	0 2	<0 01
	11/22/2016	1020	1880	2 6	0 037	<0 03	0 0361	0 12	-0 8	-0 68	0 1	<0 01
	11/30/2016	970	1840	2 6	0 036	<0 03	0 0775	0 49	1 1	1 59	0 04	<0 01
	12/7/2016	973	1750	2.2	0 037	<0 03	0 105	0 27	-0 6	-0 33	0 05	<0 01
	12/12/2016	980	1800	2.2	0 033	<0 03	0 121	0 23	-3	-2 77	0 02	<0 01
1200Z Trains 3&4	8/2/2016	1080	2160	1 6	0 036	<0 03	**0 59**	0 23	0 1	0 33	0 02	0 01
	8/3/2016	1130	2180	2 3	0 039	<0 03	0 066	0.26	3 6	3 86	0 1	<0 01
	10/19/2016	1160	2090	2 4	0 03	<0 03	0 0066	0 23	1 6	1 83	0 05	<0 01
	10/25/2016	1040	1900	2 6	0 036	<0 03	0 0121	0 24	0 6	0 84	0 00006	<0 01
	11/4/2016	986	1890	2 6	0 035	<0 03	0 0227	0 2	-0 09	0 11	0 06	<0 01
	11/8/2016	972	1860	2 6	0 039	<0 03	0 041	0 09	0.2	0 29	0 06	<0 01
	11/11/2016	**1920**	**3330**	2 4	0 033	<0 03	0 0606	0 58	-0 04	0 54	0 03	<0 01
	11/14/2016	967	1960	2 3	0 046	<0 03	0 0384	0 39	3 9	4 29	0 09	<0 01
	12/16/2016	908	1840	2 3	0 036	<0 03	0 0215	3 3	1 3	4 6	0 2	<0 01
	12/19/2016	909	1840	2 3	0 035	<0 03	0 018	1 5	-4	-2 5	0 1	<0 01
	12/27/2016	988	1870	2 5	0 036	<0 03	0 0099	0 69	0 4	1 09	0 03	<0 01

Concentrations greater than site standards are in bold

f = field measurement

Figure 1 – Monitoring & Sampling Locations

FIGURE 1 : HMC Air Monitoring & Sampling Locations - Grants, NM



Location ID	Sampling Unit	Northing	Easting
HMC1	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1547458.8	491370.5
HMC1A	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1549715.8	491387.7
HMC2	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1546349.5	495053.2
HMC3	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1543048.7	495640.5
HMC4	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1538751.1	488918.0
HMC5	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1541268.4	488546.3
HMC6	Hi-Vol Particulate (Air), Track-Etch Cup (Radon), OSL Badge (Gamma)	1543813.1	486297.3
HMC7	Track-Etch Cup (Radon)	1540395.7	493293.8
HMC16 (BKG)	Track-Etch Cup (Radon), OSL Badge (Gamma)	1556470.5	485135.1

- Location
- Road
- Gate
- EP-3
- Fence Line
- Section Line

HOMESTAKE

Attachment 1
High Volume Air Sampling Results

ANALYTICAL SUMMARY REPORT

February 14, 2017

Homestake Mining Co
Hwy 605
Grants, NM 87020

Work Order C17010178 Quote ID C775 - Hi-Vol Filters

Project Name Grants NM Homestake Mining Company

Energy Laboratories, Inc Casper WY received the following 8 samples for Homestake Mining Co on 1/9/2017 for analysis

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C17010178-001	HMC-1	12/31/16 00 00	01/09/17	Filter	Metals by ICP/ICPMS, Total Composite of two or more samples Client Provided Field Parameters Digestion, Total Metals, Radiochemistry Radiochemistry Air Filter Compliance Calculations RAD-AIR, Routine Radiological Reports RAD Alternate Unit Reporting Air Filters Radium 226 Thorium, Isotopic
C17010178-002	HMC-1A	12/31/16 00 00	01/09/17	Filter	Same As Above
C17010178-003	HMC-2	12/31/16 00 00	01/09/17	Filter	Same As Above
C17010178-004	HMC-3	12/31/16 00 00	01/09/17	Filter	Same As Above
C17010178-005	HMC-4	12/31/16 00 00	01/09/17	Filter	Same As Above
C17010178-006	HMC-5	12/31/16 00 00	01/09/17	Filter	Same As Above
C17010178-007	HMC-6	12/31/16 00 00	01/09/17	Filter	Same As Above
C17010178-008	HMC-7 Blank	12/31/16 00 00	01/09/17	Filter	Same As Above

The results as reported relate only to the item(s) submitted for testing The analyses presented in this report were performed at Energy Laboratories, Inc , 2393 Salt Creek Hwy , Casper, WY 82601, unless otherwise noted Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative

If you have any questions regarding these test results, please call

Report Approved By

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-001
Client Sample ID: HMC-1

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 14 / sf
RADIONUCLIDES - IN AIR							
Radium 226	1 8E-17	uCi/mL				E903 0	01/28/17 09 43 / dmf
Radium 226 precision (±)	7 7E-18	uCi/mL				E903 0	01/28/17 09 43 / dmf
Radium 226 MDC	6 9E-18	uCi/mL				E903 0	01/28/17 09 43 / dmf
Thorium 230	3 1E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	5 8E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	1 2E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 14 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	2 4	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	1 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	0 95	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	4 2	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 80	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	1 6	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	5 3	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	2 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	1 0E-01	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	137000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-1

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-001	^{nat}U	9E-17	N/A	N/A	1E-16	9E-14	1E-01
First Quarter 2016	^{230}Th	1E-17	3E-18	2 9E-18	1E-16	3E-14	5E-02
Air Volume in mLs	^{226}Ra	3E-17	8E-18	3 4E-18	1E-16	9E-13	4E-03
1 37E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-001	^{nat}U	1E-16	N/A	N/A	1E-16	9E-14	1E-01
Second Quarter 2016	^{230}Th	1E-17	2E-18	3 1E-18	1E-16	3E-14	3E-02
Air Volume in mLs	^{226}Ra	2E-17	8E-18	9 8E-18	1E-16	9E-13	2E-03
1 44E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-001	^{nat}U	8E-16	N/A	N/A	1E-16	9E-14	9E-01
Third Quarter 2016	^{230}Th	6E-18	3E-18	4 1E-18	1E-16	3E-14	2E-02
Air Volume in mLs	^{226}Ra	3E-17	1E-17	8 9E-18	1E-16	9E-13	3E-03
1 48E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-001	^{nat}U	4E-17	N/A	N/A	1E-16	9E-14	4E-02
Fourth Quarter 2016	^{230}Th	3E-17	6E-18	1 2E-17	1E-16	3E-14	1E-01
Air Volume in mLs	^{226}Ra	2E-17	8E-18	6 9E-18	1E-16	9E-13	2E-03
1 37E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-002
Client Sample ID: HMC-1A

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 18 / sf
RADIONUCLIDES - IN AIR							
Radium 226	1 6E-17	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 precision (±)	6 4E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	7 9E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	1 2E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	2 3E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	3 3E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 18 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	2 2	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	0 88	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	1 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	1 6	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 31	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 46	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	5 2	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	2 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	137000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-1A

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-002	^{nat}U	1E-16	N/A	N/A	1E-16	9E-14	1E-01
First Quarter 2016	^{230}Th	1E-17	3E-18	3 9E-18	1E-16	3E-14	5E-02
Air Volume in mLs	^{226}Ra	4E-17	9E-18	3 2E-18	1E-16	9E-13	4E-03
1 43E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-002	^{nat}U	7E-17	N/A	N/A	1E-16	9E-14	8E-02
Second Quarter 2016	^{230}Th	4E-17	7E-18	2 2E-17	1E-16	3E-14	1E-01
Air Volume in mLs	^{226}Ra	4E-17	1E-17	1 1E-17	1E-16	9E-13	4E-03
1 22E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-002	^{nat}U	5E-16	N/A	N/A	1E-16	9E-14	6E-01
Third Quarter 2016	^{230}Th	1E-17	2E-18	5 1E-18	1E-16	3E-14	3E-02
Air Volume in mLs	^{226}Ra	4E-17	1E-17	9 0E-18	1E-16	9E-13	4E-03
1.42E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-002	^{nat}U	4E-17	N/A	N/A	1E-16	9E-14	4E-02
Fourth Quarter 2016	^{230}Th	1E-17	2E-18	3 3E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	2E-17	6E-18	7.9E-18	1E-16	9E-13	2E-03
1 37E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-003
Client Sample ID: HMC-2

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 21 / sf
RADIONUCLIDES - IN AIR							
Radium 226	1 8E-17	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 precision (±)	7 4E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	7 6E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	1 5E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	2 8E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	2 5E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 21 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	2 5	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	1 0	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	1 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	2 1	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 39	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 35	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	4 7	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	2 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	5 0E-02	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	142000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-2

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-003	^{nat}U	2E-16	N/A	N/A	1E-16	9E-14	2E-01
First Quarter 2016	^{230}Th	4E-17	8E-18	4 1E-18	1E-16	3E-14	1E-01
Air Volume in mLs	^{226}Ra	7E-17	2E-17	3 2E-18	1E-16	9E-13	8E-03
1 37E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-003	^{nat}U	9E-17	N/A	N/A	1E-16	9E-14	1E-01
Second Quarter 2016	^{230}Th	2E-17	4E-18	7.5E-18	1E-16	3E-14	7E-02
Air Volume in mLs	^{226}Ra	3E-17	1E-17	1 2E-17	1E-16	9E-13	4E-03
1 18E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-003	^{nat}U	6E-16	N/A	N/A	1E-16	9E-14	6E-01
Third Quarter 2016	^{230}Th	1E-17	2E-18	4 2E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	2E-17	1E-17	9.3E-18	1E-16	9E-13	3E-03
1 36E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-003	^{nat}U	3E-17	N/A	N/A	1E-16	9E-14	4E-02
Fourth Quarter 2016	^{230}Th	1E-17	3E-18	2 5E-18	1E-16	3E-14	5E-02
Air Volume in mLs	^{226}Ra	2E-17	7E-18	7.6E-18	1E-16	9E-13	2E-03
1 42E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-004
Client Sample ID: HMC-3

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 25 / sf
RADIONUCLIDES - IN AIR							
Radium 226	2 6E-17	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 precision (±)	9 5E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	7 3E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	1 4E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	2 7E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	2 3E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 25 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	3 7	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	1 4	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	1 0	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	2 0	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 39	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 33	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	11 3	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	3 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	5 0E-02	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	9 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	143000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-3

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-004	^{nat}U	2E-16	N/A	N/A	1E-16	9E-14	2E-01
First Quarter 2016	^{230}Th	2E-17	4E-18	4.6E-18	1E-16	3E-14	7E-02
Air Volume in mLs	^{226}Ra	6E-17	1E-17	3 6E-18	1E-16	9E-13	6E-03
1 21E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-004	^{nat}U	4E-16	N/A	N/A	1E-16	9E-14	5E-01
Second Quarter 2016	^{230}Th	2E-17	5E-18	6 4E-18	1E-16	3E-14	8E-02
Air Volume in mLs	^{226}Ra	4E-17	1E-17	1 2E-17	1E-16	9E-13	5E-03
1 22E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-004	^{nat}U	1 3E-15	N/A	N/A	1E-16	9E-14	1.4E+00
Third Quarter 2016	^{230}Th	1E-17	2E-18	6 0E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	3E-17	1E-17	8 3E-18	1E-16	9E-13	3E-03
1 47E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-004	^{nat}U	8E-17	N/A	N/A	1E-16	9E-14	9E-02
Fourth Quarter 2016	^{230}Th	1E-17	3E-18	2 3E-18	1E-16	3E-14	5E-02
Air Volume in mLs	^{226}Ra	3E-17	9E-18	7 3E-18	1E-16	9E-13	3E-03
1 43E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-005
Client Sample ID: HMC-4

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 28 / sf
RADIONUCLIDES - IN AIR							
Radium 226	1 9E-17	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 precision (±)	7 2E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	8 0E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	9 3E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	1 8E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	2 9E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 28 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	2 7	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	1 0	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	1 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	1 3	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 25	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 40	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	5 5	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	2 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	3 0E-02	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	140000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-4

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-005	^{nat}U	4E-16	N/A	N/A	1E-16	9E-14	5E-01
First Quarter 2016	^{230}Th	6E-17	1E-17	4 5E-18	1E-16	3E-14	2E-01
Air Volume in mLs	^{226}Ra	2E-16	4E-17	3 6E-18	1E-16	9E-13	2E-02
1 17E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-005	^{nat}U	6E-16	N/A	N/A	1E-16	9E-14	6E-01
Second Quarter 2016	^{230}Th	2E-17	4E-18	5 6E-18	1E-16	3E-14	7E-02
Air Volume in mLs	^{226}Ra	6E-17	2E-17	1 2E-17	1E-16	9E-13	7E-03
1 19E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-005	^{nat}U	2 0E-15	N/A	N/A	1E-16	9E-14	2 2E+00
Third Quarter 2016	^{230}Th	2E-17	3E-18	4.7E-18	1E-16	3E-14	5E-02
Air Volume in mLs	^{226}Ra	3E-17	1E-17	9.0E-18	1E-16	9E-13	3E-03
1 48E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-005	^{nat}U	4E-17	N/A	N/A	1E-16	9E-14	4E-02
Fourth Quarter 2016	^{230}Th	9E-18	2E-18	2 9E-18	1E-16	3E-14	3E-02
Air Volume in mLs	^{226}Ra	2E-17	7E-18	8 0E-18	1E-16	9E-13	2E-03
1 40E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-006
Client Sample ID: HMC-5

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 32 / sf
RADIONUCLIDES - IN AIR							
Radium 226	2 6E-17	uCi/mL				E903.0	01/30/17 10 11 / dmf
Radium 226 precision (±)	8 4E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	7 4E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	1 2E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	2 3E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	3 8E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 32 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	3 7	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	1 2	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	1 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	1 8	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 34	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 55	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	10 0	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	3 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	8 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	145000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-5

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-006	^{nat}U	1E-16	N/A	N/A	1E-16	9E-14	1E-01
First Quarter 2016	^{230}Th	2E-17	3E-18	3 3E-18	1E-16	3E-14	5E-02
Air Volume in mLs	^{226}Ra	4E-17	1E-17	3 2E-18	1E-16	9E-13	5E-03
1 35E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-006	^{nat}U	1 6E-15	N/A	N/A	1E-16	9E-14	1 8E+00
Second Quarter 2016	^{230}Th	1E-17	2E-18	5 2E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	4E-17	1E-17	9 4E-18	1E-16	9E-13	5E-03
1 36E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-006	^{nat}U	5 8E-15	N/A	N/A	1E-16	9E-14	6 4E+00
Third Quarter 2016	^{230}Th	1E-17	2E-18	5 2E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	4E-17	1E-17	8 9E-18	1E-16	9E-13	4E-03
1 38E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-006	^{nat}U	7E-17	N/A	N/A	1E-16	9E-14	8E-02
Fourth Quarter 2016	^{230}Th	1E-17	2E-18	3 8E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	3E-17	8E-18	7 4E-18	1E-16	9E-13	3E-03
1 45E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-007
Client Sample ID: HMC-6

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 46 / sf
RADIONUCLIDES - IN AIR							
Radium 226	2 8E-17	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 precision (±)	9 5E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	7.7E-18	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	1 3E-17	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	2 5E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	2 0E-18	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	<1 0E-16	uCi/mL		1 0E-16		SW6020	01/30/17 21 46 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	4 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 precision (±)	1 4	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Radium 226 MDC	1 1	pCi/Filter				RADCALC	02/09/17 18 38 / sec
Thorium 230	1 9	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 36	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 29	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	6 4	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	3 0E-03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	4 0E-02	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	5 0E-02	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	144000000	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-6

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-007	^{nat}U	9E-17	N/A	N/A	1E-16	9E-14	1E-01
First Quarter 2016	^{230}Th	2E-17	4E-18	4.9E-18	1E-16	3E-14	7E-02
Air Volume in mLs	^{226}Ra	5E-17	1E-17	3 1E-18	1E-16	9E-13	6E-03
1 36E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-007	^{nat}U	3E-16	N/A	N/A	1E-16	9E-14	3E-01
Second Quarter 2016	^{230}Th	8E-18	4E-18	5.6E-18	1E-16	3E-14	3E-02
Air Volume in mLs	^{226}Ra	4E-17	1E-17	1 3E-17	1E-16	9E-13	4E-03
1 15E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-007	^{nat}U	9E-16	N/A	N/A	1E-16	9E-14	1E+00
Third Quarter 2016	^{230}Th	1E-17	2E-18	3 7E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	3E-17	1E-17	9 6E-18	1E-16	9E-13	3E-03
1 37E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-007	^{nat}U	4E-17	N/A	N/A	1E-16	9E-14	5E-02
Fourth Quarter 2016	^{230}Th	1E-17	2E-18	2 0E-18	1E-16	3E-14	4E-02
Air Volume in mLs	^{226}Ra	3E-17	9E-18	7 7E-18	1E-16	9E-13	3E-03
1 44E+11							

+LLD's are from NRC Reg Guide 4 14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company
Lab ID: C17010178-008
Client Sample ID: HMC-7 Blank

Report Date: 02/14/17
Collection Date: 12/31/16
Date Received: 01/09/17
Matrix: Filter

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Vanadium	<0 10	mg/filter		0 10		SW6020	01/30/17 21 49 / sf
RADIONUCLIDES - IN AIR							
Radium 226	-3 6E-11	uCi/mL	U			E903 0	01/30/17 10 11 / dmf
Radium 226 precision (±)	5 7E-10	uCi/mL				E903 0	01/30/17 10 11 / dmf
Radium 226 MDC	1 0E-09	uCi/mL				E903 0	01/30/17 10 11 / dmf
Thorium 230	3 6E-10	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 precision (±)	1 6E-10	uCi/mL				E908 0	02/03/17 09 48 / cng
Thorium 230 MDC	1 7E-10	uCi/mL				E908 0	02/03/17 09 48 / cng
Uranium, Activity	3 9E-10	uCi/mL	D	2 0E-11		SW6020	01/30/17 21 49 / sf
RADIONUCLIDES - IN AIR - PER FILTER							
Radium 226	-0 036	pCi/Filter	U			RADCALC	02/08/17 15 16 / rdw
Radium 226 precision (±)	0 57	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Radium 226 MDC	1 0	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230	0 36	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 precision (±)	0 16	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Thorium 230 MDC	0 17	pCi/Filter				RADCALC	02/08/17 15 16 / rdw
Uranium, Activity	0 39	pCi/Filter		0 20		RADCALC	02/08/17 15 16 / rdw
RADIOCHEMISTRY AIR FILTER COMPLIANCE							
Radium 226, % of EFF	-4 0E+03	%				RADCALC	02/09/17 18 40 / sec
Radium 226, EFF Week	9 0E-13	uCi/mL				RADCALC	02/09/17 18 40 / sec
Radium 226, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, % of EFF	1 2E+06	%				RADCALC	02/09/17 18 40 / sec
Thorium 230, EFF Year	3 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Thorium 230, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, % of EFF	4 4E+05	%				RADCALC	02/09/17 18 40 / sec
Uranium Natural, EFF Year	9 0E-14	uCi/mL				RADCALC	02/09/17 18 40 / sec
Uranium Natural, LLD	1 0E-16	uCi/mL				RADCALC	02/09/17 18 40 / sec
CLIENT PROVIDED FIELD PARAMETERS							
Air Filtering Volume	1	L				FIELD	12/31/16 00 00 / ***

*** Field data provided by client

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
MDC - Minimum detectable concentration
MCL - Maximum contaminant level
ND - Not detected at the reporting limit
D - RL increased due to sample matrix

HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co - Grants NM Homestake Mining Company
PROJECT: Grants
REPORT DATE: February 14, 2017

SAMPLE ID: HMC-7 Blank

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16040357-008	^{nat}U	4E-18	N/A	N/A	1E-16	9E-14	4E-03
First Quarter 2016	^{230}Th	1E-18	1E-18	2 4E-18	1E-16	3E-14	4E-03
Air Volume in mLs	^{226}Ra	3E-19	2E-18	3 3E-18	1E-16	9E-13	4E-05
1.32E+11							

Air Volumes on this page based on average of quarterly set; accompanying standard report uses a 1 L default volume.

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16070515-008	^{nat}U	7E-18	N/A	N/A	1E-16	9E-14	7E-03
Second Quarter 2016	^{230}Th	2E-18	2E-18	2 3E-18	1E-16	3E-14	8E-03
Air Volume in mLs	^{226}Ra	1E-17	6E-18	6 6E-18	1E-16	9E-13	1E-03
1 25E+11							

Air Volumes on this page based on average of quarterly set; accompanying standard report uses a 1 L default volume.

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C16110200-008	^{nat}U	4E-18	N/A	N/A	1E-16	9E-14	4E-03
Third Quarter 2016	^{230}Th	2E-18	1E-18	2 0E-18	1E-16	3E-14	5E-03
Air Volume in mLs	^{226}Ra	8E-18	9E-18	9 5E-18	1E-16	9E-13	9E-04
1 42E+11							

Air Volumes on this page based on average of quarterly set; accompanying standard report uses a 1 L default volume.

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D.+ µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C17010178-008	^{nat}U	3E-18	N/A	N/A	1E-16	9E-14	3E-03
Fourth Quarter 2016	^{230}Th	3E-18	1E-18	1 2E-18	1E-16	3E-14	8E-03
Air Volume in mLs	^{226}Ra	-3E-19	4E-18	7.1E-18	1E-16	9E-13	-3E-05
1.41E+11							

Air Volumes on this page based on average of quarterly set; accompanying standard report uses a 1 L default volume.

+LLD's are from NRC Reg Guide 4.14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company

Report Date: 02/06/17
Work Order: C17010178

Analyte		Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**SW6020**								Analytical Run	ICPMS4-C_170130B	
Lab ID:	**ICV**	2	Initial Calibration Verification Standard							01/30/17 20 25	
Uranium			0 0475	mg/L	0 00030	95	90	110			
Vanadium			0 0486	mg/L	0 0010	97	90	110			
Lab ID:	**ICSA**	2	Interference Check Sample A							01/30/17 20 42	
Uranium			-6 00E-07	mg/L	0 00030						
Vanadium			1 06E-05	mg/L	0 0010						
Lab ID:	**ICSAB**	2	Interference Check Sample AB							01/30/17 20 46	
Uranium			-3 00E-06	mg/L	0 00030						
Vanadium			9 00E-06	mg/L	0 0010						
Method:	**SW6020**									Batch 49086	
Lab ID:	**MB-49086**	2	Method Blank				Run ICPMS4-C_170130B			01/30/17 21 07	
Uranium			4E-05	mg/filter	3E-05						
Vanadium			0 003	mg/filter	7E-05						
Lab ID:	**LCS2-49086**	2	Laboratory Control Sample				Run ICPMS4-C_170130B			01/30/17 21 11	
Uranium			0 096	mg/filter	0 00030	96	70	130			
Vanadium			0 100	mg/filter	0 10	96	70	130			
Lab ID:	**C17010178-008AMS4**	2	Sample Matrix Spike				Run ICPMS4-C_170130B			01/30/17 21 56	
Uranium			0 053	mg/filter	0 00030	105	75	125			
Vanadium			0 061	mg/filter	0 10	103	75	125			
Lab ID:	**C17010178-008AMSD**	2	Sample Matrix Spike Duplicate				Run ICPMS4-C_170130B			01/30/17 22 00	
Uranium			0 053	mg/filter	0 00030	105	75	125	0 0	20	
Vanadium			0 063	mg/filter	0 10	107	75	125		20	

Qualifiers:

RL - Analyte reporting limit
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company

Report Date: 02/08/17
Work Order: C17010178

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0										Batch R_219418
Lab ID: LCS-49035		Laboratory Control Sample				Run G542M_170120A				01/30/17 08 20
Radium 226		72 9	pCi/L		118	80	120			
Lab ID: MB-49035	3	Method Blank				Run G542M_170120A				01/30/17 08 20
Radium 226		0 05	pCi/L							U
Radium 226 precision (±)		0 2	pCi/L							
Radium 226 MDC		0 3	pCi/L							
Lab ID: C17010178-001AMS		Sample Matrix Spike				Run G542M_170120A				01/30/17 08 20
Radium 226		138	pCi/L		98	70	130			
Lab ID: C17010178-001AMSD		Sample Matrix Spike Duplicate				Run G542M_170120A				01/30/17 10 11
Radium 226		137	pCi/L		98	70	130	0 1	20	
Method: E903.0										Batch 49035A
Lab ID: LCS-49035		Laboratory Control Sample				Run TENNELEC-3_170120B				01/28/17 09 43
Radium 226		63 6	pCi/L		102	80	120			
Lab ID: MB-49035	3	Method Blank				Run TENNELEC-3_170120B				01/28/17 09 43
Radium 226		0 2	pCi/L							U
Radium 226 precision (±)		0 2	pCi/L							
Radium 226 MDC		0 3	pCi/L							
Lab ID: C17010178-001AMS		Sample Matrix Spike				Run TENNELEC-3_170120B				01/28/17 09 43
Radium 226		138	pCi/L		98	70	130			
Lab ID: C17010178-001AMSD		Sample Matrix Spike Duplicate				Run TENNELEC-3_170120B				01/28/17 09 43
Radium 226		130	pCi/L		92	70	130	5 8	20	

Qualifiers:

RL - Analyte reporting limit
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Homestake Mining Co
Project: Grants NM Homestake Mining Company

Report Date: 02/08/17
Work Order: C17010178

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E908.0										Batch 49086
Lab ID: LCS-49086		Laboratory Control Sample				Run EGG-ORTEC_2_170126B				02/03/17 09 48
Thorium 230		24 5	pCi/L		100	80	120			
Lab ID: C17010178-002AMS		Sample Matrix Spike				Run EGG-ORTEC_2_170126B				02/03/17 09 48
Thorium 230		117	pCi/L		118	70	130			
Lab ID: C17010178-002AMSD		Sample Matrix Spike Duplicate				Run EGG-ORTEC_2_170126B				02/03/17 09 48
Thorium 230		104	pCi/L		105	70	130	12	20	
Lab ID: MB-49086	3	Method Blank				Run EGG-ORTEC_2_170126B				02/03/17 09 47
Thorium 230		0 8	pCi/L							U
Thorium 230 precision (±)		0 8	pCi/L							
Thorium 230 MDC		1	pCi/L							

Qualifiers:

RL - Analyte reporting limit
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit
U - Not detected at minimum detectable concentration

Work Order Receipt Checklist

Homestake Mining Co

C17010178

Login completed by	Dorian Quis	Date Received:	1/9/2017
Reviewed by	Kasey Vidick	Received by:	tjp
Reviewed Date	1/10/2017	Carrier name	Ground

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Applicable ☑
Container/Temp Blank temperature	n/a°C		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Contact and Corrective Action Comments:

None

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT (Provide as much information as possible.)

Company Name: Homestake Mining Comp	Project Name, PWS, Permit, Etc.: Homestake Mining Co. Grants	Sample Origin State:	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address (Required): P.O. Box 98	Contact Name: Adrian Venable Phone/Fax: 1-505-287-4456 Ext. 28	Cell:	Sampler: (Please Print)
☐ No Hard Copy Email:	Invoice Contact & Phone:	Purchase Order:	Quote/Bottle Order:
Invoice Address (Required): SAME ☐ No Hard Copy Email:			

Special Report/Formats:
☐ DW ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP Format: ____
☐ State: ____ ☐ LEVEL IV
☐ Other: ____ ☐ NELAC

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids
Vegetation Bioassay Other
DW - Drinking Water

ANALYSIS REQUESTED

Standard Turnaround (TAT)

RUSH

Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: we will Provide ASAP Air Volume

Shipped by: UPS-NDA
Cooler ID(s): —
Receipt Temp: N/A °C
On Ice: Y N
Custody Seal: On Bottle Y N; On Cooler Y N
Intact Y N
Signature Match Y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	TOTAL Uranium	TOTAL Ra 226	TOTAL Th 230	TOTAL Vanadium						SEE ATTACHED				
1	HMC-1	4th Q		1-A	X	X	X	X									LSD	
2	HMC-1-A	2016		↓	X	X	X	X									RS-4-1	
3	HMC 2				X	X	X	X									C17010178	
4	HMC 3				X	X	X	X										
5	HMC 4				X	X	X	X										
6	HMC 5				X	X	X	X										
7	HMC 6				X	X	X	X										
8	HMC 7 Blank			↓	X	X	X	X									NO Air Volume	
9																		
10																		

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print):	Date/Time	Signature:	Received by (print)	Date/Time	Signature
Adrian Venable	1-5-2017	[signature]			
Relinquished by (print):	Date/Time	Signature	Received by (print)	Date/Time	Signature
Sample Disposal Return to Client: ____ Lab Disposal: ____			Received by Laboratory: [signature]	Date/Time 1/9/17 10:24	Signature

In certain circumstances, samples submitted to Energy Laboratories, Inc may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

From: Archuleta, William
Sent: Thursday, January 19, 2017 10:53 AM
To: dblaida@energylab.com
Cc: Venable, Adrian; ChuckFarr@ERGOFFICE.COM
Subject: HMC Air Sample Volumes

Dave –

The flow volumes for the Homestake Hi-Vol air particulate samples sent to ELI on Jan 5th are as follows:

2016 4th Quarter Sampling Volumes

Total Sampling Volume for Quarter (mL)							
1	1A	2	3	4	5	6	7
1.37E+11	1.37E+11	1 42E+11	1.43E+11	1 40E+11	1 45E+11	1.44E+11	n/a

Please contact me with any questions. Thank you –

Chuck Farr (for Billy Archuleta)
cell: 505-604-6290

William "Billy" Archuleta
Homestake Mining Company
Radiation Technician / Assistant Site Supervisor
Office 505-287-4456, ext 26
Cell 505-290-2215

Attachment 2

Radon Gas Monitoring Results

Attachment 2 - Radon Gas Monitoring Results

Track-Etch Passive Survey

Location	Monitoring Period	Rn Concentration (µCi/ml)	Uncertainty - 2 S.D. (µCi/ml)	% EC* (%)	LLD (µCi/ml)
HMC #1(average) N Outer Perimeter	7/7/16 - 12/28/16	8.2E-10	2.1E-10	8.2	3.5E-10
HMC #1-A (average) N Outer Perimeter	7/7/16 - 12/28/16	7.8E-10	1.9E-10	7.8	3 5E-10
HMC #2 (average) NE Outer Perimeter	7/7/16 - 12/28/16	8.4E-10	2.1E-10	8.4	3.5E-10
HMC #3 (average) E Outer Perimeter	7/7/16 - 12/28/16	7.6E-10	1.9E-10	7.6	3.5E-10
HMC #4 (average) S Outer Perimeter	7/7/16 - 12/28/16	8.6E-10	2.1E-10	8.6	3.5E-10
HMC #5 (average) N of Nearest Residence	7/7/16 - 12/28/16	8 3E-10	2.1E-10	8.3	3.5E-10
HMC #6 (average) W of Outer Perimeter	7/7/16 - 12/28/16	8.6E-10	2.1E-10	8.6	3.5E-10
HMC #7 (average) S Boundary	7/7/16 - 12/28/16	8.6E-10	2.2E-10	8.6	3.5E-10
HMC #16 (average) Background	7/7/16 - 12/28/16	4.8E-10	1.7E-10	4.8	3.5E-10

*EC of 1E-8 µCi/ml for radon-222 with daughters removed as given in 10 CFR20, Appendix B, Table 2

Attachment 3
Radon Flux Report

Radon Flux Measurements for the HMC Tailings Piles

January 2017

Prepared for:

Homestake Mining Company of California
P. O. Box 98
Grants, New Mexico 87020

Prepared by:

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113

Radon Flux Measurements for the HMC Tailings Piles

1. Introduction

Reclamation activities associated with the Large Tailings Pile (LTP) at the Grants Uranium Mill, owned by Homestake Mining Company of California (HMC), were completed in phases. The pile was contoured in 1994 at which time an interim cover was placed on the top of the pile to control the dispersal of tailings by wind and water erosion. Radon barriers were applied to the north, west, and south side slopes, with completion of the work in 1994. Radon flux measurements were made on these side slopes on October 24-25, 1994. Completion of the placement of radon barrier on the east side slope and aprons occurred just prior to making the radon flux measurements on July 24-25, 1995. An evaporation pond was constructed on the Small Tailings Pile (STP) and an interim cover placed on the remainder of the pile. Radon flux measurements were made on the top of the LTP and the interim cover of the Small Tailings Pile (STP) on August 18-19, 1995.

As part of a request for a license amendment extending the milestones in the NRC License, radon flux measurements were repeated in the areas with interim cover on October 21-22, 2003. This license amendment required HMC to repeat these measurements annually.

The Year 2016 annual measurements were made in two separate deployments consisting of 100 canisters per deployment. The first 100 canister measurements, consisting of 64 on the LTP and 36 on the STP were made on October 12-13, 2016. A second 100 canister measurements was performed consisting of 36 on the LTP and 64 on the STP were made on October 27-28, 2016. The second deployment of canisters achieved a 100-canister deployment on both piles. The deployment locations, with location number are shown in Figure 1-1 below.

2. Radon Flux and Gamma-Ray Exposure Results

The results of the 200 flux measurements, consisting of 100 on the LTP and 100 on the STP are presented in Figure 2-1, and in tabular form in Appendix A. In addition, two locations on the LTP and two locations on the STP had duplicate field measurements made. The distribution of canisters was allocated so that each canister represented an equal area of the total pile surface. All flux measurements made are reported for the 100 locations on the LTP and 100 locations on the STP. The final averaged measured flux was 21.73 pCi/m^2s and 7.88 pCi/m^2s for the LTP and STP, respectively. When calculating average measured flux for analysis duplicates (same canister analyzed twice) or location duplicates (same location measured twice), the results were averaged.

During the radon flux canister deployment, gamma exposure rate measurements were made at each canister location using a Ludlum Model 19 microR survey meter. Measurements were made with the survey meter held approximately one meter above the ground surface. Results of the exposure measurements for the LTP and STP are presented in Figure 2-2, and in tabular form in Appendix B.

Figure 1-1 - Measurement Locations

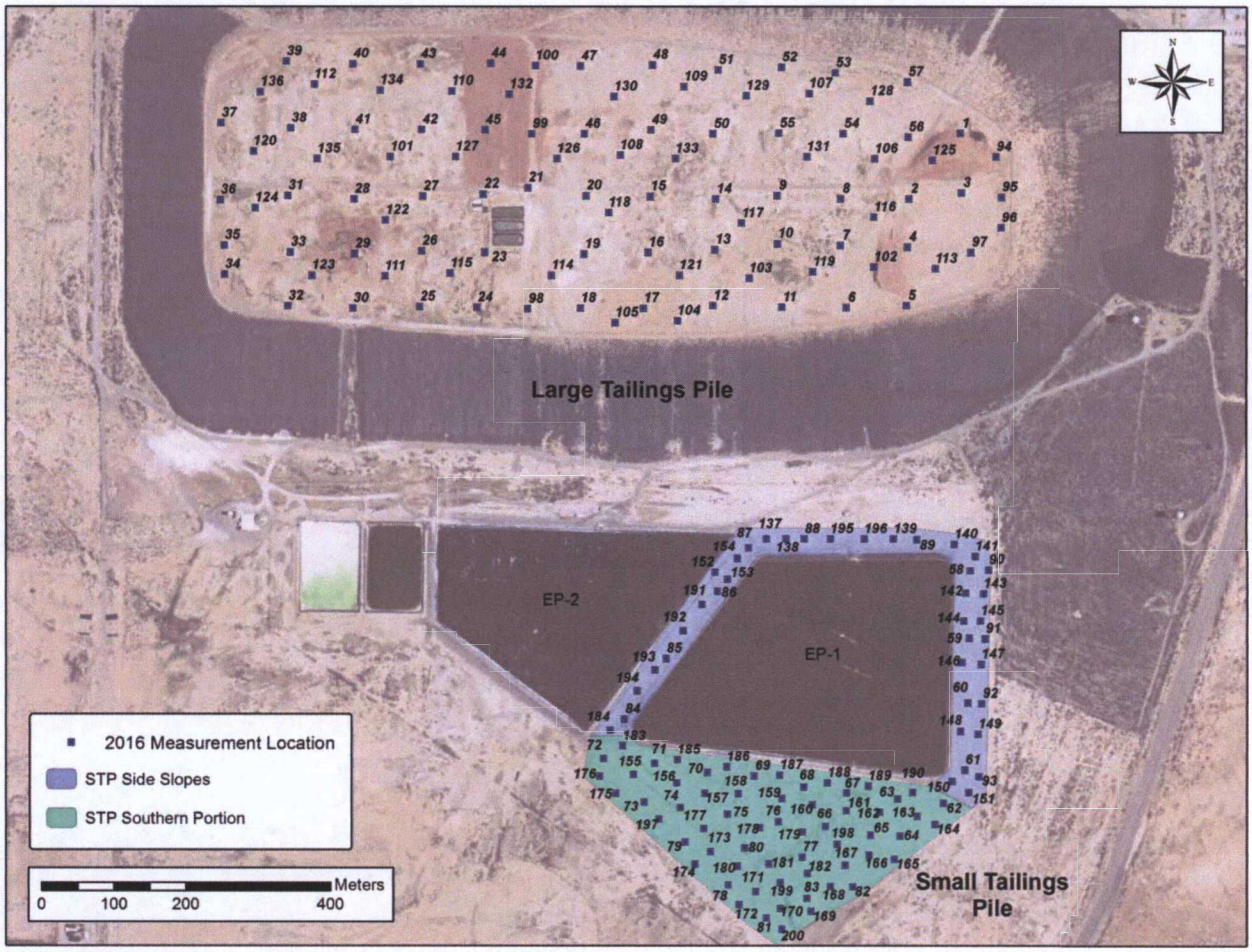


Figure 2-1 Radon Flux Measurement Results

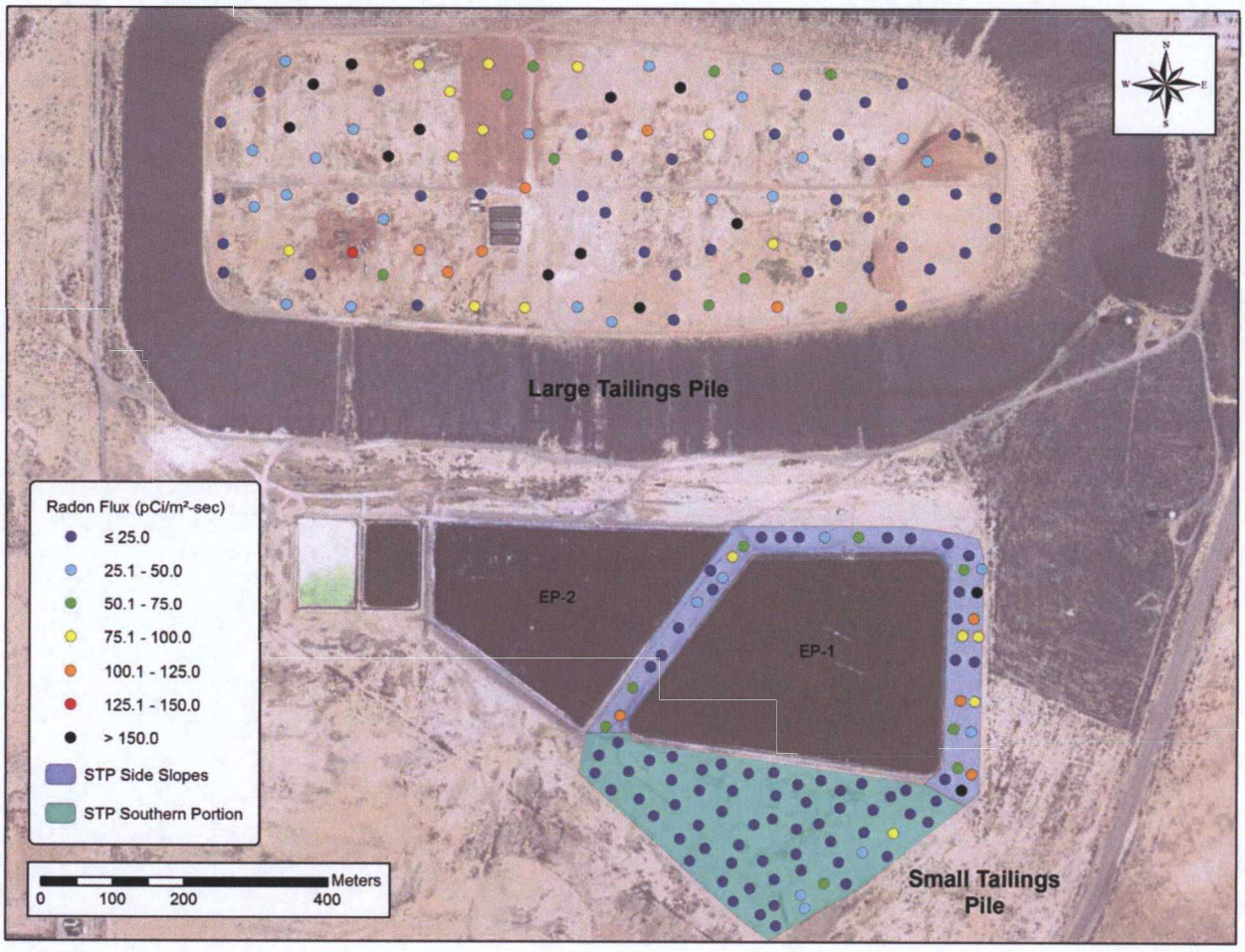
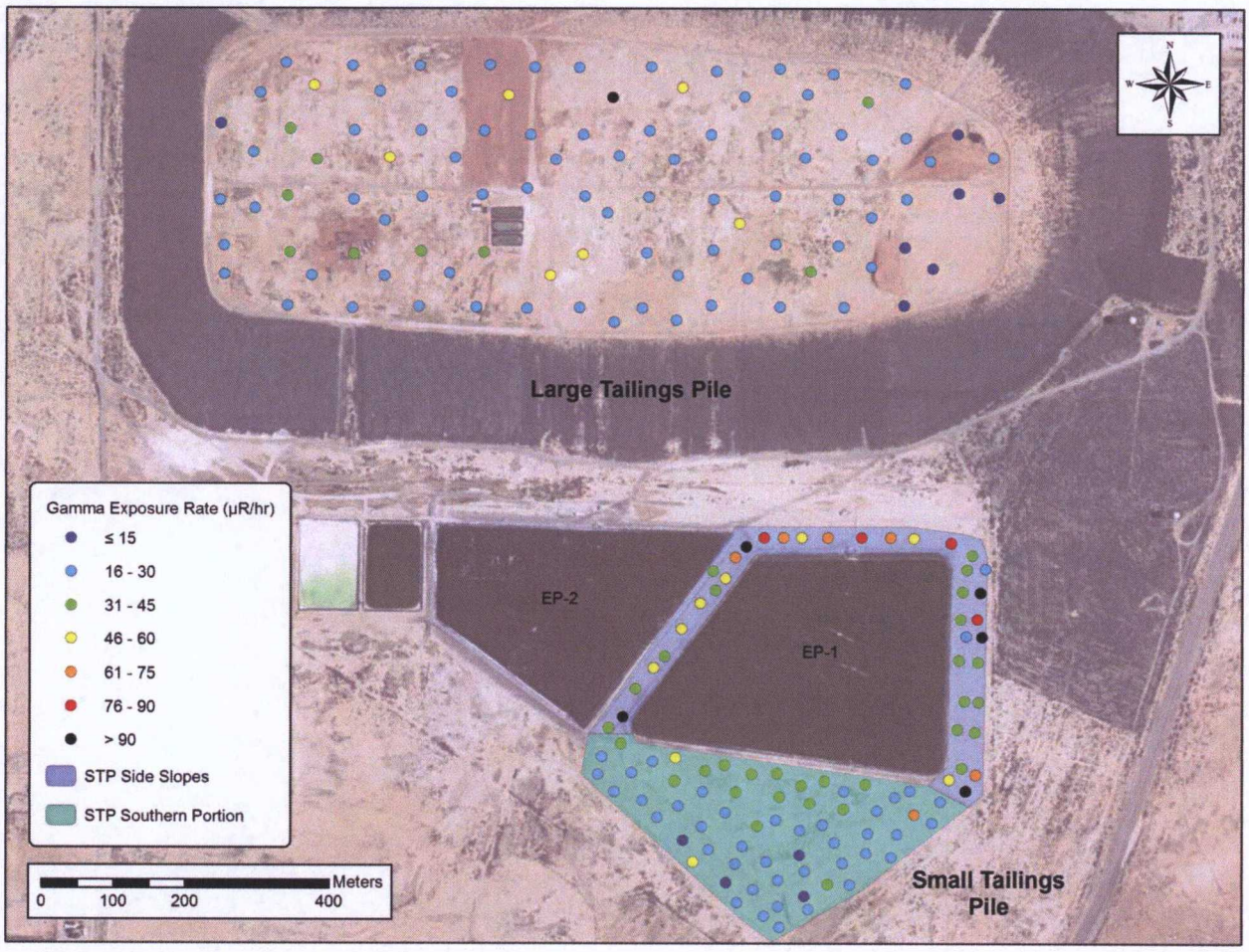


Figure 2-2 Gamma Exposure Rate Measurement Results



3. Average Pile Flux

Since all but the top of the LTP has rock cover, canisters were placed on the top of the pile only. The final average measured flux on the top of the pile was 56.01 pCi/m^{2}s. This compares to 42.1 pCi/m^{2}s measured in 1995. In the earlier data, the average flux on the sides of the pile was 3.27 pCi/m^{2}s, which constitutes 65 percent of the area. If one assumes that the flux on the side slopes remains constant, the final average flux for the pile in 2016 is calculated to be 21.73 pCi/m^{2}s, using Equation 3-1 below:

$$Flux_w = 0.65 \times Flux_{side} + 0.35 \times Flux_{top} \qquad \text{Eq. 3-1}$$

Where:

w is the = weighted LTP flux average

$Flux_{side} = 3.27$

$Flux_{top} = 56.01$

An evaporation pond is located on top of the STP and therefore that portion of the pile has 0 pCi/m^{2}s flux. The areas for the side slopes, southern portion, and evaporation pond are 137,000, 874,000, and 1,331,000 square feet, respectively. These areas equate to a percent of total area for the side slopes, southern portion, and evaporation pond of 5.85 percent, 37.32 percent, and 56.83 percent, respectively. The 2016 corresponding average fluxes for these areas were 51.18, 13.10, and 0 pCi/m^{2}s, respectively. The final average flux rate for the STP is calculated to be 7.88 pCi/m^{2}s, using Equation 3-2 below.

$$Flux_w = 0.0585 * Flux_{side} + 0.3732 * Flux_{south} + 0.5683 * Flux_{pond} \qquad \text{Eq. 3-2}$$

Where:

w is the = weighted STP flux average

$Flux_{side} = 51.18$

$Flux_{south} = 13.10$

$Flux_{pond} = 0.00$

The final data show that the STP average flux of 7.88 pCi/m^{2}s is below the 20 pCi/m^{2}s standard in 10 CFR 40 Appendix A. The LTP average flux of 21.73 pCi/m^{2}s is slightly higher than the 20 pCi/m^2-s standard in 10 CFR 40 Appendix A.

4. Quality Assurance

The EPA Method 115 requirements were met for the measurements. There was no rainfall in the 24 hours prior to or during deployment and ambient temperatures did not fall below 35 degrees Fahrenheit during deployment.

Two independent sources were used to calibrate the spectrometer, using identical geometry conditions to that of the canisters. Good agreement between calibration factors was obtained as shown in Table 4.1. The relative percent difference (RPD) of the average efficiencies for the two sources was 4.8 percent, less than the 10 percent accuracy required by EPA Method 115.

Twenty-three canisters were reanalyzed for laboratory duplicate analysis comparison. The second analysis is indicated in the Appendix A results table with a "D" shown in the Lab Type column. The comparison results are shown in Table 4.2 and are consistent with typical gamma spectroscopy results. All 23 canisters analyzed for duplicate comparison met the EPA Method 115 criteria requiring a precision of 10 percent for flux rates above 1.0 pCi/m^{2}s. The duplicate comparison results have an RPD of 4.0 percent or less.

Two locations on the LTP and two locations on the STP were chosen for side-by-side measurements (not true duplicates). The results of the measurements are included in Table 4.3. The differences of duplicate sample results range from 7.5 percent (55.3 and 51.3 pCi/m^{2}s) to 43.1 percent (7.6 and 11.8 pCi/m^{2}s). These results are not unexpected since it is known that flux values from a tailings pile can be variable over short distances, and the larger relative percent difference is a result of comparing two relatively low flux rate values.

Two trip blanks for each 100 canister deployment (4 total) were included in the batch, and were counted without exposing them to radon. The measured fluxes ranged from 0.08 and 0.97 pCi/m^{2}s are near the expected 0 pCi/m^{2}s value. These results indicate that the canisters had not been exposed while sealed in the plastic bags, confirming the integrity of the bags during both deployments.

Table 4.1 Quality Assurance Results of Standard Analysis

Identifier	Date	Count Duration (sec)	Activity (nCi)	Total Counts	Average BKG Counts	Efficiency	Error
STD #3	13-10-16	1200	78.83	43166	3292.5	0.01139	6.16E-05
STD #3	14-10-16	1200	78.83	42155	3292.5	0.01110	6.09E-05
STD #1	14-10-16	1200	80	43900	3292.5	0.01143	6.12E-05
STD #1	14-10-16	1200	80	44920	3393.5	0.01169	6.19E-05
STD #3	14-10-16	1200	78.83	41453	3393.5	0.01087	6.05E-05
STD #1	14-10-16	1200	80	44517	3393.5	0.01158	6.16E-05
STD #3	14-10-16	1200	78.83	42993	3393.5	0.01131	6.15E-05
STD #1	13-10-16	1200	80	45390	3292.5	0.01185	6.21E-05
STD #1	28-10-16	1200	80	44798	3028.5	0.01176	6.16E-05
STD #3	28-10-16	1200	78.83	42115	3028.5	0.01117	6.07E-05
STD #3	28-10-16	1200	78.83	42048	3028.5	0.01115	6.07E-05
STD #1	28-10-16	1200	80	44740	3028.5	0.01174	6.15E-05
STD #1	29-10-16	1200	80	44214	1621	0.01199	6.03E-05
STD #3	29-10-16	1200	78.83	41420	1621	0.01137	5.93E-05
STD #3	29-10-16	1200	78.83	41168	1621	0.01130	5.91E-05
STD #1	29-10-16	1200	80	44272	1621	0.01201	6.03E-05
Mean of STD #1						0.011757	
Mean of STD #3						0.011209	
Relative Percent Difference of Standards						4.8%	

Note

[1] Efficiency unit is net counts-per-second per source activity in becquerels

[2] SD standard deviation of efficiency

Table 4.2 Comparison Data of Every Tenth Sample Analyzed

Canister[1]	Analysis 1 (pCi/m²s)	Analysis 2 (pCi/m²s)	Average Flux (pCi/m²s)	RPD (%)
263	57.5	56.1	56.8	2.4
463	93.1	93.9	93.5	0.9
445	79.9	81.5	80.7	2.0
465	141.2	142.4	141.8	0.8
460	75.3	75.2	75.2	0.1
499	102.9	105.1	104.0	2.1
412	100.5	100.3	100.4	0.1
256	92.6	90.2	91.4	2.6
5	13.7	13.5	13.6	1.7
254	107.9	109.2	108.6	1.2
461	8.7	8.9	8.8	2.1
1434	20.7	21.6	21.1	4.0
1443	15.9	15.4	15.6	2.9
1450	10.1	10.0	10.0	1.7
1458	13.9	14.2	14.0	1.7
1477	9.2	9.1	9.2	0.6
1421	7.6	7.7	7.6	0.6
1441	7.7	7.7	7.7	0.7
1437	13.6	13.6	13.6	0.0
1499	18.4	18.7	18.6	1.3
1462	58.2	56.9	57.5	2.2
1005	58.0	59.9	59.0	3.3
1495	14.7	14.5	14.6	1.2

Note.

[1] Canisters in second deployment group (locations 101 – 200) are prefixed with a 1

Table 4.3 Comparison Data of Field Duplicates Sample Results

Location	Canister 1	Canister 2	Canister 1 (pCi/m²s)	Canister 2 (pCi/m²s)	Average Flux (pCi/m²s)	RPD (%)
51	479	438	55.3	51.3	53.3	7.5
89	496	75	19.3	22.5	20.9	15.3
130	1416	1473	271.1	323.2	297.2	17.5
162	1421	1500	7.6	11.8	9.7	43.1

Appendix A

Radon Flux Measurement Results

ERG

Radon Flux Measurements

Environmental Restoration Group Inc
8809 Washington St NE, Suite 150
Albuquerque, NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Retrieval	Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	LLD	Error 1.00 S D	Remarks
1		498	10/12/2016 12 24	10/13/2016 13:06	10/14/2016 00 13	519	3292.5		6315	0 0114	5 89	0.2	0 11	OK
2		408	10/12/2016 09 54	10/13/2016 11 02	10/13/2016 18 05	219	3292.5		9374	0 0114	23 9	0.3	0.27	OK
3		434	10/12/2016 09 42	10/13/2016 10 54	10/13/2016 16 45	133	3292.5		5037	0 0114	20 72	0 4	0.33	OK
4		471	10/12/2016 09:51	10/13/2016 11:03	10/13/2016 19:20	384	3292.5		9876	0.0114	13 8	0.2	0 16	OK
5		480	10/12/2016 09 49	10/13/2016 11 04	10/13/2016 18.38	1200	3292.5		5289	0 0114	0.99	0 1	0 05	OK
6		263	10/12/2016 10 00	10/13/2016 11 05	10/13/2016 18.35	67	3292.5		6454	0 0114	56 11	0 6	0 73	OK
6		263	10/12/2016 10:00	10/13/2016 11:05	10/13/2016 18 36	53	3292.5	D	5225	0 0114	57 47	0.7	0 83	OK
7		484	10/12/2016 09.58	10/13/2016 11 06	10/13/2016 18 24	644	3292 5		6465	0 0114	4.36	0.2	0 08	OK
8		443	10/12/2016 09 56	10/13/2016 11 08	10/13/2016 18 19	238	3292 5		6696	0 0114	15 13	0 3	0 21	OK
9		422	10/12/2016 10 06	10/13/2016 11.17	10/13/2016 19 30	72	3292 5		5872	0 0114	47 34	0 6	0 65	OK
10		463	10/12/2016 10 04	10/13/2016 11 16	10/13/2016 19 29	32	3292 5	D	5049	0.0114	93 06	0 9	1 34	OK
10		463	10/12/2016 10 04	10/13/2016 11 16	10/13/2016 19:28	32	3292.5		5092	0 0114	93 86	0 9	1 35	OK
11		468	10/12/2016 10 02	10/13/2016 11 15	10/13/2016 19 35	27	3292.5		5174	0 0114	113 41	1	1.61	OK
12		105	10/12/2016 10:11	10/13/2016 11.20	10/13/2016 19.32	42	3292 5		5145	0 0114	72.01	0 8	1 04	OK
13		458	10/12/2016 10 10	10/13/2016 11 19	10/13/2016 19 37	172	3292.5		7031	0 0114	22 95	0 4	0.3	OK
14		432	10/12/2016 10 08	10/13/2016 11 18	10/13/2016 19.33	102	3292 5		5024	0 0114	27 96	0.5	0 43	OK
15		482	10/12/2016 10:17	10/13/2016 11.29	10/13/2016 19.56	273	3292 5		5814	0 0114	11 16	0.3	0 18	OK
16		476	10/12/2016 10:16	10/13/2016 11 28	10/13/2016 19:41	709	3292.5		5956	0 0114	3 4	0 2	0 08	OK
17		457	10/12/2016 10 14	10/13/2016 11:27	10/13/2016 20 15	18	3292.5		5115	0 0114	169.57	1.2	2.41	OK
18		406	10/12/2016 10 36	10/13/2016 11 32	10/13/2016 19 53	143	3292 5		7183	0 0114	28 81	0 4	0.37	OK
19		492	10/12/2016 10 34	10/13/2016 11 31	10/13/2016 19 36	18	3292.5		5105	0 0114	169 95	1.2	2 41	OK
20		448	10/12/2016 10:30	10/13/2016 11.30	10/13/2016 20:01	570	3292 5		12385	0 0114	11.51	0 2	0 13	OK

Types. D-Duplicate; TB-Trip Blank

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Radon Flux Measurements

Environmental Restoration Group, Inc
8809 Washington St. Ne, Suite 150
Albuquerque NM, 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²/s) Result	Flux (pCi/m²/s) LLD	Flux (pCi/m²/s) Error 1 00 S D.	Remarks
21		430	10/12/2016 10 46	10/13/2016 11 51	10/13/2016 21.07	28	3292.5		5190	0 0114	110 95	1	1.57	OK
22		437	10/12/2016 10·44	10 13/2016 11 50	10/13/2016 21.27	862	3292.5		5319	0 0114	2.1	0.2	0 06	OK
23		415	10/12/2016 10·42	10/13/2016 11 49	10/13/2016 21 06	26	3292 5		5279	0 0114	121.57	1	1 71	OK
24		493	10/12/2016 10 40	10/13/2016 11 46	10/13/2016 20 16	31	3292.5		5061	0 0114	96 91	0 9	1 4	OK
25		407	10/12/2016 10.52	10/13/2016 11 48	10/13/2016 20 17	1002	3292 5		5376	0 0114	1.59	0.2	0 05	OK
26		453	10/12/2016 10 51	10/13/2016 11 48	10/13/2016 21·08	25	3292.5		5074	0 0114	122 3	1	1 75	OK
27		405	10/12/2016 10·50	10/13/2016 11 53	10/13/2016 21·09	1061	3292 5		6070	0 0114	1.81	0 1	0 05	OK
28		500	10/12/2016 10 59	10/13/2016 12·05	10/13/2016 22.15	234	3292.5		5005	0 0114	11 4	0 3	0.2	OK
29		465	10/12/2016 10 58	10/13/2016 12 06	10/13/2016 21 44	22	3292.5	D	5167	0 0114	141 17	1 1	2	OK
29		465	10/12/2016 10 58	10/13/2016 12 06	10/13/2016 21 42	50	3292.5		11844	0 0114	142.36	0 7	1 33	OK
30		104	10/12/2016 10 56	10/13/2016 12 07	10/13/2016 21 49	133	3292.5		9753	0 0114	42.88	0 4	0 46	OK
31		478	10/12/2016 11.02	10 13/2016 12 11	10/13/2016 21.51	268	3292 5		19475	0 0114	42 52	0 3	0 32	OK
32		428	10/12/2016 11 07	10/13/2016 12·09	10/13/2016 21 45	173	3292.5		11350	0 0114	38 37	0 4	0.38	OK
33		483	10/12/2016 11 04	10/13/2016 12 10	10/13/2016 21 57	39	3292.5		5047	0 0114	77 22	0 8	1 12	OK
34		421	10/12/2016 11 10	10/13/2016 12 17	10/13/2016 22 40	218	3292 5		7467	0 0114	19 29	0 3	0.25	OK
35		472	10/12/2016 11:11	10/13/2016 12 17	10/13/2016 22.23	653	3292.5		5699	0 0114	3 66	0 2	0 08	OK
36		426	10/12/2016 11·12	10/13/2016 12·16	10/13/2016 21.58	974	3292.5		35811	0 0114	20 77	0.2	0 12	OK
37		411	10/12/2016 11.21	10/13/2016 12 30	10/13/2016 22·52	1039	3292 5		13058	0 0114	6 01	0 1	0 07	OK
38		455	10/12/2016 11.25	10/13/2016 12 33	10/13/2016 22 50	16	3292 5		5090	0 0114	192.75	1.3	2.74	OK
39		447	10/12/2016 11 30	10/13/2016 12 31	10/13/2016 22 45	237	3292 5		14555	0 0114	36	0 3	0.32	OK
40		420	10/12/2016 11 38	10/13/2016 12.35	10/13/2016 22 44	15	3292 5		5028	0 0114	204 33	1.3	2.92	OK
41		485	10/12/2016 11 40	10/13/2016 12.34	10/13/2016 22 20	63	3292.5		5119	0 0114	48.2	0 6	0 71	OK

[1]Types D-Duplicate, TB-Trip Blank

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Radon Flux Measurements

Environmental Restoration Group, Inc.
8809 Washington St NE, Suite 150
Albuquerque NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	LLD	Error 1 00 S.D	Remarks
42		1	10/12/2016 11 41	10/13/2016 12 25	10/13/2016 22 39	17	3292 5		5069	0 0114	183 14	1.3	2.61	OK
43		446	10/12/2016 11 43	10/13/2016 12.26	10/13/2016 22.51	39	3292.5		5059	0 0114	78 87	0 8	1 14	OK
44		470	10/12/2016 11 45	10/13/2016 12.22	10/13/2016 20.34	84	3292 5		11261	0 0114	80 51	0 5	0 78	OK
45		460	10/12/2016 11.47	10/13/2016 12.23	10/13/2016 22 36	41	3292.5	D	5066	0 0114	75.26	0 8	1 09	OK
45		460	10/12/2016 11 47	10/13/2016 12 23	10/13/2016 22 35	41	3292.5		5062	0 0114	75 19	0 8	1 09	OK
46		433	10/12/2016 11 54	10/13/2016 12 46	10/13/2016 20.52	627	3292 5		5488	0 0114	3 65	0 2	0 08	OK
47		68	10/12/2016 11 52	10/13/2016 12 44	10/13/2016 21·04	40	3292.5		5109	0 0114	76	0 8	1 1	OK
48		441	10/12/2016 11 59	10/13/2016 12 48	10/13/2016 23·39	75	3292 5		5536	0 0114	44 13	0 6	0 63	OK
49		499	10/12/2016 11 57	10/13/2016 12 47	10/13/2016 20 51	30	3292.5	D	5165	0 0114	102 94	0.9	1 47	OK
49		499	10·12/2016 11 57	10/13/2016 12 47	10/13/2016 20 36	30	3292 5		5282	0 0114	105 12	0 9	1 48	OK
50		425	10/12/2016 12 09	10/13/2016 12 55	10/13/2016 23 41	36	3292.5		5049	0 0114	85 48	0 9	1.24	OK
51		479	10/12/2016 12.01	10/13/2016 12 54	10/14/2016 00 25	55	3292 5		5035	0 0114	55.28	0 7	0 82	OK
51	D	438	10/12/2016 12·01	10/13/2016 12 54	10/14/2016 00·27	323	3292 5		27472	0.0114	51.27	0.3	0 32	OK
52		451	10/12/2016 12 13	10/13/2016 12.57	10/14/2016 00 12	69	3292.5		5033	0 0114	43.85	0 6	0 65	OK
53		481	10/12/2016 12 15	10/13/2016 13 01	10/13/2016 23 17	42	3292 5		5057	0 0114	72 87	0 8	1.06	OK
54		402	10/12/2016 12 18	10/13/2016 13·02	10/13/2016 23 22	964	3292 5		5584	0 0114	1 89	0.2	0 06	OK
55		469	10/12/2016 12.11	10/13/2016 12 56	10/14/2016 00 01	650	3292.5		6105	0 0114	4 15	0.2	0 09	OK
56		467	10/12/2016 12.20	10/13/2016 13 03	10/13/2016 23 18	213	3292.5		9465	0 0114	25 87	0 3	0.29	OK
57		452	10/12/2016 12 22	10/13/2016 13 04	10/13/2016 23 42	1038	3292 5		5004	0 0114	1 29	0 2	0 05	OK
58		21	10/12/2016 12.39	10/13/2016 13 23	10/14/2016 00 24	43	3292 5		5030	0 0114	71.24	0 8	1 04	OK
59		42	10/12/2016 12 42	10/13/2016 13 25	10/14/2016 00 40	36	3292 5		5057	0 0114	86 09	0 9	1.25	OK
60		412	10/12/2016 12 44	10/13/2016 13 28	10/14/2016 00 39	31	3292.5	D	5074	0 0114	100 48	0 9	1 45	OK

Types: D-Duplicate, TB-Trip Blank

Reviewed by: _____

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Radon Flux Measurements

Environmental Restoration Group, Inc
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	Flux (pCi/m²s) LLD	Flux (pCi/m²s) Error 1 00 S.D	Remarks
60		412	10/12/2016 12 44	10/13/2016 13 28	10/14/2016 00 38	31	3292.5		5068	0 0114	100.35	0 9	1 45	OK
61		200	10/12/2016 12 48	10/13/2016 13 30	10/14/2016 00 43	42	3292.5		5044	0 0114	73 38	0 8	1 07	OK
62		416	10/12/2016 12 54	10/13/2016 13.32	10/14/2016 09-06	220	3393.5		5159	0 0114	13 87	0 4	0.23	OK
63		490	10/12/2016 13 18	10/13/2016 13 45	10/14/2016 09 33	266	3393 5		5035	0 0114	10 92	0 3	0 19	OK
64		403	10/12/2016 12 58	10/13/2016 13 34	10/14/2016 00 47	33	3292.5		5051	0 0114	94 34	0 9	1 36	OK
65		64	10/12/2016 13 04	10/13/2016 13 39	10/14/2016 09 00	309	3393 5		5199	0.0114	9 42	0 3	0 17	OK
66		410	10/12/2016 13 14	10/13/2016 13 44	10/14/2016 00 52	341	3292 5		6568	0 0114	10 4	0 3	0 16	OK
67		5	10/12/2016 13 16	10/13/2016 13 46	10/14/2016 01 03	210	3292 5	D	5137	0 0114	13 69	0.3	0.23	OK
67		5	10/12/2016 13 16	10/13/2016 13 46	10/14/2016 00-59	209	3292.5		5039	0 0114	13 46	0 3	0 23	OK
68		424	10/12/2016 13 24	10/13/2016 13.48	10/14/2016 11 27	437	3393 5		6403	0 0114	8 15	0.3	0 14	OK
69		439	10/12/2016 13 28	10/13/2016 13 50	10/14/2016 11 35	859	3393 5		5006	0 0114	2 07	0 2	0 07	OK
70		456	10/12/2016 13 31	10/13/2016 13 50	10/14/2016 11 59	716	3393 5		5004	0 0114	2 89	0 2	0 08	OK
71		427	10/12/2016 13.33	10/13/2016 13.50	10/14/2016 11 50	490	3393 5		6711	0 0114	7.57	0.2	0 13	OK
72		436	10/12/2016 14 02	10/13/2016 14 08	10/14/2016 10 13	665	3393.5		5005	0 0114	3.24	0.2	0 09	OK
73		489	10/12/2016 14 01	10/13/2016 14 08	10/14/2016 10-25	502	3393 5		5876	0 0114	6 12	0 2	0 12	OK
74		462	10/12/2016 13 40	10/13/2016 13 56	10/14/2016 11 18	477	3393 5		5003	0 0114	5 3	0 3	0 12	OK
75		4	10/12/2016 13 42	10/13/2016 13 56	10/14/2016 11-09	260	3393 5		5130	0 0114	11 68	0.3	0 2	OK
76		440	10/12/2016 13 43	10/13/2016 13.57	10/14/2016 11,06	160	3393 5		5013	0 0114	19 69	0 4	0 32	OK
77		2	10/12/2016 13 12	10/13/2016 13 42	10/14/2016 09 27	383	3393 5		6537	0 0114	9 64	0.3	0 15	OK
78		400	10/12/2016 13.55	10/13/2016 14-05	10/14/2016 10 57	482	3393.5		5003	0 0114	5.22	0.3	0 11	OK
79		494	10/12/2016 13 57	10/13/2016 14 08	10/14/2016 10 35	652	3393 5		5476	0 0114	3 84	0.2	0 09	OK
80		423	10/12/2016 13 45	10/13/2016 13 57	10/14/2016 11 14	172	3393 5		5025	0 0114	18 27	0 4	0.3	OK

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Radon Flux Measurements

Environmental Restoration Group Inc
6809 Washington St. NE, Suite 150
Albuquerque, NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	Flux (pCi/m²s) LLD	Flux (pCi/m²s) Error 1.00 S D	Remarks
81		80	10/12/2016 13 52	10/13/2016 14 02	10/14/2016 10:46	581	3393.5		5005	0 0114	4	0.2	0.1	OK
82		450	10/12/2016 13 06	10/13/2016 13 36	10/14/2016 09 11	906	3393 5		5194	0 0114	1 96	0.2	0 07	OK
83		312	10/12/2016 13:08	10/13/2016 13 40	10/14/2016 00 48	173	3292 5		8014	0 0114	27.41	0 4	0.33	OK
84		254	10/12/2016 14:07	10/13/2016 14 10	10/14/2016 10 09	32	3393 5	D	5099	0 0114	107 9	1	1 55	OK
84		254	10/12/2016 14:07	10/13/2016 14 10	10/14/2016 10 08	32	3393.5		5162	0 0114	109.24	1	1.56	OK
85		495	10/12/2016 14 08	10/13/2016 14 12	10/14/2016 10.10	148	3393 5		5013	0 0114	21 39	0.5	0.34	OK
86		429	10/12/2016 14 11	10/13/2016 14 14	10/14/2016 10 00	416	3393.5		5012	0 0114	6 35	0 3	0 13	OK
87		91	10/12/2016 14 13	10/13/2016 14 16	10/14/2016 09 58	62	3393 5		5063	0 0114	54.23	0 7	0 8	OK
88		461	10/12/2016 14 15	10/13/2016 14 18	10/14/2016 09.52	324	3393 5	D	5012	0 0114	8.69	0.3	0 16	OK
88		461	10/12/2016 14 15	10/13/2016 14 18	10/14/2016 09 46	336	3393 5		5289	0 0114	8 87	0.3	0 16	OK
89		496	10/12/2016 14 18	10/13/2016 14 20	10/14/2016 09 39	165	3393.5		5095	0 0114	19 26	0 4	0.31	OK
89	D	75	10/12/2016 14 18	10/13/2016 14 20	10/14/2016 09 43	141	3393 5		5009	0 0114	22 46	0 5	0.36	OK
90		491	10/12/2016 12.39	10/13/2016 13 21	10/14/2016 00 36	111	3292.5		5075	0 0114	26 88	0 5	0.41	OK
91		435	10/12/2016 12 41	10/13/2016 13 25	10/14/2016 00 35	33	3292.5		5043	0 0114	93 69	0 9	1 36	OK
92		256	10/12/2016 12 44	10/13/2016 13 28	10/14/2016 00 44	35	3292 5		5151	0 0114	90.23	0.9	1 29	OK
92		256	10/12/2016 12:44	10/13/2016 13 28	10/14/2016 00 45	34	3292.5	D	5131	0 0114	92 58	0 9	1.33	OK
93		49	10/12/2016 12 48	10/13/2016 13 30	10/14/2016 00 41	43	3292 5		7155	0.0114	102 31	0 8	1 24	OK
94		488	10/12/2016 09 28	10/13/2016 10 51	10/13/2016 18 09	532	3292.5		8868	0 0114	8.25	0.2	0 11	OK
95		475	10/12/2016 09 30	10/13/2016 10:52	10/13/2016 17 10	1200	3292.5		4282	0 0114	0 49	0 1	0 04	OK
96		418	10/12/2016 09:32	10/13/2016 10.52	10/13/2016 17 30	763	3292.5		6876	0 0114	3 7	0.2	0.07	OK
97		449	10/12/2016 09.38	10/13/2016 10:56	10/13/2016 17 44	1200	3292.5		4347	0 0114	0 52	0 1	0.04	OK
98		445	10/12/2016 10 38	10/13/2016 11 44	10/13/2016 20:12	41	3292 5		5649	0.0114	81 5	0 8	1 12	OK

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Radon Flux Measurements

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM, 87113

			Date/Time								Flux (pCi/m²s)			
Location Name	Field Type	Canister Number	Deployment	Retrieval	Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Result	LLD	Error 1.00 S.D	Remarks
98		445	10/12/2016 10 38	10/13/2016 11 44	10/13/2016 20 13	41	3292.5	D	5536	0 0114	79 85	0 8	1 11	OK
99		474	10/12/2016 11 48	10/13/2016 12 20	10/13/2016 22 37	66	3292.5		5027	0 0114	45 87	0 6	0.68	OK
100		401	10/12/2016 11 50	10/13/2016 12 21	10/13/2016 22 21	46	3292 5		5134	0 0114	67 91	0.8	0 98	OK
	TB	473	10/12/2016 12 00	10/13/2016 12 00	10/13/2016 16 48	1200	3292.5		3804	0 0114	0.26	0 1	0.04	OK
	TB	94	10/12/2016 12 00	10/13/2016 12 00	10/13/2016 19 00	1200	3292.5		3348	0 0114	0 03	0 1	0 04	OK

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Radon Flux Measurements

Environmental Restoration Group, Inc
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	LLD	Error 1 00 S.D	Remarks
101		1094	10/27/2016 11 51	10/28/2016 13.30	10/29/2016 09 43	21	1621		5074	0.0117	152 42	0 8	2 16	OK
102		1068	10/27/2016 12 39	10/28/2016 14 15	10/29/2016 12 40	508	1621		5009	0 0117	5.5	0 2	0 1	OK
103		1001	10/27/2016 12 35	10/28/2016 14 11	10/29/2016 12 25	52	1621		5729	0 0117	70 22	0 5	0 94	OK
104		1472	10/27/2016 12.20	10/28/2016 13 58	10/29/2016 12.51	199	1621		5041	0.0117	15.53	0.3	0 24	OK
105		1465	10/27/2016 12:18	10/28/2016 13.58	10/29/2016 13 17	66	1621		5014	0 0117	48 43	0.5	0 7	OK
106		1256	10/27/2016 11 19	10/28/2016 12 50	10/29/2016 10 35	303	1621		5697	0 0117	11 26	0.2	0 17	OK
107		1453	10/27/2016 11.22	10/28/2016 12:55	10/29/2016 09.52	706	1621		5002	0 0117	3 67	0 1	0 07	OK
108		1433	10/27/2016 11 28	10/28/2016 13 03	10/29/2016 10:04	363	1621		5045	0 0117	8.03	0 2	0 13	OK
109		1445	10/27/2016 11 25	10/28/2016 13 03	10/29/2016 09 48	19	1621		5090	0 0117	169 87	0 9	2 4	OK
110		1494	10/27/2016 11 48	10/28/2016 13 25	10/29/2016 09 44	33	1621		5019	0 0117	95.81	0 7	1.37	OK
111		1064	10/27/2016 12 08	10/28/2016 13 51	10/29/2016 13 16	60	1621		5061	0 0117	53.82	0.5	0 77	OK
112		1463	10/27/2016 11 55	10/28/2016 13 33	10/29/2016 09 31	16	1621		5106	0 0117	201 33	1	2.84	OK
113		1478	10/27/2016 12 40	10/28/2016 14.19	10/29/2016 11.37	273	1621		5115	0 0117	11 12	0 2	0 17	OK
114		1451	10/27/2016 12.16	10/28/2016 13.56	10/29/2016 12.50	17	1621		5116	0 0117	193.83	1	2.73	OK
115		1475	10/27/2016 12 13	10/28/2016 13 51	10/29/2016 13 25	31	1621		5285	0 0117	110 11	0 7	1 53	OK
116		1405	10/27/2016 12 43	10/28/2016 14 21	10/29/2016 11 29	393	1621		5519	0 0117	8 12	0 2	0 13	OK
117		1476	10/27/2016 12 33	10/28/2016 14:11	10/29/2016 13 15	18	1621		5096	0 0117	182 74	0 9	2 58	OK
118		1429	10/27/2016 12.24	10/28/2016 14:07	10/29/2016 13 06	371	1621		5029	0 0117	7 89	0.2	0 13	OK
119		1457	10/27/2016 12.37	10/28/2016 14 14	10/29/2016 12.26	650	1621		5252	0 0117	4.34	0 1	0 08	OK
120		1427	10/27/2016 12:02	10/28/2016 13 41	10/29/2016 13 19	67	1621		5039	0 0117	48 08	0.5	0,7	OK
121		1455	10/27/2016 12.22	10/28/2016 14 07	10/29/2016 12 55	542	1621		5084	0 0117	5 18	0.2	0 09	OK
122		1417	10/27/2016 12 10	10/28/2016 13.51	10/29/2016 13 13	77	1621		5355	0 0117	44 25	0 4	0 62	OK

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Radon Flux Measurements

Environmental Restoration Group, Inc
8809 Washington St NE, Suite 150
Albuquerque, NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	Flux (pCi/m²s) LLD	Flux (pCi/m²s) Error 1 00 S D	Remarks
123		1426	10/27/2016 12.06	10/28/2016 13 51	10/29/2016 13 21	186	1621		5015	0 0117	16 6	0.3	0 25	OK
124		1420	10/27/2016 12 03	10/28/2016 13 43	10/29/2016 13 26	70	1621		5026	0 0117	45 86	0 4	0 67	OK
125		1428	10/27/2016 12 46	10/28/2016 14.23	10/29/2016 12 38	87	1621		5017	0 0117	36 32	0 4	0 53	OK
126		1401	10/27/2016 11.33	10/28/2016 13 21	10/29/2016 09 39	48	1621		5045	0 0117	65 52	0 5	0 94	OK
127		1484	10/27/2016 11 49	10/28/2016 13 27	10/29/2016 09 41	37	1621		5060	0 0117	85 96	0 6	1.23	OK
128		1459	10/27/2016 11 17	10/28/2016 12 47	10/29/2016 10 44	299	1621		5026	0 0117	9 99	0 2	0 16	OK
129		1409	10/27/2016 11 23	10/28/2016 12 57	10/29/2016 09 49	96	1621		5121	0 0117	33.25	0 4	0 48	OK
130		1416	10/27/2016 11.30	10/28/2016 13 03	10/29/2016 09 47	12	1621		5107	0 0117	271 13	1.2	3.81	OK
130	D	1473	10/27/2016 11-30	10/28/2016 13 03	10/29/2016 09 35	10	1621		5078	0 0117	323 19	1.3	4 55	OK
131		1491	10/27/2016 11 20	10/28/2016 12 55	10/29/2016 10 41	131	1621		6450	0 0117	30 81	0.3	0 4	OK
132		1496	10/27/2016 11 46	10/28/2016 13 21	10/29/2016 09 46	46	1621		5038	0 0117	68 89	0 6	0 99	OK
133		1406	10/27/2016 11 27	10/28/2016 13 03	10/29/2016 10 11	1200	1621		5180	0 0117	1.9	0 1	0 04	OK
134		1492	10/27/2016 11 53	10/28/2016 13.31	10/29/2016 09 24	385	1621		5038	0 0117	7.43	0.2	0.12	OK
135		1481	10/27/2016 11 57	10/28/2016 13.37	10/29/2016 09 37	65	1621		5008	0 0117	47.92	0 5	0.7	OK
136		1423	10/27/2016 12 00	10/28/2016 13 35	10/29/2016 09 32	252	1621		7173	0 0117	17 21	0 2	0 22	OK
137		1422	10/27/2016 10.55	10/28/2016 12.23	10/29/2016 10 52	300	1621		5090	0 0117	10.15	0.2	0 16	OK
138		1488	10/27/2016 10 56	10/28/2016 12.23	10/29/2016 11 16	528	1621		5019	0 0117	5 32	0.2	0 09	OK
139		1419	10/27/2016 11 00	10/28/2016 12.29	10/29/2016 10 59	360	1621		5539	0 0117	9.12	0 2	0 14	OK
140		1402	10/27/2016 08 35	10/28/2016 10 20	10/29/2016 09 20	165	1621		5010	0 0117	18 73	0.3	0 28	OK
141		1200	10/27/2016 08 33	10/28/2016 10 18	10/29/2016 09.13	272	1621		6144	0 0117	13 71	0.2	0 19	OK
142		1452	10/27/2016 08.37	10/28/2016 10 18	10/29/2016 09 08	256	1621		5125	0 0117	12 07	0.2	0 19	OK
143		1479	10/27/2016 08 38	10/28/2016 10-18	10/29/2016 09 19	18	1621		5361	0 0117	191 99	0 9	2.64	OK

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Radon Flux Measurements

Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	Flux (pCi/m²s) LLD	Flux (pCi/m²s) Error 1.00 S.D	Remarks
144		1431	10/27/2016 08 41	10/28/2016 10 20	10/29/2016 09-02	276	1621		5046	0 0117	10 95	0 2	0 17	OK
145		1410	10/27/2016 08 40	10/28/2016 10 26	10/29/2016 08 47	30	1621		5076	0 0117	107 77	0 7	1 53	OK
146		1446	10/27/2016 08 42	10/28/2016 10 20	10/29/2016 08.52	489	1621		10263	0 0117	12.69	0.2	0 14	OK
147		1042	10/27/2016 08 43	10/28/2016 10:20	10/29/2016 08 48	174	1621		5012	0 0117	17 74	0 3	0.27	OK
148		1430	10/27/2016 08.51	10/28/2016 10 30	10/29/2016 08 45	58	1621		5123	0 0117	56 03	0 5	0.8	OK
149		1470	10/27/2016 08 51	10/28/2016 10 30	10/29/2016 08 39	66	1621		5005	0 0117	47 95	0 5	0 7	OK
150		1483	10/27/2016 08 54	10/28/2016 10.33	10/29/2016 08 41	130	1621		5076	0 0117	24.26	0.3	0.36	OK
151		1482	10/27/2016 08 53	10/28/2016 10.33	10/29/2016 08:44	15	1621		5074	0 0117	216 8	1	3 06	OK
152		1412	10/27/2016 10 51	10/28/2016 12 17	10/29/2016 11:08	416	1621		5002	0 0117	6 96	0.2	0 12	OK
153		1403	10/27/2016 10 50	10/28/2016 12 17	10/29/2016 11 26	95	1621		5219	0 0117	35 01	0 4	0 5	OK
154		1263	10/27/2016 10:53	10/28/2016 12.34	10/29/2016 10 33	41	1621		5066	0 0117	78 48	0 6	1 12	OK
155		1254	10/27/2016 09.43	10/28/2016 11 09	10/28/2016 19 54	950	3028 5		8168	0 0115	3 63	0 1	0 06	OK
156		1400	10/27/2016 09 46	10/28/2016 11:10	10/28/2016 20.11	570	3028 5		5030	0 0115	3 78	0 2	0 08	OK
157		1471	10/27/2016 09 49	10/28/2016 11 13	10/28/2016 20 40	177	3028.5		6060	0 0115	19 06	0.3	0.27	OK
158		1437	10/27/2016 10 18	10/28/2016 11 53	10/28/2016 17 35	195	3028.5	D	5062	0 0115	13 61	0.3	0.22	OK
158		1437	10/27/2016 10 18	10/28/2016 11 53	10/28/2016 17 31	193	3028 5		5014	0 0115	13 61	0 3	0.22	OK
159		1499	10/27/2016 10.23	10/28/2016 11 49	10/28/2016 17 10	145	3028 5		5022	0 0115	18 69	0 4	0 29	OK
159		1499	10/27/2016 10 23	10/28/2016 11 49	10/28/2016 17 13	150	3028.5	D	5130	0 0115	18 45	0 4	0 29	OK
160		1415	10/27/2016 10:25	10/28/2016 11 42	10/28/2016 16.39	330	3028 5		5005	0 0115	7.38	0.2	0 14	OK
161		1448	10/27/2016 10 26	10/28/2016 11 47	10/28/2016 16 45	367	3028 5		5004	0 0115	6 47	0 2	0 12	OK
162		1421	10/27/2016 10 07	10/28/2016 11:37	10/28/2016 18:57	325	3028.5	D	5015	0 0115	7 61	0 2	0 14	OK
162		1421	10/27/2016 10 07	10/28/2016 11.37	10/28/2016 18 53	323	3028.5		5011	0 0115	7 65	0 2	0 14	OK

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Radon Flux Measurements

Environmental Restoration Group Inc.
8809 Washington St NE Suite 150
Albuquerque, NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	LLD	Error 1 00 S.D	Remarks
162	D	1500	10/27/2016 10:07	10/28/2016 11 37	10/28/2016 19:01	436	3028 5		9844	0.0115	11 83	0.2	0 14	OK
163		1485	10/27/2016 09 03	10/28/2016 10.38	10/28/2016 22.48	348	3028 5		5030	0 0115	7 27	0 2	0 13	OK
164		1474	10/27/2016 09 00	10/28/2016 10,37	10/28/2016 22 27	1200	3028 5		5908	0 0115	1 46	0 1	0.05	OK
165		1493	10/27/2016 09:05	10/28/2016 10:40	10/29/2016 08.20	1079	1621		5005	0 0117	2.12	0 1	0 05	OK
166		1104	10/27/2016 09 07	10/28/2016 10 40	10/29/2016 08 18	87	1621		5866	0 0117	42 52	0 4	0 57	OK
167		1456	10/27/2016 09 09	10/28/2016 10:40	10/28/2016 22 18	326	3028 5		5001	0 0115	7 8	0.3	0 14	OK
168		1432	10/27/2016 09 11	10/28/2016 10 45	10/28/2016 22 24	44	3028 5		5033	0 0115	67 96	0 7	0 99	OK
169		1449	10/27/2016 09 13	10/28/2016 10 45	10/28/2016 22.25	94	3028.5		5011	0 0115	30.89	0 5	0 47	OK
170		1002	10/27/2016 09 18	10/28/2016 10:46	10/28/2016 22 06	653	3028 5		5005	0 0115	3 13	0.2	0 08	OK
171		1480	10/27/2016 09 19	10/28/2016 10 50	10/28/2016 21 57	485	3028 5		5005	0 0115	4 73	0 2	0.1	OK
172		1105	10/27/2016 09 21	10/28/2016 10 50	10/28/2016 21 21	813	3028 5		5008	0 0115	2 2	0 2	0 06	OK
173		1091	10/27/2016 09 27	10/28/2016 10 56	10/28/2016 20 45	719	3028 5		5331	0 0115	2 94	0 2	0 07	OK
174		1419	10/27/2016 09 26	10/28/2016 10 56	10/28/2016 21 06	164	3028 5		5084	0 0115	17 15	0 4	0.27	OK
175		1440	10/27/2016 09 37	10/28/2016 11:04	10/28/2016 19 20	904	3028 5		5195	0.0115	1 92	0 1	0.06	OK
176		1080	10/27/2016 09 39	10/28/2016 11 05	10/28 2016 19 36	975	3028.5		6116	0 0115	2.24	0 1	0 06	OK
177		1004	10/27/2016 09 29	10/28/2016 10.56	10/28/2016 20 58	396	3028 5		5529	0 0115	6 9	0.2	0 12	OK
178		1408	10/27/2016 09 51	10/28/2016 11 14	10/28/2016 20.23	226	3028.5		5711	0.0115	13 65	0 3	0.21	OK
179		1458	10/27/2016 10 00	10/28/2016 11 29	10/28/2016 18 10	188	3028 5		5007	0 0115	14 15	0.3	0 23	OK
179		1458	10/27/2016 10 00	10/28/2016 11 29	10/28/2016 18 15	191	3028 5	D	5005	0 0115	13 91	0 3	0.23	OK
180		1490	10/27/2016 09 23	10/28/2016 10.50	10/28/2016 21 17	160	3028 5		5044	0 0115	17 53	0 4	0 28	OK
181		1434	10/27/2016 09 53	10/28/2016 11.21	10/28/2016 20:30	135	3028.5	D	5017	0 0115	20 73	0 4	0.32	OK
181		1434	10/27/2016 09.53	10/28/2016 11 21	10/28/2016 20 27	130	3028 5		5017	0 0115	21.57	0 4	0.34	OK

Types D-Duplicate, TB-Trip Blank

Reviewed by _____

ERG

Radon Flux Measurements

Environmental Restoration Group, Inc
8809 Washington St NE, Suite 150
Albuquerque, NM, 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	Flux (pCi/m²s) LLD	Flux (pCi/m²s) Error 1.00 S.D	Remarks
182		1450	10/27/2016 09 57	10/28/2016 11 26	10/28/2016 18 05	253	3028.5	D	5003	0 0115	10 12	0.3	0.17	OK
182		1450	10/27/2016 09 57	10/28/2016 11.26	10/28/2016 18 00	257	3028.5		5009	0 0115	9 95	0 3	0 17	OK
183		1436	10/27/2016 10.43	10/28/2016 12·01	10/28/2016 17 23	284	3028 5		5052	0 0115	8 93	0 3	0 16	OK
184		1462	10/27/2016 10.44	10/28/2016 12·04	10/28/2016 16.36	50	3028 5		5026	0 0115	56 89	0 6	0 83	OK
184		1462	10/27/2016 10 44	10/28/2016 12·04	10/28/2016 16·37	49	3028.5	D	5032	0 0115	58 16	0 6	0 85	OK
185		1469	10/27/2016 10;16	10/28/2016 11 51	10/28/2016 17 17	305	3028 5		5009	0 0115	8 05	0 3	0 14	OK
186		1407	10/27/2016 10 15	10/28/2016 11.59	10/28/2016 17 40	1062	3028 5		5783	0 0115	1.69	0 1	0 05	OK
187		1438	10/27/2016 10 13	10/28/2016 11 42	10/28/2016 16 52	998	3028 5		5001	0 0115	1 44	0 1	0 05	OK
188		1411	10/27/2016 10 12	10/28/2016 11 40	10/28/2016 19·10	529	3028 5		5004	0 0115	4 1	0 2	0 09	OK
189		1441	10/27/2016 10 10	10/28/2016 11.35	10/28/2016 18 38	489	3028 5		7611	0 0115	7 7	0.2	0 11	OK
189		1441	10/27/2016 10 10	10/28/2016 11.35	10/28/2016 18 47	320	3028 5	D	5004	0 0115	7 75	0 3	0 14	OK
190		1477	10/27/2016 10 04	10/28/2016 11 30	10/28/2016 18·25	303	3028 5		5468	0.0115	9 14	0.3	0 15	OK
190		1477	10/27/2016 10:04	10/28/2016 11 30	10/28/2016 18 31	308	3028 5	D	5585	0 0115	9 2	0 3	0 15	OK
191		1486	10/27/2016 10 49	10/28/2016 12 14	10/29/2016 11 06	105	1621		5335	0 0117	32 28	0 4	0 46	OK
192		1424	10/27/2016 10 47	10/28/2016 12.14	10/28/2016 16 15	1200	3028.5		5496	0 0115	1 19	0 1	0 04	OK
193		1495	10/27/2016 10 46	10/28/2016 12 09	10/28/2016 16 05	183	3028 5		5073	0 0115	14.54	0 3	0 23	OK
193		1495	10/27/2016 10 46	10/28/2016 12 09	10/28/2016 16·08	179	3028 5	D	5015	0 0115	14 71	0.3	0 24	OK
194		1005	10/27/2016 10 45	10/28/2016 12 09	10/28/2016 16 13	49	3028 5	D	5048	0 0115	58	0 6	0 85	OK
194		1005	10/27/2016 10 45	10/28/2016 12.09	10/28/2016 16.12	47	3028 5		5001	0 0115	59.94	0 7	0 88	OK
195		1075	10/27/2016 10.58	10/28/2016 12.25	10/29/2016 10 50	76	1621		5688	0.0117	47 74	0 4	0 65	OK
196		1468	10/27/2016 10·59	10/28/2016 12.30	10/29/2016 10·57	46	1621		5035	0 0117	70 08	0 6	1 01	OK
197		1489	10/27/2016 09·35	10/28/2016 10.58	10/28/2016 21 11	306	3028.5		5017	0 0115	8.39	0 3	0 13	OK

Types D-Duplicate, TB-Trip Blank

Reviewed by _____

ERG

Radon Flux Measurements

Environmental Restoration Group, Inc.
6809 Washington St NE, Suite 150
Albuquerque NM 87113

Location Name	Field Type	Canister Number	Date/Time Deployment	Date/Time Retrieval	Date/Time Counting	Count Time (sec)	BKG Counts	Lab Type	Sample Counts	Efficiency (cps/dps)	Flux (pCi/m²s) Result	LLD	Error 1 00 S D	Remarks
198		1461	10/27/2016 10:02	10/28/2016 11:21	10/28/2016 20 34	286	3028 5		9025	0 0115	17 48	0.3	0 21	OK
199		1443	10/27/2016 09 56	10/28/2016 11.26	10/28/2016 18 18	174	3028.5		5007	0 0115	15 42	0.3	0 25	OK
199		1443	10 27/2016 09 56	10/28/2016 11 26	10/28/2016 18 21	170	3028.5	D	5020	0 0115	15 87	0.3	0 26	OK
200		1418	10/27/2016 09 15	10/28/2016 10 46	10/28/2016 21 35	1200	3028.5		5879	0 0115	1 44	0 1	0 05	OK
999	TB	1021	10/27/2016 13:00	10/28/2016 13 00	10/29/2016 11 42	1200	1621		3234	0 0117	0 92	0 1	0 04	OK
999	TB	1460	10/27/2016 13:00	10/28/2016 13:00	10/29/2016 12 03	1200	1621		3310	0 0117	0 97	0 1	0 04	OK

Types. D-Duplicate, TB-Trip Blank

Reviewed by _____

Appendix B

Field Exposure Rate Measurements

HMC Exposure Rate Measurements

Location	Exposure Rate (µR/hr)	Pile	Location	Exposure Rate (µR/hr)	Pile	Location	Exposure Rate (µR/hr)	Pile	Location	Exposure Rate (µR/hr)	Pile
1	15	LTP	51	22	LTP	101	54	LTP	151	140	STP
2	17	LTP	52	30	LTP	102	22	LTP	152	45	STP
3	15	LTP	53	24	LTP	103	26	LTP	153	55	STP
4	14	LTP	54	22	LTP	104	20	LTP	154	70	STP
5	15	LTP	55	20	LTP	105	22	LTP	155	30	STP
6	28	LTP	56	26	LTP	106	30	LTP	156	34	STP
7	24	LTP	57	20	LTP	107	28	LTP	157	30	STP
8	21	LTP	58	32	STP	108	24	LTP	158	42	STP
9	22	LTP	59	30	STP	109	48	LTP	159	32	STP
10	20	LTP	60	32	STP	110	24	LTP	160	34	STP
11	30	LTP	61	45	STP	111	18	LTP	161	36	STP
12	24	LTP	62	30	STP	112	54	LTP	162	30	STP
13	24	LTP	63	26	STP	113	14	LTP	163	70	STP
14	25	LTP	64	24	STP	114	48	LTP	164	30	STP
15	22	LTP	65	20	STP	115	26	LTP	165	30	STP
16	20	LTP	66	20	STP	116	20	LTP	166	30	STP
17	26	LTP	67	30	STP	117	50	LTP	167	26	STP
18	28	LTP	68	32	STP	118	24	LTP	168	42	STP
19	48	LTP	69	38	STP	119	44	LTP	169	20	STP
20	20	LTP	70	40	STP	120	20	LTP	170	24	STP
21	22	LTP	71	28	STP	121	22	LTP	171	20	STP
22	20	LTP	72	28	STP	122	22	LTP	172	20	STP
23	40	LTP	73	20	STP	123	21	LTP	173	20	STP
24	25	LTP	74	19	STP	124	24	LTP	174	60	STP
25	24	LTP	75	25	STP	125	16	LTP	175	26	STP
26	45	LTP	76	20	STP	126	24	LTP	176	28	STP
27	22	LTP	77	14	STP	127	24	LTP	177	22	STP
28	24	LTP	78	14	STP	128	40	LTP	178	34	STP
29	36	LTP	79	15	STP	129	30	LTP	179	22	STP
30	20	LTP	80	18	STP	130	400	LTP	180	22	STP
31	40	LTP	81	16	STP	131	24	LTP	181	28	STP
32	22	LTP	82	20	STP	132	46	LTP	182	22	STP
33	32	LTP	83	15	STP	133	20	LTP	183	32	STP
34	16	LTP	84	175	STP	134	28	LTP	184	44	STP
35	19	LTP	85	40	STP	135	35	LTP	185	48	STP
36	18	LTP	86	38	STP	136	20	LTP	186	44	STP
37	15	LTP	87	160	STP	137	80	STP	187	40	STP
38	45	LTP	88	60	STP	138	65	STP	188	36	STP
39	18	LTP	89	46	STP	139	65	STP	189	36	STP
40	26	LTP	90	26	STP	140	80	STP	190	22	STP
41	22	LTP	91	120	STP	141	32	STP	191	55	STP
42	28	LTP	92	45	STP	142	44	STP	192	50	STP
43	20	LTP	93	70	STP	143	120	STP	193	48	STP
44	22	LTP	94	18	LTP	144	40	STP	194	40	STP
45	28	LTP	95	14	LTP	145	80	STP	195	65	STP
46	22	LTP	96	13	LTP	146	38	STP	196	90	STP
47	26	LTP	97	13	LTP	147	32	STP	197	24	STP
48	20	LTP	98	25	LTP	148	40	STP	198	30	STP
49	22	LTP	99	26	LTP	149	40	STP	199	22	STP
50	22	LTP	100	28	LTP	150	50	STP	200	24	STP

Appendix C

Field Deployment and Laboratory Analysis Log Forms

ERG Canister Deployment and Retrieval Log Form

Site: HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
94	488	10/12/16	09:28	10/13/16	1051	18 µR/hr
95	475		09:30		1052	14
96	418		09:32		1052	13
97	449		09:38		1056	13
3	434		09:42		~~1059~~ 1054	15
5	480		09:49		1104	14
4	471		09:51		1103	16
2	408		09:54		1102	17
8	443		09:56		1108	21
7	484		09:58		1106	24
6	263		10:00		1105	28
11	468		10:02		1115	30
10	463		10:04		1116	20
9	422		10:06		1117	22
14	432		10:08		1118	25
13	458		10:10		1119	24
12	105		10:11		1120	24
17	457		10:14		1127	26
16	476		10:16		1128	20
15	482		10:17		1129	22
20	448		10:30		1130	20
19	492		10:34		1131	48
18	406		10:36		1132	28
98	445		10:38		1144	25
24	493		10:40		1146	25
23	415		10:42		1149	40
22	437		10:44		1150	20
21	430		10:46		1151	22
27	405		10:50		1153	22
26	453		10:51		1148	45

Review: [signature]

ERG Canister Deployment and Retrieval Log Form

Site: HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
25	407	10/12/16	10:52	10/13/16	1148	24
30	104		10:56		1207	20
29	465		10:58		1206	36
28	500		10:59		1205	24
31	478		11:02		1211	40
33	483		11:04		1210	32
32	428		11:07		1209	22
34	421		11:10		1217	16
35	472		11:11		1217	19
36	426		11:12		1216	18
37	411		11:21		1230	15
38	455		11:25		1233	45
39	447		11:30		1231	18
40	420		11:38		1235	26
41	485		11:40		1234	22
42	1		11:41		1225	28
43	446		11:43		1226	20
44	470		11:45		1222	22
45	460		11:47		1223	28
99	474		11:48		1220	26
100	401		11:50		1221	28
47	68		11:52		1244	26
46	433		11:54		1246	22
49	499		11:57		1247	22
48	441		11:59		1248	20
51	479		12:01		1254	22
DUP → 51 D	438		12:01		1254	22 ← DUP
50	425		12:09		1255	22
55	469		12:11		1256	20
52	451		12:13		~~1255~~ 1257	30

Review: T. [illegible]

ERG Form PWT.107.A

ERG Canister Deployment and Retrieval Log Form

Site: _____

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
53	481	10/12/16	12:15	10/13/16	1301	24
54	402		12:18		1302	22
56	467		12:20		1303	26
57	452		12:22		1304	20
1	498		12:24		1306	15
STP						
58	21		12:39		13:23	32
90	491		12:39		13:23	26
91	435		12:41		13:25	120
59	42		12:42		13:25	~~565~~ 30
60	412		12:44		13:28	32
92	256		12:44		13:28	45
61	200		12:48		13:30	45
93	49		12:48		13:30	70
62	416		1254		13:32	30
64	403		1258		13:34	24
65	64		1304		13:39	20
82	450		1306		13:36	20
83	312		1308		13:40	15
77	2		13.12		13:42	14
66	410		13:14		13:44	20
67	5		13:16		13:46	30
63	490		13:18		13:45	26
68	424		13-24		13:48	32
69	439		13:28		13:50	38
70	456		13:31		13:50	40
71	427		13 33		13:50	28
74	462		13:40		13:56	19
75	4		13:42		13:56	25
76	440		13:43		13:57	20

Review: _____

ERG Form PWT.107.A

ERG Canister Deployment and Retrieval Log Form

Site HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
80	423	10/12/16	13:45	10/13/16	13:57	18
81	80		13:52		14:02	16
78	400		13:55		14:05	14
79	494		13:57		14:08	15
73	489		14:01		14:08	20
72	436		14:02		14:08	20
84	254		14:07		14:10	175
85	495		14:08		14:12	40
86	429		14:11		14:14	38
87	91		14:13		14:16	160
88	461		14:15		14:18	60
89	496		14:18		14:20	46
* 89 D	75		14:18		14:20	46 * DUP
TB #1	473		12:00		12:00	TRIP BLANK
TB #2	94		12:00		12:00	TRIP BLANK
						LEFT SEALED IN BAGS
						@ HMC SHOP
				CHECKED MOT STATION @		
				HMC & > 35°F for		
				PREVIOUS 24 HOURS &		
				NO PRECIP.		
						CR

Review: [signature]

ERG Canister Analysis Log Form

Site: ~~ERG Office~~ HMC

ROI: Channel 763 to Channel 954

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
STD3		10-13-16	1317	1200	43166	esh
STD1			1345	1200	45390	
BKG			1406	1200	3210	
434			1645	133	5037	JPH
473			1648	1200	3804	
475			1710	1200	4282	
418			1730	763	6876	
449			1744	1200	4347	
408			1805	219	9374	
488			1809	532	8868	
443			1819	238	6696	
484			1824	644	6465	
* 263			1835	67	6454	
D 263	✓		1836	53	5225	
480			1838	1200	5289	
94			1900	1200	3348	
471			1920	384	9876	
463			1928	32	5092	
D 463	✓		1929	32	5049	
422			1930	72	5872	
105			1932	42	5145	
432			1933	102	5024	
468			1935	27	5174	
492			1936	18	5105	
458			1937	172	7031	
476			1941	709	5956	
406			1953	143	7183	
482			1956	273	5814	
448			2001	570	12385	

Review: [signature]

Date: 01/09/17

ERG Form PWT.107.B

ERG Canister Analysis Log Form

Site HMC
ROI: Channel 761 to Channel 954

	Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
	445		10-13-16	2012	41	5649	JDH
D	445	✓		2013	41	5536	
	457			2015	18	5115	
	493			2016	31	5061	
	407			2017	~~102~~ 1002	5376	
	470			2034	84	11261	
	499			2036	30	5282	
D	499	✓		2051	30	5165	
	433			2052	627	5488	
	68			2104	40	5109	
	415			2106	26	5279	
	430			2107	28	5190	
	453			2108	25	5074	
	405			2109	1061	6070	
	437			2127	862	5339	
	465			2142	50	11844	
D	465	✓		2144	22	5167	
	428			2145	173	11350	
	104			2149	133	9753	
	478			2151	268	19475	
	483			2157	39	5047	
	426			2158	974	35811	
	500			2215	234	5005	
	485			~~2020~~ 2220	63	5119	
	401			~~2021~~ 2221	46	5134	
	472			~~2023~~ 2223	653	5699	
	460			~~2035~~ 2235	41	5062	
D	460	✓		~~2036~~ 2236	41	5066	
	474			~~2037~~ 2237	66	5027	

Review: T. [illegible]

Date: 01/09/17

ERG Form PWT.107.B

ERG Canister Analysis Log Form

Site: HMC
ROI Channel 761 to Channel 954

	Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
	1		10-13-16	2239	17	5069	JDM
	421			2240	218	7467	
	420			2244	15	5028	
	447			2245	237	14555	
	455			2250	16	5090	
	446			2251	39	5059	
	411			2252	1039	13058	
	481			2317	42	5057	
	467			2318	213	9465	
	402			2322	964	5584	
	441			2339	75	5536	
	425			2341	36	5049	
	452			2342	1038	5004	
	469		10-14-16	0001	650	6105	
	451			0012	69	5033	
	498			0013	519	6315	
	21			0024	43	5030	
	479			0025	55	5035	
•	438			0027	323	27472	
D	438	/		0033	70	6018	
	435			0035	33	5043	
	491			0036	111	5075	
	412			0038	31	5068	
D	412	/		0039	31	5074	
	42			0040	36	5057	
	49			0041	43	7155	
	200			0043	42	5044	
	256			0044	35	5151	
D	256	/		0045	34	5131	

Review: [signature]

Date: 01/09/17

ERG Form PWT.107.B

ERG Canister Analysis Log Form

Site HMC
ROI: Channel 761 to Channel 954

	Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
	403		10-14-16	0047	33	5051	JDH
	312			0048	173	8014	
	410			0052	341	6568	
	5			0059	209	5039	
D	5	✓		0103	210	5137	
	STD#3			0108	1200	42155	
	STD#1			0128	1200	43900	
	BKG			0150	1200	3375	
	BKG		10-14-16	0617	1200	3471	RSH
	STD1			0640	1200	44920	RSH
	STD3			0710	1200	41453	RSH
	64			0900	309	5199	CF
	416			0906	220	5159	CF
	450			0911	906	5194	CF
	2			0927	383	6537	CF
	490			0933	266	5035	CF
	446			0939	165	5095	CF
	75			0943	141	5009	CF
	461			0946	336	5289	CF
D	461	✓		0952	324	5012	RSH
	91			0958	62	5063	RSH
	429			1000	416	5012	RSH
	254			1008	32	5162	RSH
D	254	✓		1009	32	5099	RSH
	495			1010	148	5013	RSH
	436			1013	665	5005	RSH
	489			1025	502	5876	RSH
	494			1035	652	5467	RSH
	80			1046	581	5005	RSH

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Date: 01/09/17

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ERG Canister Analysis Log Form

Site HMC
ROI Channel 763 to Channel 954

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
400		10-14-16	1057	482	5003	RSH
440			1106	160	5013	RSH
4			1109	260	5130	RSH
423			1114	172	5025	RSH
462			1118	477	5003	RSH
424			1127	437	6403	CF
439			1135	859	5006	RSH
427			1150	490	6731	RSH
456			1159	716	5004	RSH
STD1			1212	1200	44517	RSH
STD3			1232	1200	42993	RSH
BKG			1253	1200	3316	RSH

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Date: 01/09/17

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ERG Canister Deployment and Retrieval Log Form

Site HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
141	200	10/27/11	833	10/28/11	1018	32
140	402		0835		1020	80
142	452		0837		1018	44
143	479		0838		1018	120
145	410		0840		1026	80
144	431		0841		1020	40
146	446		0842		1020	38
147	42		0843		1020	32
149	~~40~~ 470		0851		1030	40
148	~~40~~ 430		0851		1030	40
151	482		0853		1037	140
150	483		0854		1037	~~100~~ 50
164	474		0900		1037	30
163	485		0903		1038	70
165	493		0905		1040	30
166	104		0907		1040	30
167	456		0909		1040	26
168	432		0911		1045	42
169	449		0913		1045	20
200	418		0915		1046	24
170	2		0918		1046	24
171	480		0919		1050	26
172	105		0921		1050	20
180	490		0923		1050	22
174	439		0926		1056	60
173	91		0927		1056	20
177	4		0929		1056	22
197	489		0935		1058	24
175	440		0937		1104	26
176	80		0939		1105	28

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ERG Canister Deployment and Retrieval Log Form

Site: HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
155	254	10/27/16	0943	1109	10/28/16	30
156	400		0946	1110		34
157	471		949	1113		30
178	408		951	1114		34
181	434		953	1121		28
~~185~~ 199	443		956	1126		22
182	450		957	1126		22
179	458		1000	1129		22
198	461		1002	1121		30
~~162~~ 190	477		1004	1130		22
162 ~~1620~~ 190	421		1007	1137		30
1620 ~~190~~	500		1007	1137		30
189	441		1010	1135		36
188	411		1012	1140		36
187	438		1013	1142		46
186	407		1015	1159		44
185	469		1016	1151		48
158	437		1018	1153		42
159	499		1023	1149		32
160	415		1025	1142		34
161	448		1026	1147		36
183	436		1043	1201		32
184	462		1044	1204		44
194	5		1045	1205		40
193	495		1046	1209		48
192	424		1047	1214		50
191	486		1049	1214		55
153	403		1050	1217		55
152	412		1051	1217		45
154	263		1053	1234		70

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ERG Canister Deployment and Retrieval Log Form

Site: HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
137	422	10/27/11	1055	1223	10/28/11	80
138	488		1056	1223		65
195	75		1058	1225		65
196	468		1059	1230		90
139	419		1100	1229		65
128	~~495~~ 459		1117	1247		40
106	256		1119	1250		30
131	491		1120	1255		24
107	453		1122	1255		28
129	409		1123	1257		30
109	445		1125	13~~14~~03		48
133	406		1127	13~~14~~03		28
108	433		1128	13~~14~~03		24
130	416		1130	13~~14~~03		400
130D	473		1130	13~~14~~03		400
126	401		1133	1321		24
132	496		1146	1321		46
110	494		1148	1325		24
127	484		1149	1327		24
101	94		1151	1330		54
134	492		1153	1331		28
112	463		1155	1333		54
135	481		1157	1337		35
136	423		1200	1335		20
120	427		1202	1341		20
124	420		1203	1343		24
123	426		1206	1351		21
111	64		1208	1351		18
122	417		1210	1351		22

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Canister Deployment and Retrieval Log Form

Site HMC

Location Number	Canister Number	Deployment Date (mm/dd/yy)	Deployment Time (24:00)	Retrieval Date (mm/dd/yy)	Retrieval Time (24:00)	Comments
115	475		1213	1351		26
114	451		1216	1356		48
105	465		1218	1358		22
104	472		1220	1358		20
121	455		1222	1407		22
118	429		1224	1407		24
117	476		1233	1411		50
103	1		1235	1411		26
119	457		1237	1414		44
102	68		1239	1415		22
113	478		1240	1419		14
116	405		1243	1421		20
125	428		1246	1423		16
BIK	21		1300	1440		
BIK	460		1300	1440		

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ERG Canister Analysis Log Form

Site: HMC
ROI: Channel 372 to Channel 957

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
STD1		10/28/16	23:16	1200	44740	HH
BKG		10/28/16	23:37	1200	3016	
BKG		10/29/16	7:15	1200	3242	
STD 1			7:36	1200	44214	
STD			7:57	1200	41420	
104			8:18	87	5866	
493			8:20	1079	5005	
470			8:39	66	5005	
483			8:41	130	5076	
482			8:44	15	5074	
430			8:45	58	5123	
410			8:47	30	5076	
42			8:48	174	5012	
446			8:52	489	10263	
431			9:02	276	5046	
452			9:08	256	5125	
200			9:13	272	6144	
479.			9:19	18	5361	
402			9:20	165	5010	
492			9:24	385	5038	
463			9:31	16	5106	
423			9:32	252	7173	
481			9:37	65	5008	
401			9:39	48	5045	
484			9:41	37	5060	
94			9:43	21	5074	
494			9:44	33	5019	
473			9:45	10	5078	
496			9:46	46	5038	

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Date: 01/09/17

ERG Canister Analysis Log Form

Site: HMC
ROI, Channel 772 to Channel 957

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
416		10/27/16	9:47	12	5107	HH
445			9:48	19	5090	
409			9:49	96	5121	
453			9:52	706	5002	
433			10:04	363	5045	
406			10:11	1200	5180	
263			10:33	41	5066	
256			10:35	303	5697	
491			10:41	131	6450	
459			10:44	299	5026	
75			10:50	76	5688	
422			10:52	300	5090	
468			10:57	46	5035	
419			10:59	360	5539	
486			11:06	105	5335	
412			11:08	416	5002	
488			11:16	528	5019	
403			11:26	95	5219	
405			11:29	393	5519	
478			11:37	273	5115	
21			11:42	1200	3234	
460			12:03	1200	3310	
1			12:25	52	5729	
457			12:26	650	5252	
428			12:38	87	5017	
68			12:40	508	5009	
451			12:50	17	5116	
472			12:51	199	5041	
455			12:55	542	5084	

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ERG Canister Analysis Log Form

Site: HMC
ROI: Channel 772 to Channel 957

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
BKG		10/28/16	14:46	1200	3041	HH
STD1			15:06	1200	44798	
STD3			15:30	1200	42115	
495			16:05	183	5073	
* ~~DUP~~ 495	✓		16:08	179	5015	
5			16:12	47	5001	
* 5	✓		16:13	49	5048	
424			16:15	1200	5496	
462			16:36	50	5026	
* 462	✓		16:37	49	5032	
415			16:39	330	5005	
448			16:45	367	5004	
438			16:52	998	5001	
499			17:10	145	5022	
* 499	✓		17:13	150	5130	
469			17:17	305	5009	
436			17:23	284	5052	
437			17:31	193	5014	
* 437	✓		17:35	195	5062	
407			17:40	1062	5783	
450			18:00	257	5009	
* 450	✓		18:05	253	5003	
458			18:10	188	5007	
* 458	✓		18:15	191	5005	
443			18:18	174	5007	
* 443	✓		18:21	170	5020	
477			18:25	303	5468	
* 477	✓		18:31	308	5585	
441			18:38	489	7611	

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Date: 01/09/17

ERG Canister Analysis Log Form

Site HMC
ROI Channel 772 to Channel 957

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
441	✓	10/28/16	18:47	320	5004	HH
421			18:53	323	5011	
421	✓		18:57	325	5015	
500			19:01	436	9844	
411			19:10	529	5004	
440			19:20	904	5195	
80			19:36	975	6116	
254 ~~425~~			19:54	950	8168	
400			20:11	570	5030	
408			20:23	226	5711	
434			20:27	130	5017	
434			20:30	135	5017	
461			20:34	286	9025	
471			20:40	177	6060	
91			20:45	719	5331	
4			20:58	396	5529	
439			21:06	164	5084	
489			21:11	306	5017	
490			21:17	160	5044	
105			21:21	813	5008	
418			21:35	1200	5879	
480			21:57	485	5005	
2			22:06	653	5005	
456			22:18	326	5001	
432			22:24	44	5033	H
449			22:25	94	5011	
474			22:27	1200	5908	
485			22:48	348	5030	
STD3			22:55	1200	42048	

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Date: 01/09/17

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ERG Canister Analysis Log Form

Site: HMC
ROI: Channel 772 to Channel 957

Canister Number	Duplicate Count	Count Date (mm/dd/yy)	Count Time (24:00)	Count Duration (seconds)	Total Counts	Technician Initials
429		10/29/16	13:06	371	5029	HH
417			13:13	77	5355	
476			13:15	18	5096	
64			13:16	60	5061	
465			13:17	66	5014	
427			13:19	67	5039	
426			13:21	186	5015	
475			13:25	31	5285	
420			13:26	70	5026	
STD3			13:28	1200	41168	
STD1			13:49	1200	44272	
BKG			14:11	1200	3129	

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Date: 01/09/17

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Attachment 4
Environmental Gamma Radiation Results

Attachment 4 - Environmental Gamma Radiation Results
OSL Perimeter Survey

Direct Radiation Measurements

Location	Monitoring Period	Exposure Rate (mrem/6 months)	Error (mrem/6 months) *
HMC #1 N Outer Perimeter	7/1/16 - 12/31/16	55	5.4
HMC #1-A N Outer Perimeter	7/1/16 - 12/31/16	56	5.5
HMC #2 NE Outer Perimeter	7/1/16 - 12/31/16	62	6 1
HMC #3 E Outer Perimeter	7/1/16 - 12/31/16	58	5.7
HMC #4 S Outer Perimeter	7/1/16 - 12/31/16	48	4.7
HMC #5 N of Nearest Residence	7/1/16 - 12/31/16	60	5.9
HMC #6 Background	7/1/16 - 12/31/16	59	5.8
HMC #16	7/1/16 - 12/31/16	53	5 2

*Error is 1.96 std. dev.

Attachment 5
Public Dose Evaluation

Annual Effective Dose Equivalent to Individuals of the Public

1.0 Introduction

There were very few activities in 2016 at the Grants Uranium Mill Site other than those associated with the groundwater restoration program. All off-pile tailings were consolidated with the tailings in 1995 and covered with a soil cover. All tailings currently have either an interim or permanent cover. Other activities that occurred on the tailings piles include placing additional interim cover on top of the large tailings pile to reduce exposure rate and radon emissions and construction of a water treatment facility.

The 10 CFR 20.1301 radiation dose limit for individual members of the public from NRC-licensed facilities is specified as a total effective dose equivalent (TEDE) of 100 mrem/year. In addition, 10 CFR 20.1101 has a constraint on air emissions (excluding Rn-222 and its decay products) from a site limiting the TEDE to the maximum exposed member of the public from such emissions to10 mrem/year. A licensee may request permission from the NRC to operate a facility up to a maximum of 500 mrem/year. Compliance may be demonstrated by calculations or measurements showing that the individual likely to receive the maximum dose from the facility does not exceed the limit, or by comparing measured effluent concentrations to those specified in Table 2 of Appendix B to 10 CFR Part 20. In addition, radiation from external sources for individuals in the unrestricted area may not deliver a dose equivalent of 0.002 rem in any hour or 0.050 rem in one year.

HMC has submitted environmental monitoring reports as required by 10 CFR 40.65 and License No. SUA-1471. The data from these reports have been used in this dose assessment.

2.0 Dose Assessment

The important pathways for assessing the dose to the maximum exposed individual are: inhalation of airborne particulate from the site, exposure to radon generated at the site, and the exposure to direct gamma radiation originating from the site. The nearest residence is located within 100 yards of the HMC-4 and HMC-5 monitoring stations and therefore the exposure may be conservatively assumed to be comparable to that at the monitoring stations. The exposure at both monitoring stations is considered and the station with the highest exposure is used for calculating the TEDE to the maximum exposed individual. It is known that the nearby residents have typical lifestyles

NUREG/CR-5512 recommends default values for the residential scenario. The values for indoor and outdoor occupancy are 200 and 71 effective days/year, respectively. This is equivalent to a 75 percent total occupancy factor. This has been used in this analysis for all pathways.

2.1 Inhalation of Radionuclides

The committed effective dose equivalent (CEDE) from inhalation of particulate was calculated for the four principal long-lived radionuclides, U-238, U-234, Th-230, and Ra-226, using the quarterly environmental monitoring data given in the Semi-Annual Environmental Reports for 2016.

The monitoring stations HMC-4 and HMC-5 were considered as nearest residence locations and the point of compliance for public dose limits. These stations are located on the southwestern perimeter of the site near existing residences. The use of these data to predict the dose to the nearest resident is conservative in that the doses at the residences should be less than that at the site perimeter.

The CEDE per Unit Intake via Inhalation factors were taken from ICRP 30 tables. The values are given below:

Nuclide	CEDE (mrem/μCi)
U-234	13.2E4
U-238	11.8E4
Th-230	32.6E4
Ra-226	8.6E3

Continuous occupancy at a breathing rate of 20,000 liters/day (Table A-1, NUREG-0859) was assumed. The CEDE was calculated for each of the radionuclides at each station. The CEDE at locations HMC-4 and HMC-5 for 100 percent occupancy was calculated to be 0.75 mrem/year and 0.23 mrem/y, respectively while that at the background location (HMC-6) was calculated to be 0.33 mrem/y, for a net CEDE at locations HMC-4 and HMC-5 of 0.4 mrem/y and 0 mrem/y. The results from these calculations are shown in Table 2-1, Table 2-2, and Table 2-3. The net dose equivalent, when accounting for the occupancy factor of 75%, results in a dose rate of 0.3 and 0 mrem/year at HMC-4 and HMC-5 respectively. The location with the highest exposure from all pathways will be chosen for calculating the TEDE to the public.

2.2 Exposure to Radon

The outdoor radon levels in the Grants Uranium Belt are known to be high and variable, depending on the location relative to mine vents, surface ore deposits, and topographical features. The natural background radon concentrations, arising from the calm winds during the evenings and at times from temperature inversions, generally follow the drainage path of the air. The HMC site is situated at the lowest point in the drainage path for radon generated over a very large area to the North, Northwest, and Lobo Canyon to the East. Therefore the natural background levels at the site are expected to be high and variable over short periods of time due to being in this drainage path.

The radon data for the four quarterly monitoring periods are provided in Attachment 2 of the semi-annual monitoring reports. Monitoring Station 16 has been accepted as the radon background location for the site. The average radon concentration for 2016 at HMC-4 and HMC-5 was 1.3 and 1.0 pCi/L respectively. The average annual concentration at the background location (HMC-16) was 0.45 pCi/L. Subtracting the background concentration from the measured concentrations at HMC-4 and HMC-5 results in net radon concentrations of 0.88 and 0.58 pCi/L respectively.

Since the nearest residence is within a few hundred feet of the site perimeter and within 3500 feet of the major source of on-site releases of radon, the radon progeny equilibrium is expected to be low due to a small flight time until it reaches the residence. We have selected 20 percent radon progeny equilibrium as an estimate for use in the dose calculations. NRC uses a continuous exposure to 0.1 pCi/l Rn-222, in full equilibrium with the decay products, as being equivalent to a committed effective dose equivalent (CEDE) of 50 mrem/y (10 CFR Part 20, Appendix B). With 20 percent equilibrium, the CEDE would be 100 mrem/pCi/l. Considering the 75 percent occupancy factor, the net radon concentration at the nearest residence locations HMC-4 and

HMC-5 results in a calculated CEDE of 66 and 44 mrem/y respectively. The method to calculate public dose from radon-222 is the same used in previous years.

2.3 Dose from Exposure to Direct Radiation

An estimate of the dose equivalent from direct exposure to radiation sources at the site is obtained from optically stimulated luminescence (OSL) dosimeters placed at each monitoring station. The direct radiation measurements for the two monitoring periods are provided in Attachment 3 of the semi-annual monitoring reports. The average annual effective dose equivalents measured at HMC-4 and HMC-5 locations was 104 and 117 mrem/year, respectively. The average annual effective dose equivalent at the background location (HMC-6) was 114 mrem/year. The net annual effective dose equivalent for HMC-4 and HMC-5, assuming 100 percent occupancy, was 0 and 3 mrem/year, respectively. Considering the 75 percent occupancy factor, the net annual effective dose equivalent was 0 and 2 mrem/year for HMC-4 and HMC-5, respectively.

2.4 Total Effective Dose Equivalent to the Nearest Resident

The TEDE to the Nearest Resident can be calculated by adding the CEDE from inhalation of airborne particulate, the CEDE from the exposure to radon coming from the site, and the dose equivalent from direct gamma radiation. The TEDE at HMC-4 was 66 mrem/year and at HMC-5 was 47 mrem/year. This is within the 100 mrem/year limit and the particulate TEDE is much below the 10 mrem/y constraint limit on particulate emissions.

Table 2-1 Annual Effective Dose at the Nearest Residence from Airborne Particulate

Year 2016

STATION: HMC-4 Nearest Residence

AIRBORNE CONCENTRATION

	U-nat µCi/ml	U-234 µCi/ml	U-238 µCi/ml	Th-230 µCi/ml	Ra-226 µCi/ml
1st qtr	4.00E-16	1.95E-16	1.95E-16	6.00E-17	2.00E-16
2nd qtr	6.00E-16	2.92E-16	2.92E-16	2.00E-17	6.00E-17
3rd qtr	2.00E-15	9.75E-16	9.75E-16	2.00E-17	3.00E-17
4th qtr	4.00E-17	1.95E-17	1.95E-17	9.00E-18	2.00E-17
Average	7.60E-16	3.70E-16	3.70E-16	2.73E-17	7.75E-17

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
0.357	0.319	0.065	0.005	0.7

Table 2-2 Annual Effective Dose at the Nearest Residence from Airborne Particulate

Year 2016

STATION: HMC-5 Nearest Residence

AIRBORNE CONCENTRATION

	U-nat µCi/ml	U-234 µCi/ml	U-238 µCi/ml	Th-230 µCi/ml	Ra-226 µCi/ml
1st qtr	1.00E-16	4.87E-17	4.87E-17	2.00E-17	4.00E-17
2nd qtr	1.60E-16	7.80E-17	7.80E-17	1.00E-17	4.00E-17
3rd qtr	5.80E-16	2.83E-16	2.83E-16	1.00E-17	4.00E-17
4th qtr	7.00E-17	3.41E-17	3.41E-17	1.00E-17	3.00E-17
Average	2.28E-16	1.11E-16	1.11E-16	1.25E-17	3.75E-17

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
0.107	0.096	0.030	0.002	0.2

Table 2-3 Annual Effective Dose at the Site Background Location from Airborne Particulate

Year 2016

STATION: HMC-6 Background

AIRBORNE CONCENTRATION

	U-nat µCi/ml	U-234 µCi/ml	U-238 µCi/ml	Th-230 µCi/ml	Ra-226 µCi/ml
1st qtr	9.00E-17	4.39E-17	4.39E-17	2.00E-17	5.00E-17
2nd qtr	3.00E-16	1.46E-16	1.46E-16	8.00E-18	4.00E-17
3rd qtr	9.00E-16	4.39E-16	4.39E-16	1.00E-17	3.00E-17
4th qtr	4.00E-17	1.95E-17	1.95E-17	9.00E-18	3.00E-17
Average	3.33E-16	1.62E-16	1.62E-16	1.18E-17	3.75E-17

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
0.156	0.140	0.028	0.002	0.3