HOMESTAKE MINING COMPANY OF CALIFORNIA GRANTS PROJECT

SEMI-ANNUAL ENVIRONMENTAL REPORT

JULY - DECEMBER 1998

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

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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 1998. In some instances, data collected prior to this period is also included in the report because it was not available at the time Homestake submitted their previous semi-annual report. The submittal of this report to the appropriate Nuclear Regulatory Commission (NRC) Regional Office and New Mexico state agency 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 representatives to satisfy the requirements of 10 CFR Part 40.65.

Homestake's monitoring and surveillance program for radioactive effluent releases have been designed to ensure the project 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 the 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 in February 1996. The large tailings pile has been recontoured and covered with interim cover on the top and radon barrier on the outslopes. Bedding and erosion protection was placed on outslopes. Soil verification of the removal of off-pile contaminated soil is complete, with completion report submitted December 18, 1995. In addition, a decommissioning report for the mine ion-exchange (IX) plant was completed and submitted in March 1997.

Homestake's groundwater monitoring program, as outlined in license Condition No. 35, continued as an ongoing program during this period. The requirements set forth in Condition No. 35 include the reporting of both radiological and non-radiological water quality parameters for specified wells, as well as 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. In order to meet NRC's requirement for semi-annual reporting, groundwater-monitoring data for the point-of-compliance (POC) wells and background well P are included in the semi-annual environmental monitoring reports. It should be noted that while these POC wells will eventually be used to demonstrate groundwater restoration, they are not representative of off-site effluent levels.

2.0 ENVIRONMENTAL MONITORING PROGRAMS

The monitoring requirements for the site are summarized in Tables 1, 2, and 3. Details of the monitoring program are discussed in the following sections:

2.1 Air Particulate Monitoring

Homestake continuously samples total suspended particulate at six locations around the reclamation site (see Figure 1). Those locations identified as HMC-1, 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 from Homestake's reclamation activities. The location identified at HMC-6 represents background conditions, and is located due west of the large tailings pile at the western most side of the property boundary. Locations HMC-4 and HMC-5 represent the sites of the nearest residences. The results are presented in Attachment 1.

Homestake uses a Sierra Instruments Model #305-200 High Volume Air Sampler (or equivalent) to continuously sample the ambient air of 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, and Thorium-230

2.2 Radon Gas Monitoring

Radon gas concentrations are monitored on a continuous basis at the eight locations identified in Figure 1. The background station for radon gas is HMC #16, located Northwest of the site. Landauer Corporation's track-etch passive radon monitors (PRM), or the equivalent, are used to continuously monitor radon gas at each sampling location. Semi-annually, Homestake personnel place new alpha particle sensitive detectors at monitoring locations and the exposed detectors are retrieved and returned to Landauer Corporation 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. The decay of radon gas contained in the ambient air causes imprint tracks on the alpha-sensitive detector that can then be counted at a later time. The radon gas concentration can subsequently be calculated by determining the number of tracks per unit area of the detector. A filter is placed over the container opening to inhibit the entrance of any alpha-emitting dust particles. The results are presented in Attachment 2.

3.0 WATER QUALITY MONITORIN

Table 2 (8-97) outlines the sampling frequency and parameters monitored. Additionally, the volumes of water injected and recovered as part of the ground-water cleanup program is monitored on a weekly frequency and the values are documented. A performance review report is submitted by March 31 of each year according to License Condition 35E. In order to comply with 10 CFR 40.65, the groundwater monitoring data for the POC wells and background well P are included in this Semi-Annual Environmental Report. These data are reported in Tables 2.1.1-2.1.9.

The water quality of these POC wells is currently being restored and therefore the reported levels are not representative of effluent from the site. 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.

4.0 DIRECT RADIATION

Gamma exposure rates are continuously monitored through the use of thermoluminescent dosimeters (TLD) at each of the seven locations identified in Figure 1. Each TLD badge consists of five LiF chips selected for uniform response and placed in a plastic holder. The plastic provides adequate protection from weather for these badges to be used out-of-doors. The TLD's are exchanged semi-annually and analyzed by an approved independent laboratory (currently Eberline Instrument Co.). The integrated levels of direct environmental radiation are recorded for each of the seven locations. HMC #16 is considered the background location for direct radiation. The data are reported in Attachment 3.

It should be noted that when Homestake attempted to retrieve the background TLD badge, located at HMC #16, it was missing from its placement site. A search of the area was made but the badge could not be found. This site is the up-stream background location. Extra care has been made in the placement of this badge for the next monitoring period. Homestake does not feel that the loss of the information from the background TLD badge for the monitoring period has the potential of compromising the total site-monitoring program; our reason being normal background levels from past samples have been running very close to the recorded exposure levels for the other sites. For example, background for the first half of 1998 was 24.8 mrem/hr while the average for the other six monitoring sites was 27.7 mrem/hr.

5.0 SURFACE CONTAMINATION

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

5.1 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.

5.2 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.

6.0 LOWER LIMIT OF DETECTION

Homestake representatives have calculated the Lower Limit of Detection (LLD) for each measurement system, where applicable, to more accurately evaluate concentrations of radioactive

material measured in the environment surrounding the mill site. The lower limit of detection is defined in the U.S. Nuclear Regulatory Guide 4.14 as the smallest concentration of radioactive material sampled that has a 95% probability of being detected, with only a 5% probability that a blank sample will yield a response interpreted to mean that radioactive material is present. Since the LLD is a function of sample volume, counting efficiency, radiochemical yield, etc., it varies for different sampling and analysis procedures.

For the individual measurement systems for which Homestake has calculated LLDs, the following formula was utilized:

$$LLD = \frac{4.66\, S_b}{3.7\ E\ 4\ EVY \exp(-\lambda \Delta t)}$$

Where:

LLD	is the lower limit of detection (microCuries per milliliter);
S_b	is the standard deviation of the instrument background counting rate (counts per second);
3.7 E 4	is the number of disintegrations per second per microCurie;
E	is the counting efficiency (counts per disintegration);
V	is the sample volume (milliliters);
Y	is the fractional radiochemical yield (when applicable);
λ	is the radioactive decay constant for the particular radionuclide; and;
Δt	is the elapsed time between sample collection and counting

The value of S_b used in the calculation of the LLD for a particular measurement system will be based on the actual observed variance of the instrument background counting rate. The laboratory has been instructed to report the LLD for each measurement considering all of the parameters associated with the measurement system and the sample size.

The vendor laboratory that performed the analyses reported herein has documented that the LLD for air and water samples will meet or exceed the requirements in Regulatory Guide 4.14. This assumes a minimum water sample size of 1 liter and an air sample volume of 2 E09 ml. The LLD for radon-222 is reported by Landauer, Inc. The LLDs for the constituents are:

Ra-226, Th-230 in air	1 E-16 µCi/ml
Rn-222 in air	30 pCi(d?)
U-nat in air	1 E-16 µCi/ml
U-nat in water	2 E-10 µCi/ml
Ra-226, Th-230 in water	2 E-9 µCi/ml
Ra-228 in water	1 E-9 µCi/ml

U-nat is analyzed by a fluorometric method by the current vendor laboratory. In order to determine the LLD, the laboratory has performed the analysis on a blank sample many times and uses the standard deviation of these background measurements to calculate the LLD. This LLD is specified for all analyses as long as the sample size or volume meets the minimum value.

7.0 ANNUAL STATUS REPORT FOR TAILINGS AND EVAPORATION POND EMBANKMENTS

License Condition 12 specifies that periodic inspection of the large and small tailings embankments are made and documented. The results of the inspection for 1998 will be included in the second half Semi-Annual Environmental Report.

8.0 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, dated November 15, 1995, and 10 CFR Part 40.65 requires that Homestake submit it's 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 January 1 and July 1 of each year. Homestake is submitting this report to satisfy the regulatory requirements cited above. Included in this report's attachments are summaries of the results of the effluent monitoring activities conducted by Homestake and pertinent to the required monitoring time period.

The data collected in many of Homestake's effluent monitoring programs can be readily compared to 10 CFR Part 20 values. Homestake has not exceeded 10 CFR Part 20 values in any of their effluents monitored during the period covered by this report. This, of course, does not include the ground water values at the POC wells as discussed earlier. Individual effluent monitoring program results are more fully discussed in the following paragraphs.

Vegetation and soil samples are no longer required on an annual basis per Amendment 24 to Source Material License.

Table 1 - Environmental Monitoring Program Excluding Groundwater Monitoring

TABLE 1 - Environmental Monitoring Program Excluding Groundwater Monitoring

Type of Sample	Number	Locations	Method	Frequency	Analytical Parameters
AIR					
Particulates	3	HMC1, HMC2, HMC3 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
	2	HMC4, HMC5 at 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
	1	HMC6 background location	Continuous (High Vol.)	Weekly filter change, or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230
Radon Gas	8	Locations described in Air - Particulates & HMC7 on S boundary & HMC16 as a background	Continuous Track-etch	Semi-Annual	Rn-222
DIRECT RADIATION	7	Locations described in Air - Particulates & HMC-16 as a background	Continuous Track-etch	Semi-Annual	Gamma Exposure Rate

Table 2 – Groundwater Monitoring Program (8-97)

TABLE 2 – Groundwater Monitoring Program (8-97)

Well Number	Parameters to be Monitored	Frequency of Monitoring
#1 & #2 Deepwell	C	Quarterly
#1 & #2 Deepwell	D	Annually
All Active Injection Wells	Rate & Monthly Total	Monthly
Broadview Acres SUB1, SUB3, 453	A	Semi-Annually
Broadview Acres SUB2	A (except water level)	Semi-Annually
Broadview Acres SUB1, SUB2, SUB3, 434, 446, 453	B (except water level)	Annually
Felice Acres 490, 492, 493, 494	A	Semi-Annually
Felice Acres 490, 492, 493, 494	B	Annually
Murray Acres 802, 844	A	Semi-Annually
Murray Acres 802, 804, 820, 844, WCW	B(no water level in 804)	Annually
Pleasant Valley 688, 835, 846	A (no water level in 835)	Semi-Annually
Pleasant Valley 688, 835, 846	B (no water level in 835)	Annually
Regional 905, 910, 917, 920, 942	B (except water level)	Annually
Site Monitoring Wells B, CW2, CW3, CW4R, PM, WR7, WR11, X, Y	A	Quarterly
Site Monitoring Wells B, CW2, CW3, CW4R, PM, WR7, WR11, X, Y	B & F	Semi-annually
Secondary Site Monitoring Wells BC, B1, BP, D1, DC, DM, DZ, F, FB, I, K2, KM, KZ, M4, MO, N, O, S, SO, SV, T, W, WR5, WR9	A	Semi-annually
Secondary Site Monitoring Wells GH, CW2-1	Water Level Only	Semi-annually

TABLE 2 – Groundwater Monitoring Program (8-97)

Well Number	Parameters to be Monitored	Frequency of Monitoring
Secondary Site Monitoring Wells BC, B1, BP, CW9, D1, DC, DM, DZ, F, FB, I, K2, KM, KZ, M4, MO, N, ND, O, S, SO, SV, S2, T, W, WR9, WR5	B	Annually
Secondary Site Monitoring Wells 931, 934	B	Semi-Annually
Secondary Site Monitoring Well NC	A B	Quarterly Semi-Annually
Secondary Site Monitoring Wells 929, 933, 945, CW40	B (no water level in 933 or 945)	Semi-Annually
All Active Collection Wells	E	Monthly
All Active Collection Wells	B	Annually
All Active Collection Wells	Collection rate, water level and total volume for week	Weekly
Reversal Wells B, BA, KZ, KF, SO, SP, S1, S2	Water Level	Weekly
E Coll Pond, W Coll Pond	B (W Coll Pond - no water level)	Quarterly
E Coll Pond, W Coll Pond	F	Semi-annually
DQ, M5, S3, S4	B	Quarterly
DQ, M5, S3, S4	F	Semi-annually
Background Wells P, P1, P2	B F	Quarterly Semi-annually
Background Wells DD, Q, R	B & F	Annually

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

Table 2.1.1 - Water Quality Analyses for Well BP

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	BP/ 08-04-98/1115
Laboratory ID:	98-48232
Report Date:	September 14, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	205
Magnesium	Mg	mg/L	1.0	54.0
Sodium	Na	mg/L	1.0	409
Potassium	K	mg/L	1.0	3.7
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	548
Sulfate	SO_4	mg/L	1.0	866
Chloride	Cl	mg/L	0.10	206
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	2.33

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	2160
pH		std. units	0.10	7.88

Trace Metals				
Chromium, total	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	0.62
Selenium	Se	mg/L	0.005	0.165
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	1.56
*Uranium Precision ±				0.140
Uranium	^{Nat}U	µCi/mL	2.0E-10	1.1E-06
*Uranium Precision ±				9.5E-08
Radium 226	^{226}Ra	pCi/L	0.2	< 0.2
Radium Error Estimate ±				0.3
Radium 226	^{226}Ra	µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±				3.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				1.5
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				1.5E-09
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		33.03
Cation	meq		32.63
WYDEQ A/C Balance	%	-5 - +5	-0.61
Calc TDS	mg/L		2029
TDS A/C Balance	dec. %	0.80 - 1.20	1.06

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	**BP 11/12/98/0931**
Laboratory ID:	**98-70842**
Report Date:	**January 4, 1999**

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	195
Magnesium	Mg	EPA-200.7	mg/L	1.0	52.4
Sodium	Na	EPA-200.7	mg/L	1.0	373
Potassium	K	EPA-200.7	mg/L	1.0	3.7
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	556
Sulfate	SO_4	EPA-200.7	mg/L	1.0	804
Chloride	Cl	EPA-200.7	mg/L	0.10	192
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	2.37

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	2080
pH		EPA-310.1	std. units	0.10	7.79

Trace Metals					
Chromium	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.7	mg/L	0.05	0.42
Selenium	Se	EPA-200.7	mg/L	0.10	< 0.1
Vanadium	V	EPA-200.7	mg/L	0.01	< 0.01

Radiometric					
Uranium	^{Nat}U	EPA-200.7	mg/L	1.0	1.0
*Uranium Precision ±					0.090
Uranium	^{Nat}U		µCi/mL	2.0E-10	6.8E-07
*Uranium Precision ±					6.1E-08
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	< 0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±					2.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					1.2
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					1.2E-09
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	0.2
Thorium Error Estimate ±					0.2
Thorium 230	^{230}Th		µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±					2.0E-10

Quality Assurance Data			Target Range	
Anion		meq		31.48
Cation		meq		30.43
WYDEQ A/C Balance		%	-5 - +5	-1.69
Calc TDS		mg/L		1910
TDS A/C Balance		dec. %	0.80 - 1.20	1.09

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.2 - Water Quality Analyses for Well D1

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	D1/ 08-04-98/1045
Laboratory ID:	98-48452
Report Date:	September 20, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	217
Magnesium	Mg	mg/L	1.0	56.1
Sodium	Na	mg/L	1.0	462
Potassium	K	mg/L	1.0	4.4
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	471
Sulfate	SO_4	mg/L	1.0	1040
Chloride	Cl	mg/L	0.10	201
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	4.72

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	2350
pH		std. units	0.10	7.76

Trace Metals				
Chromium	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	1.74
Selenium	Se	mg/L	0.005	0.265
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	2.20
*Uranium Precision ±				0.198
Uranium	^{Nat}U	µCi/mL	2.0E-10	1.5E-06
*Uranium Precision ±				1.3E-07
Radium 226	^{226}Ra	pCi/L	0.2	< 0.2
Radium Error Estimate ±				0.2
Radium 226	^{226}Ra	µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±				2.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				0.2
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				2.0E-10
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		35.42
Cation	meq		35.72
WYDEQ A/C Balance	%	-5 - +5	0.43
Calc TDS	mg/L		2238
TDS A/C Balance	dec. %	0.80 - 1.20	1.05

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	D1 11/12/98/1007
Laboratory ID:	98-70841
Report Date:	January 4, 1999

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	207
Magnesium	Mg	EPA-200.7	mg/L	1.0	53.5
Sodium	Na	EPA-200.7	mg/L	1.0	419
Potassium	K	EPA-200.7	mg/L	1.0	4.1
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	478
Sulfate	SO_4	EPA-200.7	mg/L	1.0	986
Chloride	Cl	EPA-200.7	mg/L	0.10	189
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	5.43
Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	2330
pH		EPA-310.1	std. units	0.10	7.73
Trace Metals					
Chromium	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.7	mg/L	0.05	1.33
Selenium	Se	EPA-200.7	mg/L	0.10	0.25
Vanadium	V	EPA-200.7	mg/L	0.01	< 0.01
Radiometric					
Uranium	^{Nat}U	EPA-200.7	mg/L	1.0	1.5
*Uranium Precision ±					0.135
Uranium	^{Nat}U		µCi/mL	2.0E-10	1.0E-06
*Uranium Precision ±					9.1E-08
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	< 0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±					2.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					1.3
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					1.3E-09
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	0.2
Thorium Error Estimate ±					0.2
Thorium 230	^{230}Th		µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±					2.0E-10

Quality Assurance Data			Target Range	
Anion		meq		34.12
Cation		meq		33.13
WYDEQ A/C Balance		%	-5 - +5	-1.48
Calc TDS		mg/L		2123
TDS A/C Balance		dec. %	0.80 - 1.20	1.10

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.3 - Water Quality Analyses for Well DQ

ENERGY LABORATORIES, INC.
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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	DQ/ ~~08/05/1998/0900~~ 8/5/98
Laboratory ID:	98-48491
Report Date:	October 6, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	528
Magnesium	Mg	mg/L	1.0	198
Sodium	Na	mg/L	1.0	5100
Potassium	K	mg/L	1.0	13.8
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	2720
Sulfate	SO_4	mg/L	1.0	9100
Chloride	Cl	mg/L	0.10	1030
Nitrate as N	NO_3	mg/L	0.10	17.4

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	18600
pH		std. units	0.10	7.90

Trace Metals				
Chromium	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	48.7
Selenium	Se	mg/L	0.005	1.26
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	63.5
*Uranium Precision ±				5.72
Uranium	^{Nat}U	µCi/mL	2.0E-10	4.3E-05
*Uranium Precision ±				3.9E-06
Radium 226	^{226}Ra	pCi/L	0.2	0.3
Radium Error Estimate ±				0.2
Radium 226	^{226}Ra	µCi/mL	2.0E-10	3.0E-10
Radium Error Estimate ±				2.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				1.1
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				1.1E-09
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		264.46
Cation	meq		264.99
WYDEQ A/C Balance	%	-5 - +5	0.10
Calc TDS	mg/L		17408
TDS A/C Balance	dec. %	0.80 - 1.20	1.07

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	DQ 11/12/98/1046
Laboratory ID:	98-70844
Report Date:	January 4, 1999

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	439
Magnesium	Mg	EPA-200.7	mg/L	1.0	235
Sodium	Na	EPA-200.7	mg/L	1.0	5162
Potassium	K	EPA-200.7	mg/L	1.0	13.5
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	2119
Sulfate	SO_4	EPA-200.7	mg/L	1.0	9535
Chloride	Cl	EPA-200.7	mg/L	0.10	1066
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	21.30

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	19700
pH		EPA-310.1	std. units	0.10	7.80

Trace Metals					
Chromium	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.7	mg/L	0.05	69.8
Selenium	Se	EPA-200.7	mg/L	0.10	1.0
Vanadium	V	EPA-200.7	mg/L	0.01	0.04

Radiometric					
Uranium	^{Nat}U	EPA-200.7	mg/L	1.0	50.5
*Uranium Precision ±					4.55
Uranium	^{Nat}U		µCi/mL	2.0E-10	3.4E-05
*Uranium Precision ±					3.1E-06
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±					2.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					1.2
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					1.2E-09
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	1.0
Thorium Error Estimate ±					0.6
Thorium 230	^{230}Th		µCi/mL	2.0E-10	1.0E-09
Thorium Error Estimate ±					6.0E-10

Quality Assurance Data			Target Range	
Anion		meq		264.97
Cation		meq		266.31
WYDEQ A/C Balance		%	-5 - +5	0.25
Calc TDS		mg/L		17605
TDS A/C Balance		dec. %	0.80 - 1.20	1.12

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.4 - Water Quality Analyses for Well M5

ENERGY LABORATORIES, INC.
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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	M5/ 08-05-98/0944
Laboratory ID:	98-48454
Report Date:	September 20, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	238
Magnesium	Mg	mg/L	1.0	49.0
Sodium	Na	mg/L	1.0	521
Potassium	K	mg/L	1.0	4.0
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	445
Sulfate	SO_4	mg/L	1.0	1250
Chloride	Cl	mg/L	0.10	191
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	7.24

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	2650
pH		std. units	0.10	7.89

Trace Metals				
Chromium	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	4.32
Selenium	Se	mg/L	0.005	0.560
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	3.55
*Uranium Precision ±				0.320
Uranium	^{Nat}U	µCi/mL	2.0E-10	2.4E-06
*Uranium Precision ±				2.2E-07
Radium 226	^{226}Ra	pCi/L	0.2	0.2
Radium Error Estimate ±				0.2
Radium 226	^{226}Ra	µCi/mL	2.0E-10	2.0E-10
Radium Error Estimate ±				2.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				0.3
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				3.0E-10
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		39.27
Cation	meq		38.74
WYDEQ A/C Balance	%	-5 - +5	-0.68
Calc TDS	mg/L		2509
TDS A/C Balance	dec. %	0.80 - 1.20	1.06

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	M5 11/12/98/1246
Laboratory ID:	98-70758
Report Date:	December 29, 1998

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	210
Magnesium	Mg	EPA-200.7	mg/L	1.0	47.4
Sodium	Na	EPA-200.7	mg/L	1.0	499
Potassium	K	EPA-200.7	mg/L	1.0	4.3
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	447
Sulfate	SO_4	EPA-200.7	mg/L	1.0	1185
Chloride	Cl	EPA-200.7	mg/L	0.10	187
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	6.84

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	2610
pH		EPA-310.1	std. units	0.10	7.82

Trace Metals					
Chromium, total	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.8	mg/L	0.03	5.26
Selenium	Se	EPA-200.8	mg/L	0.005	0.496
Vanadium	V	EPA-200.7	mg/L	0.01	< 0.01

Radiometric					
Uranium	^{Nat}U	EPA-200.8	mg/L	0.0003	3.58
*Uranium Precision ±					0.32
Uranium	^{Nat}U		µCi/mL	2.0E-10	2.4E-06
*Uranium Precision ±					2.2E-07
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	< 0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±					2.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					-
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					0.0E+00
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	0.6
Thorium Error Estimate ±					0.4
Thorium 230	^{230}Th		µCi/mL	2.0E-10	6.0E-10
Thorium Error Estimate ±					4.0E-10

Quality Assurance Data			Target Range	
Anion	-	meq		37.80
Cation	-	meq		36.26
WYDEQ A/C Balance	-	%	-5 - +5	-2.09
Calc TDS	-	mg/L		2388
TDS A/C Balance	-	dec. %	0.80 - 1.20	1.09

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.5 - Water Quality Analyses for Well S3

ENERGY LABORATORIES, INC.
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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	S3/ 08/03/1998/1028
Laboratory ID:	98-48490
Report Date:	October 6, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	302
Magnesium	Mg	mg/L	1.0	72.0
Sodium	Na	mg/L	1.0	927
Potassium	K	mg/L	1.0	7.8
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	735
Sulfate	SO_4	mg/L	1.0	2010
Chloride	Cl	mg/L	0.10	237
Nitrate as N	NO_3	mg/L	0.10	5.61

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	4180
pH		std. units	0.10	8.02

Trace Metals				
Chromium, total	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	7.18
Selenium	Se	mg/L	0.005	0.587
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	14.4
*Uranium Precision ±				1.30
Uranium	^{Nat}U	µCi/mL	2.0E-10	9.7E-06
*Uranium Precision ±				8.8E-07
Radium 226	^{226}Ra	pCi/L	0.2	0.5
Radium Error Estimate ±				0.3
Radium 226	^{226}Ra	µCi/mL	2.0E-10	5.0E-10
Radium Error Estimate ±				3.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				1.1
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				1.1E-09
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		61.03
Cation	meq		61.60
WYDEQ A/C Balance	%	-5 - +5	0.46
Calc TDS	mg/L		3949
TDS A/C Balance	dec. %	0.80 - 1.20	1.06

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	**S3 11/12/98/1317**
Laboratory ID:	**98-70843**
Report Date:	**January 4, 1999**

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	285
Magnesium	Mg	EPA-200.7	mg/L	1.0	68.9
Sodium	Na	EPA-200.7	mg/L	1.0	820
Potassium	K	EPA-200.7	mg/L	1.0	6.2
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	744
Sulfate	SO_4	EPA-200.7	mg/L	1.0	1860
Chloride	Cl	EPA-200.7	mg/L	0.10	230
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	4.89

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	4140
pH		EPA-310.1	std. units	0.10	7.84

Trace Metals					
Chromium	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.7	mg/L	0.05	5.77
Selenium	Se	EPA-200.7	mg/L	0.10	0.49
Vanadium	V	EPA-200.7	mg/L	0.01	< 0.01

Radiometric					
Uranium	^{Nat}U	EPA-200.7	mg/L	1.0	11.3
*Uranium Precision ±					1.02
Uranium	^{Nat}U		µCi/mL	2.0E-10	7.7E-06
*Uranium Precision ±					6.9E-07
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±					2.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					1.2
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					1.2E-09
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	0.2
Thorium Error Estimate ±					0.2
Thorium 230	^{230}Th		µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±					2.0E-10

Quality Assurance Data			Target Range	
Anion		meq		57.81
Cation		meq		55.80
WYDEQ A/C Balance		%	-5 - +5	-1.77
Calc TDS		mg/L		3665
TDS A/C Balance		dec. %	0.80 - 1.20	1.13

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.6 - Water Quality Analyses for Well S4

ENERGY LABORATORIES, INC.
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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	S4/ 08-05-98/1123
Laboratory ID:	98-48453
Report Date:	September 20, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	588
Magnesium	Mg	mg/L	1.0	150
Sodium	Na	mg/L	1.0	712
Potassium	K	mg/L	1.0	7.6
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	631
Sulfate	SO_4	mg/L	1.0	2500
Chloride	Cl	mg/L	0.10	218
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	0.28

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	4670
pH		std. units	0.10	7.86

Trace Metals				
Chromium	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	1.47
Selenium	Se	mg/L	0.005	0.059
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	9.35
*Uranium Precision ±				0.842
Uranium	^{Nat}U	µCi/mL	2.0E-10	6.3E-06
*Uranium Precision ±				5.7E-07
Radium 226	^{226}Ra	pCi/L	0.2	0.9
Radium Error Estimate ±				0.2
Radium 226	^{226}Ra	µCi/mL	2.0E-10	9.0E-10
Radium Error Estimate ±				2.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				0.2
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				2.0E-10
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				0

Quality Assurance Data		Target Range	
Anion	meq		68.62
Cation	meq		73.05
WYDEQ A/C Balance	%	-5 - +5	3.13
Calc TDS	mg/L		4493
TDS A/C Balance	dec. %	0.80 - 1.20	1.04

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	S4 11/12/98/1358
Laboratory ID:	98-70756
Report Date:	December 29, 1998

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	452
Magnesium	Mg	EPA-200.7	mg/L	1.0	110
Sodium	Na	EPA-200.7	mg/L	1.0	664
Potassium	K	EPA-200.7	mg/L	1.0	7.4
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	616
Sulfate	SO_4	EPA-200.7	mg/L	1.0	2244
Chloride	Cl	EPA-200.7	mg/L	0.10	204
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	0.57

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	4440
pH		EPA-310.1	std. units	0.10	7.79

Trace Metals					
Chromium, total	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.8	mg/L	0.03	2.87
Selenium	Se	EPA-200.8	mg/L	0.005	0.080
Vanadium	V	EPA-200.7	mg/L	0.01	0.01

Radiometric					
Uranium	^{Nat}U	EPA-200.8	mg/L	0.0003	7.86
*Uranium Precision ±					0.71
Uranium	^{Nat}U		µCi/mL	2.0E-10	5.3E-06
*Uranium Precision ±					4.8E-07
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	0.7
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	7.0E-10
Radium Error Estimate ±					2.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					.
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					0.0E+00
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	1.2
Thorium Error Estimate ±					0.6
Thorium 230	^{230}Th		µCi/mL	2.0E-10	1.2E-09
Thorium Error Estimate ±					6.0E-10

Quality Assurance Data			Target Range	
Anion	-	meq		62.67
Cation	-	meq		60.83
WYDEQ A/C Balance	-	%	-5 - +5	-1.49
Calc TDS	-	mg/L		3993
TDS A/C Balance	-	dec. %	0.80 - 1.20	1.11

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.7 - Water Quality Analyses for Well X

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	X/ 08-03-98/1530
Laboratory ID:	98-48230
Report Date:	September 14, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	192
Magnesium	Mg	mg/L	1.0	56.0
Sodium	Na	mg/L	1.0	387
Potassium	K	mg/L	1.0	5.9
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	611
Sulfate	SO_4	mg/L	1.0	728
Chloride	Cl	mg/L	0.10	214
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	1.42

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	2010
pH		std. units	0.10	7.68

Trace Metals				
Chromium, total	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	1.06
Selenium	Se	mg/L	0.005	0.131
Vanadium	V	mg/L	0.01	0.05

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	0.700
*Uranium Precision ±				0.0630
Uranium	^{Nat}U	µCi/mL	2.0E-10	4.7E-07
*Uranium Precision ±				4.3E-08
Radium 226	^{226}Ra	pCi/L	0.2	< 0.2
Radium Error Estimate ±				0.3
Radium 226	^{226}Ra	µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±				3.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				1.4
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				1.4E-09
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		31.35
Cation	meq		31.24
WYDEQ A/C Balance	%	-5 - +5	-0.16
Calc TDS	mg/L		1896
TDS A/C Balance	dec. %	0.80 - 1.20	1.06

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	X 10/06/98/1040
Laboratory ID:	98-60955
Report Date:	November 12, 1998

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	183
Magnesium	Mg	EPA-200.7	mg/L	1.0	54.2
Sodium	Na	EPA-200.7	mg/L	1.0	338
Potassium	K	EPA-200.7	mg/L	1.0	5.7
Carbonate	CO_3	EPA-310.1	mg/L	1.0	<1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	596
Sulfate	SO_4	EPA-200.7	mg/L	1.0	669
Chloride	Cl	EPA-200.7	mg/L	0.10	195
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	1.77

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	1930
pH		EPA-150.1	std. units	0.10	7.93

Trace Metals					
Chromium	Cr	EPA-200.7	mg/L	0.05	<0.05
Molybdenum	Mo	EPA-200.8	mg/L	0.03	0.88
Selenium	Se	EPA-200.8	mg/L	0.005	0.079
Vanadium	V	EPA-200.8	mg/L	0.01	0.04

Radiometric					
Uranium	^{Nat}U	EPA-200.8	mg/L	0.0003	0.665
*Uranium Precision ±					0.060
Uranium	^{Nat}U		µCi/mL	2.0E-10	4.5E-07
*Uranium Precision ±					4.1E-08
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	<0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	<2.0E-10
Radium Error Estimate ±					
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	<1.0
Radium Error Estimate ±					1.2
Radium 228	^{228}Ra		µCi/mL	1.0E-09	<1.0E-9
Radium Error Estimate ±					
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	<0.2
Thorium Error Estimate ±					0.2
Thorium 230	^{230}Th		µCi/mL	2.0E-10	<2.0E-10
Thorium Error Estimate ±					

Quality Assurance Data			Target Range	
Anion		meq		29.33
Cation		meq		28.51
WYDEQ A/C Balance		%	-5 - +5	-1.42
Calc TDS		mg/L		1751
TDS A/C Balance		dec. %	0.80 - 1.20	1.10

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.8 - Water Quality Analyses for Well Y

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	Y/ 08-03-98/1500
Laboratory ID:	98-48231
Report Date:	September 14, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	319
Magnesium	Mg	mg/L	1.0	77.0
Sodium	Na	mg/L	1.0	901
Potassium	K	mg/L	1.0	8.2
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	643
Sulfate	SO_4	mg/L	1.0	1900
Chloride	Cl	mg/L	0.10	421
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	4.44

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	4290
pH		std. units	0.10	7.49

Trace Metals				
Chromium, total	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	13.0
Selenium	Se	mg/L	0.005	0.620
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	9.50
*Uranium Precision ±				0.855
Uranium	^{Nat}U	µCi/mL	2.0E-10	6.4E-06
*Uranium Precision ±				5.8E-07
Radium 226	^{226}Ra	pCi/L	0.2	< 0.2
Radium Error Estimate ±				0.3
Radium 226	^{226}Ra	µCi/mL	2.0E-10	< 2.0E-10
Radium Error Estimate ±				3.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				1.5
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				1.5E-09
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		62.33
Cation	meq		61.75
WYDEQ A/C Balance	%	-5 - +5	-0.47
Calc TDS	mg/L		3968
TDS A/C Balance	dec. %	0.80 - 1.20	1.08

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	Y 10/06/98/1015
Laboratory ID:	58-60956
Report Date:	November 12, 1998

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	317
Magnesium	Mg	EPA-200.7	mg/L	1.0	77.4
Sodium	Na	EPA-200.7	mg/L	1.0	840
Potassium	K	EPA-200.7	mg/L	1.0	8.2
Carbonate	CO_3	EPA-310.1	mg/L	1.0	<1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	644
Sulfate	SO_4	EPA-200.7	mg/L	1.0	1800
Chloride	Cl	EPA-200.7	mg/L	0.10	427
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	5.74

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	4340
pH		EPA-150.1	std. units	0.10	7.73

Trace Metals					
Chromium	Cr	EPA-200.7	mg/L	0.05	<0.05
Molybdenum	Mo	EPA-200.7	mg/L	0.03	11.6
Selenium	Se	EPA-200.8	mg/L	0.005	0.695
Vanadium	V	EPA-200.7	mg/L	0.01	<0.01

Radiometric					
Uranium	^{Nat}U	EPA-200.7	mg/L	0.0003	7.6
*Uranium Precision ±					0.684
Uranium	^{Nat}U		µCi/mL	2.0E-10	5.1E-06
*Uranium Precision ±					4.6E-07
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	<0.2
Radium Error Estimate ±					0.2
Radium 226	^{226}Ra		µCi/mL	2.0E-10	<2.0E-10
Radium Error Estimate ±					
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	<1.0
Radium Error Estimate ±					1.3
Radium 228	^{228}Ra		µCi/mL	1.0E-09	<1.0E-9
Radium Error Estimate ±					
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	<0.2
Thorium Error Estimate ±					0.2
Thorium 230	^{230}Th		µCi/mL	2.0E-10	<2.0E-10
Thorium Error Estimate ±					

Quality Assurance Data			Target Range	
Anion		meq		60.50
Cation		meq		59.03
WYDEQ A/C Balance		%	-5 - +5	-1.22
Calc TDS		mg/L		3817
TDS A/C Balance		dec. %	0.80 - 1.20	1.14

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 2.1.9- Water Quality Analyses for Background Well P

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	P 09/16/1998/0823
Laboratory ID:	98-59578
Report Date:	October 26, 1998

Major Ions		Units	"Lower Limit of Detection"	Results
Calcium	Ca	mg/L	1.0	241
Magnesium	Mg	mg/L	1.0	49.0
Sodium	Na	mg/L	1.0	232
Potassium	K	mg/L	1.0	5.0
Carbonate	CO_3	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	238
Sulfate	SO_4	mg/L	1.0	980
Chloride	Cl	mg/L	0.10	49.8
Nitrate as N	NO_3	mg/L	0.10	10.8
Fluoride	F	mg/L	0.10	0.48

Non-Metals				
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1890
pH		std. units	0.10	8.03

Trace Metals				
Chromium	Cr	mg/L	0.05	< 0.05
Molybdenum	Mo	mg/L	0.03	< 0.03
Selenium	Se	mg/L	0.005	0.196
Vanadium	V	mg/L	0.01	< 0.01

Radiometric				
Uranium	^{Nat}U	mg/L	0.0003	0.0409
*Uranium Precision ±				0.0037
Uranium	^{Nat}U	µCi/mL	2.0E-10	2.8E-08
*Uranium Precision ±				2.5E-09
Radium 226	^{226}Ra	pCi/L	0.2	0.4
Radium Error Estimate ±				0.3
Radium 226	^{226}Ra	µCi/mL	2.0E-10	4.0E-10
Radium Error Estimate ±				3.0E-10
Radium 228	^{228}Ra	pCi/L	1.0	< 1.0
Radium Error Estimate ±				1.1
Radium 228	^{228}Ra	µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±				1.1E-09
Thorium 230	^{230}Th	pCi/L	0.2	< 0.2
Thorium Error Estimate ±				0.2
Thorium 230	^{230}Th	µCi/mL	2.0E-10	< 2.0E-10
Thorium Error Estimate ±				2.0E-10

Quality Assurance Data		Target Range	
Anion	meq		26.53
Cation	meq		26.35
WYDEQ A/C Balance	%	-5 - +5	-0.34
Calc TDS	mg/L		1725
TDS A/C Balance	dec. %	0.80 - 1.20	1.10

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.
"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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WATER ANALYSIS REPORT - HOMESTAKE MINING CO.

Sample ID/Date:	P 11/12/98/1500
Laboratory ID:	98-70754
Report Date:	December 29, 1998

Major Ions		Method	Units	"Lower Limit of Detection"	Results
Calcium	Ca	EPA-200.7	mg/L	1.0	228
Magnesium	Mg	EPA-200.7	mg/L	1.0	48.7
Sodium	Na	EPA-200.7	mg/L	1.0	241
Potassium	K	EPA-200.7	mg/L	1.0	5.6
Carbonate	CO_3	EPA-310.1	mg/L	1.0	< 1.0
Bicarbonate	HCO_3	EPA-310.1	mg/L	1.0	238
Sulfate	SO_4	EPA-200.7	mg/L	1.0	986
Chloride	Cl	EPA-200.7	mg/L	0.10	49.1
Nitrate as N	NO_3	EPA-353.2	mg/L	0.10	8.80

Non-Metals					
Total Dissolved Solids @ 180°C	TDS	EPA-160.1	mg/L	2.0	1860
pH		EPA-310.1	std. units	0.10	7.78

Trace Metals					
Chromium, total	Cr	EPA-200.7	mg/L	0.05	< 0.05
Molybdenum	Mo	EPA-200.8	mg/L	0.03	< 0.03
Selenium	Se	EPA-200.8	mg/L	0.005	0.164
Vanadium	V	EPA-200.7	mg/L	0.01	< 0.01

Radiometric					
Uranium	^{Nat}U	EPA-200.8	mg/L	0.0003	0.032
*Uranium Precision ±					0.003
Uranium	^{Nat}U		µCi/mL	2.0E-10	2.2E-08
*Uranium Precision ±					1.9E-09
Radium 226	^{226}Ra	EPA-903.0	pCi/L	0.2	0.5
Radium Error Estimate ±					0.3
Radium 226	^{226}Ra		µCi/mL	2.0E-10	5.0E-10
Radium Error Estimate ±					3.0E-10
Radium 228	^{228}Ra	EPA-904.0	pCi/L	1.0	< 1.0
Radium Error Estimate ±					-
Radium 228	^{228}Ra		µCi/mL	1.0E-09	< 1.0E-09
Radium Error Estimate ±					0.0E+00
Thorium 230	^{230}Th	EPA-907.0	pCi/L	0.2	0.9
Thorium Error Estimate ±					0.5
Thorium 230	^{230}Th		µCi/mL	2.0E-10	9.0E-10
Thorium Error Estimate ±					5.0E-10

Quality Assurance Data			Target Range	
Anion	-	meq		26.49
Cation	-	meq		26.08
WYDEQ A/C Balance	-	%	-5 - +5	-0.78
Calc TDS	-	mg/L		1717
TDS A/C Balance	-	dec. %	0.80 - 1.20	1.08

*Precision is calculated using standard deviation of mean of replicate analysis multiplied by concentration.

"Lower Limit of Detection" is related to reporting limits suggested by Regulatory Guideline 4.14 in some cases.

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Table 3 - Occupational Monitoring Program

Table 3 - Occupational Monitoring Program

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 eq.)	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 Equip.	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 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	6 months or less	N/A
Personnel Gamma (TLD)	Variable	Personnel	HP-11	Quarterly	Gamma
Personnel Contam.	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; TLD = Thermoluminescent Dosimeter

Figure 1 – Monitoring & Sampling Locations

HOMESTAKE MINING COMPANY
GRANTS PROJECT
Monitoring & Sampling Locations

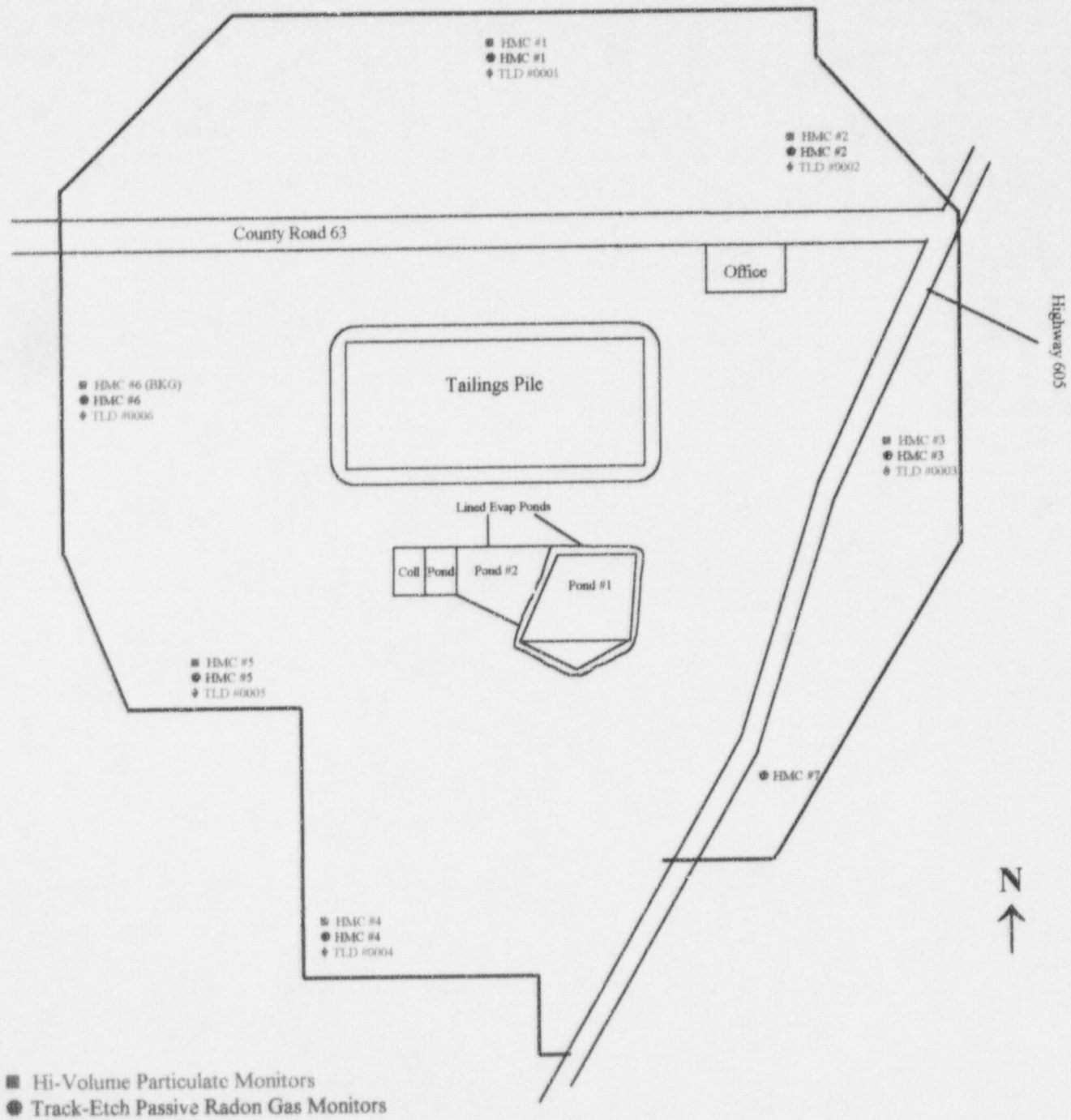

FIGURE 1

Attachment 1 – High Volume Air Sampling Results

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HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING - GRANTS, NEW MEXICO
P.O. #: 162480
REPORT DATE: January 15, 1999

SAMPLE ID: HMC 1

Quarter/Date Sampled Air Volume	Radionuclide	Conc. µCi/mL	Error Est. µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% of Effluent Concentration
98-22250	^{nat}U	3.25E-16	N/A	1.00E-16	9.00E-14	3.61E-01
First Quarter 1998	^{230}Th	< 1.00E-16	1.20E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs	^{226}Ra	< 1.00E-16	1.06E-17	1.00E-16	9.00E-13	< 1.11E-02
1.42E+11						
98-39881	^{nat}U	9.59E-16	N/A	1.00E-16	9.00E-14	1.07E+00
Second Quarter 1998	^{230}Th	< 1.00E-16	1.58E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs	^{226}Ra	3.26E-16	1.71E-17	1.00E-16	9.00E-13	3.62E-02
1.44E+11						
98-60482	^{nat}U	3.48E-15	N/A	1.00E-16	9.00E-14	3.86E+00
Third Quarter 1998	^{230}Th	< 1.00E-16	9.25E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs	^{226}Ra	1.85E-16	1.32E-17	1.00E-16	9.00E-13	2.06E-02
1.43E+11						
98-76062	^{nat}U	1.19E-15	N/A	1.00E-16	9.00E-14	1.32E+00
Fourth Quarter 1998	^{230}Th	< 1.00E-16	9.22E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs	^{226}Ra	1.04E-16	1.08E-17	1.00E-16	9.00E-13	1.16E-02
1.23E+11						

Sample volume is 1.89L
N/A not applicable for ICP-MS
LLD = Lower Limit of Detection per Regulatory Guide 4.14
All LLDs were met
*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration

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HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING - GRANTS, NEW MEXICO
P.O. #: 162480
REPORT DATE: January 15, 1999

SAMPLE ID: HMC 2

Quarter/Date Sampled / Air Volume	Radionuclide	Conc. µCi/mL	Error Est. µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% of Effluent Concentration
98-22251	^{nat}U	3.38E-16	N/A	1.00E-16	9.00E-14	3.75E-01
First Quarter 1998	^{230}Th	< 1.00E-16	1.17E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs: 1.46E+11	^{226}Ra	< 1.00E-16	7.77E-18	1.00E-16	9.00E-13	< 1.11E-02
98-39882	^{nat}U	1.84E-15	N/A	1.00E-16	9.00E-14	2.04E+00
Second Quarter 1998	^{230}Th	< 1.00E-16	1.33E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs: 1.42E+11	^{226}Ra	< 1.00E-16	7.99E-18	1.00E-16	9.00E-13	< 1.11E-02
98-60483	^{nat}U	2.08E-15	N/A	1.00E-16	9.00E-14	2.32E+00
Third Quarter 1998	^{230}Th	< 1.00E-16	8.34E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs: 1.36E+11	^{226}Ra	< 1.00E-16	8.34E-18	1.00E-16	9.00E-13	< 1.11E-02
98-76063	^{nat}U	1.06E-15	N/A	1.00E-16	9.00E-14	1.18E+00
Fourth Quarter 1998	^{230}Th	< 1.00E-16	9.22E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs: 1.23E+11	^{226}Ra	< 1.00E-16	7.68E-18	1.00E-16	9.00E-13	< 1.11E-02

Sample volume is 1.89L
N/A not applicable for ICP-MS
LLD = Lower Limit of Detection per Regulatory Guide 4.14
All LLDs were met
*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration

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HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING - GRANTS, NEW MEXICO
P.O. #: 162489
REPORT DATE: January 13, 1999

SAMPLE ID: HMC 3

Quarter/Date Sampled Air Volume	Radionuclide	Conc. µCi/mL	Error Est. µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% of Effluent Concentration
98-22252 First Quarter 1998 Air Volume in mLs 1.44E+11	^{nat}U	7.68E-16	N/A	1.00E-16	9.00E-14	8.53E-01
	^{230}Th	< 1.00E-16	6.56E-18	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	7.88E-18	1.00E-16	9.00E-13	< 1.11E-02
98-39883 Second Quarter 1998 Air Volume in mLs 1.43E+11	^{nat}U	6.25E-15	N/A	1.00E-16	9.00E-14	6.95E+00
	^{230}Th	< 1.00E-16	1.32E-17	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	7.93E-18	1.00E-16	9.00E-13	< 1.11E-02
98-60484 Third Quarter 1998 Air Volume in mLs 1.37E+11	^{nat}U	6.43E-15	N/A	1.00E-16	9.00E-14	7.14E+00
	^{230}Th	< 1.00E-16	8.28E-18	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	9.91E-16	5.79E-17	1.00E-16	9.00E-13	1.10E-01
98-76064 Fourth Quarter 1998 Air Volume in mLs 1.15E+11	^{nat}U	2.28E-15	N/A	1.00E-16	9.00E-14	2.54E+00
	^{230}Th	< 1.00E-16	8.22E-18	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	0.00E+00	1.00E-16	9.00E-13	< 1.11E-02

Sample volume is 1.89L
N/A not applicable for ICP-MS
LLD = Lower Limit of Detection per Regulatory Guide 4.14
All LLDs were met
*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration

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HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING - GRANTS, NEW MEXICO
P.O. #: 162480
REPORT DATE: January 15, 1999

SAMPLE ID: HMC 4

Quarter/Date Sampled / Air Volume	Radionuclide	Conc. µCi/mL	Error Est. µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% of Effluent Concentration
98-22253	^{nat}U	3.22E-16	N/A	1.00E-16	9.00E-14	3.58E-01
First Quarter 1998	^{230}Th	< 1.00E-16	7.93E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.43E+11	^{226}Ra	< 1.00E-16	9.25E-18	1.00E-16	9.00E-13	< 1.11E-02
98-39884	^{nat}U	1.97E-15	N/A	1.00E-16	9.00E-14	2.18E+00
Second Quarter 1998	^{230}Th	< 1.00E-16	1.23E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.38E+11	^{226}Ra	< 1.00E-16	8.22E-18	1.00E-16	9.00E-13	< 1.11E-02
98-60485	^{nat}U	7.12E-15	N/A	1.00E-16	9.00E-14	7.91E+00
Third Quarter 1998	^{230}Th	< 1.00E-16	9.59E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.38E+11	^{226}Ra	< 1.00E-16	6.85E-18	1.00E-16	9.00E-13	< 1.11E-02
98-76065	^{nat}U	4.30E-15	N/A	1.00E-16	9.00E-14	4.78E+00
Fourth Quarter 1998	^{230}Th	< 1.00E-16	8.15E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.16E+11	^{226}Ra	< 1.00E-16	6.52E-18	1.00E-16	9.00E-13	< 1.11E-02

Sample volume is 1.89L
N/A not applicable for ICP-MS
LLD = Lower Limit of Detection per Regulatory Guide 4.14
All LLDs were met
*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration

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HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING - GRANTS, NEW MEXICO
P.O. #: 162480
REPORT DATE: January 15, 1999

SAMPLE ID: HMC 5

Quarter/Date Sampled / Air Volume	Radionuclide	Conc. µCi/mL	Error Est. µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% of Effluent Concentration
98-22254	^{nat}U	1.09E-15	N/A	1.00E-16	9.00E-14	1.21E+00
First Quarter 1998	^{230}Th	< 1.00E-16	9.19E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.44E+11	^{226}Ra	< 1.00E-16	7.88E-18	1.00E-16	9.00E-13	< 1.11E-02
98-39885	^{nat}U	6.88E-15	N/A	1.00E-16	9.00E-14	7.64E+00
Second Quarter 1998	^{230}Th	< 1.00E-16	1.20E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.42E+11	^{226}Ra	< 1.00E-16	6.65E-18	1.00E-16	9.00E-13	< 1.11E-02
98-60486	^{nat}U	1.85E-14	N/A	1.00E-16	9.00E-14	2.05E+01
Third Quarter 1998	^{230}Th	< 1.00E-16	8.34E-18	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.36E+11	^{226}Ra	< 1.00E-16	6.95E-18	1.00E-16	9.00E-13	< 1.11E-02
98-76066	^{nat}U	7.62E-15	N/A	1.00E-16	9.00E-14	8.47E+00
Fourth Quarter 1998	^{230}Th	< 1.00E-16	1.23E-17	1.00E-16	2.00E-14	< 5.00E-01
Air Volume in mLs 1.23E+11	^{226}Ra	< 1.00E-16	7.68E-18	1.00E-16	9.00E-13	< 1.11E-02

Sample volume is 1.89L
N/A not applicable for ICP-MS
LLD = Lower Limit of Detection per Regulatory Guide 4.14
All LLDs were met
*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration

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HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING - GRANTS, NEW MEXICO
P.O. #: 162480
REPORT DATE: January 15, 1999

SAMPLE ID: HMC 6

Quarter/Date Sampled Air Volume	Radionuclide	Conc. µCi/mL	Error Est. µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% of Effluent Concentration
98-22255 First Quarter 1998 Air Volume in mLs 1.46E+11	^{nat}U	1.33E-16	N/A	1.00E-16	9.00E-14	1.48E-01
	^{230}Th	< 1.00E-16	5.18E-18	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	7.77E-18	1.00E-16	9.00E-13	< 1.11E-02
98-39886 Second Quarter 1998 Air Volume in mLs 1.43E+11	^{nat}U	9.93E-16	N/A	1.00E-16	9.00E-14	1.10E+00
	^{230}Th	< 1.00E-16	1.19E-17	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	9.25E-18	1.00E-16	9.00E-13	< 1.11E-02
98-60487 Third Quarter 1998 Air Volume in mLs 1.38E+11	^{nat}U	3.78E-15	N/A	1.00E-16	9.00E-14	4.20E+00
	^{230}Th	< 1.00E-16	8.22E-18	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	8.22E-18	1.00E-16	9.00E-13	< 1.11E-02
98-76067 Fourth Quarter 1998 Air Volume in mLs 1.17E+11	^{nat}U	1.15E-15	N/A	1.00E-16	9.00E-14	1.28E+00
	^{230}Th	< 1.00E-16	9.69E-18	1.00E-16	2.00E-14	< 5.00E-01
	^{226}Ra	< 1.00E-16	8.08E-18	1.00E-16	9.00E-13	< 1.11E-02

Sample volume is 1.89L
N/A not applicable for ICP-MS
LLD = Lower Limit of Detection per Regulatory Guide 4.14
All LLDs were met
*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration

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RADIOCHEMICAL QUALITY ASSURANCE REPORT - HOMESTAKE MINING CORPORATION

Laboratory ID:	98-76062-69
Sample Matrix:	Air Filter
Sample Date / Time:	4th Quarter 1998
Date Received:	12-18-98
Report Date:	January 15, 1999

	Method	Duplicate Precision (Percent)	Spike Recovery (Percent)	LCS Recovery (Percent)	Method Blank µCi/mL	Date Analyzed	Analyst
Laboratory #:		98-76095	98-76270				
Uranium:	200.8	100	99	-	< 1.00E-16	01-12-99	SMD
Laboratory #:		99-10006	99-10007	RA-002	RA-002		
Radium-226:	903.0	103	107	107	< 1.00E-16	01-06-99	RS
Laboratory #:		98-74440	98-74450	AS-130	AS-130		
Thorium-230:	907.0	101	115	108	< 1.00E-16	01-11-99	PH

Report Approved By: [signature]

Reviewed By: [signature]

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HIGH VOLUME AIR ANALYSIS REPORT

CLIENT:	HOMESTAKE MINING - GRANTS, NEW MEXICO
REPORT DATE:	November 18, 1998
DATE SAMPLED:	3RD QUARTER 1998
RELEASE NO:	162480

EPA Method		200.8	903.0		907.0	
Laboratory Number	Sample I.D.	Uranium-nat pCi/filt.	Radium 226 pCi/filt.	+/-	Thorium 230 pCi/filt.	+/-
98- 60482	HMC 1	497	26.5	1.9	4.0	1.3
98- 60483	HMC 2	284	8.9	1.1	3.6	1.1
98- 60484	HMC 3	881	136	7.9	3.2	1.1
98- 60485	HMC 4	983	4.2	0.9	3.6	1.3
98- 60486	HMC 5	2514	6.0	0.9	2.8	1.1
98- 60487	HMC 6	522	9.5	1.1	3.0	1.1
98- 60488	HMC 7	<0.2	2.1	0.8	<0.2	0.0
LLD	pCi/L	0.20	0.20		0.20	

Samples were brought up to a final volume of 1.89 liters.

Report Approved By: Reviewed By:

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HIGH VOLUME AIR ANALYSIS REPORT

CLIENT:	HOMESTAKE MINING - GRANTS, NEW MEXICO
REPORT DATE:	January 15, 1999
DATE SAMPLED:	4th Quarter 1998
RELEASE NO:	162480

EPA Method		200.8	903.0		907.0	
Laboratory Number	Sample I.D.	Uranium-nat pCi/filt.	Radium 226 pCi/filt.	+/-	Thorium 230 pCi/filt.	+/-
98- 76062	HMC 1	146	12.9	1.3	3.4	1.1
98- 76063	HMC 2	131	3.2	0.9	3.2	1.1
98- 76064	HMC 3	263	<0.2	0.0	2.3	0.9
98- 76065	HMC 4	499	2.5	0.8	2.1	0.9
98- 76066	HMC 5	937	4.7	0.9	4.3	1.5
98- 76067	HMC 6	134	3.4	0.9	3.0	1.1
98- 76068	HMC 7	<0.2	<0.2	0.0	1.3	0.8
LLD	pCi/L	0.20	0.20		0.20	

Samples were brought up to a final volume of 1.89 liters.

Report Approved By: Reviewed By:

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Attachment 2 - Radon Gas Monitoring Results

Attachment 2 - Radon Gas Monitoring Results
Track-Etch Passive Survey

Location	Monitoring Period	Rn Concentraction (µCi/ml)	Error Estimate (µCi/ml)	% Limit* (%)	LLD (µCi/ml)
Hi-Vol #1 N Outer Perimeter	7/1/98 - 12/31/98	1.1E-09	2.7E-10	11	1.6E-10
Hi-Vol #2 NE Outer Perimeter	7/1/98 - 12/31/98	1.0E-09	2.6E-10	10	1.6E-10
Hi-Vol #3 E Outer Perimeter	7/1/98 - 12/31/98	7.0E-10	2.1E-10	7	1.6E-10
Hi-Vol #4 S Outer Perimeter	7/1/98 - 12/31/98	1.2E-09	2.8E-10	12	1.6E-10
Hi-Vol #5 N of Nearest Residence	7/1/98 - 12/31/98	1.0E-09	2.6E-10	10	1.6E-10
Hi-Vol #6 W of Outer Perimeter	7/1/98 - 12/31/98	1.1E-09	2.7E-10	11	1.6E-10
HMC #7 S Boundary	7/1/98 - 12/31/98	8.0E-10	2.2E-10	8	1.6E-10
HMC #16 Background	7/1/98 - 12/31/98	9.0E-10	2.4E-10	9	1.6E-10

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

Attachment 3 - Environmental Gamma Radiation Results

Attachment 3 - Environmental Gamma Radiation Results
TLD Perimeter Survey

Direct Radiation Measurements

Location	Monitoring Period	Exposure Rate (mrem/qr)	Error (mrem/qr)*
Hi-Vol #1 N Outer Perimeter	7/1/98 - 12/31/98	28.2	2.2
Hi-Vol #2 NE Outer Perimeter	7/1/98 - 12/31/98	25.0	3.4
Hi-Vol #3 E Outer Perimeter	7/1/98 - 12/31/98	23.1	1.4
Hi-Vol #4 S Outer Perimeter	7/1/98 - 12/31/98	23.1	8.2
Hi-Vol #5 N of Nearest Residence	7/1/98 - 12/31/98	25.6	2.2
Hi-Vol #6 W of Outer Perimeter	7/1/98 - 12/31/98	28.2	1.9
#16 Background	7/1/98 - 12/31/98	Lost Badge	

*Error is 1.96 std. dev.

Attachment 4 - Annual Effective Dose Equivalent to Individuals of the Public

Annual Effective Dose Equivalent to Individuals of the Public

1.0 Introduction

There were very few activities in 1998 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. During 1998, additional soil cover was added to the top of the large tailings pile to restore some of which was lost due to wind erosion. All tailings currently are covered by an interim or permanent cover.

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. 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 the concentrations at the site perimeter to those specified in Table 2 of Appendix B to 10 CFR 20.0001-20.2401. 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 along with data from background monitoring stations 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 at the site boundary.

2.1 Dose from the Inhalation of Radionuclides

The committed effective dose equivalent 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 1998. The sampling location HMC #5 was chosen as the Nearest Residence Location since the environmental levels were higher than at the other possible Nearest Residence Location, HMC#4. 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 very conservative in that the exposure at the residences should be less than that at the site perimeter.

Committed Effective Dose Equivalent per Unit Intake via Inhalation factors were taken from ICRP 30 tables. The values are given below:

Nuclide	CEDE (mrem/mCi)
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 the principal residence was calculated to be 7.8 mrem/year while that at the background location (HMC#6) was calculated to be 1.6 mrem/y, for a net CEDE at the principal residence of 6.2 mrem/y. These results from these calculations are shown in Table 2-1 and Table 2-2.

2.2 Dose from 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 heavy 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 very high and variable over short periods of time due to being in this drainage path.

The radon data for the two monitoring periods are provided in Attachment 2 at the end of this section. Monitoring Station 16 has been accepted as the radon background location for the site. The nearest residence exposure was chosen as HMC#4 since it was higher than the other possible residence location, HMC#5. The time-weighted average of the radon concentration for HMC#4 is 1.52 pCi/l while the time-weighted average for the background location is 1.04 pCi/l. This results in a net radon concentration at the nearest residence is 0.5 pCi/l.

Since the nearest residence is within a few hundred feet of Monitoring Station HMC #4 and within 3500 feet of the major source of radon, the equilibrium should be low. We have selected 20 percent radon daughter equilibrium as an estimate for use in the calculations. NRC uses continuous exposure to 0.1 pCi/l Rn-222 in full equilibrium with the daughter products as being equivalent to a CEDE of 50 mrem/y (10CFR Part 20, Appendix B). With 20 percent equilibrium, the CEDE would be 100 mrem/pCi/l. The measured net radon concentration at the nearest residence therefore results in a calculated CEDE of 50 mrem/y.

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 the environmental TLDs placed at the monitoring stations. The Nearest Residence location, HMC#5, was used since it was higher than the alternative location HMC#4 as shown in Attachment 3 at the end of this section. The time-weighted-average exposure rate at HMC#5 was 28.1 mrem/quarter while the background location, HMC#16, had a time-weighted average exposure rate of 31.1 mrem/quarter. The TLD for the last half of 1998 for HMC#16 was lost and therefore the data for the first five months of the year was used to determine the annual average exposure rate. With this assumption, the off-site population received no additional dose equivalent above that at the background location.

2.4 Total Effective Dose Equivalent to the Nearest Resident

The TEDE to the Nearest Resident can be calculated by adding the EDE from inhalation of airborne particulate, the exposure to radon coming from the site, and the dose equivalent from direct gamma radiation. As indicated in the previous sections, there are 6.2 mrem/y from airborne particulate, 50 mrem/y from radon, and 0 mrem/y from direct

gamma radiation for a total TEDE of 56 mrem/y. This is within the 100 mrem/year limit.

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

Year:1998

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	1.09E-15	5.31E-16	5.31E-16	1.00E-16	1.00E-16
2nd qtr	6.88E-15	3.35E-15	3.35E-15	1.00E-16	1.00E-16
3rd qtr	1.85E-14	9.02E-15	9.02E-15	1.00E-16	1.00E-16
4th qtr	7.62E-15	3.71E-15	3.71E-15	1.00E-16	1.00E-16
Average	8.52E-15	4.15E-15	4.15E-15	1.00E-16	1.00E-16

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
4.003	3.578	0.238	0.006	7.8

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

Year:1998

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	1.33E-16	6.48E-17	6.48E-17	1.00E-16	1.00E-16
2nd qtr	9.93E-16	4.84E-16	4.84E-16	1.00E-16	1.00E-16
3rd qtr	3.78E-15	1.84E-15	1.84E-15	1.00E-16	1.00E-16
4th qtr	1.15E-15	5.61E-16	5.61E-16	1.00E-16	1.00E-16
Average	1.51E-15	7.38E-16	7.38E-16	1.00E-16	1.00E-16

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
0.711	0.636	0.238	0.006	1.6

Attachmen 5

HOMESTAKE

Interoffice Correspondence

TO: Roy Cellan

FROM: Ron Waterland

DATE: January 25, 1999

SUBJECT: 1998 Annual Status Report for the Large and Small Tailings Embankments

Jerry Pryor conducted monthly inspections of the Large and Small Tailings Embankments from January through June 1998 and I conducted the monthly inspections from July through December 1998. As a result of the inspections some minor maintenance work was periodically schedule and completed. The minor maintenance for 1998 consisted of minor grading work on access roads and drainage control in some road locations.

The top surface of the interim cover on the Large Tailings Pond was again re-contoured to enhance drainage. An additional pipe culvert was installed down the west embankment of the Large Tailings Pond to enhance drainage from the surface of the interim cover on the west end.

An additional 2 feet of fill material approximately 13 feet wide was added to the east embankment of the Small Tailings Pond in order to increase the freeboard on that side of the pond.

Shepherd Miller Inc. provided an evaluation of the Large Tailing Pond settlement data for 1998. The report indicated that the center of the Large Tailing Pond was still in the process of settling.