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DOE/AL/62350-53F
REV. 1

SITE-SPECIFIC ANALYSIS OF RADIOLOGICAL AND PHYSICAL PARAMETERS FOR COBBLY SOILS AT THE GUNNISON, COLORADO, PROCESSING SITE

January 1994

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January 1994

Prepared for
U.S. Department of Energy
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Albuquerque, New Mexico

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ALARA	as low as reasonably achievable
cm	centimeters
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
f	function
ft	feet
m^2	square meter
NRC	U.S. Nuclear Regulatory Commission
pCi/g	picocuries per gram
pCi/L	picocuries per liter
ppm	parts per million
Ra-226	radium-226
Th-230	thorium-230
UMTRCA	Uranium Mill Tailings Radiation Control Act
U_{total}	total uranium
μR/hr	microroentgens per hour

1.0 INTRODUCTION

The remedial action at the Gunnison, Colorado, processing site is being performed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, Public Law 95-604 (42 USC §7901 *et seq.*) Under UMTRCA, the U.S. Environmental Protection Agency (EPA) is charged with the responsibility of developing appropriate and applicable standards for the cleanup of radiologically contaminated land and buildings at 24 designated sites, including the Gunnison, Colorado, inactive processing site. Section 108 of Public Law 95-604 states that the U.S. Department of Energy (DOE) shall "select and perform remedial actions at the designated processing sites and disposal sites in accordance with the general standards" prescribed by the EPA. Regulations governing the required remedial action at inactive uranium processing sites were promulgated by the EPA in 1983 and are contained in 40 CFR Part 192 (1993), *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings*.

1.1 STANDARDS AND CRITERIA

Subpart B of 40 CFR Part 192 consists of standards for the cleanup of land and buildings. The standards applicable to land cleanup activities are as follows:

> "Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site, the concentration of Radium-226 in land averaged over an area of 100 square meters (m^2) shall not exceed the background level by more than --
>
> 1) Five picocuries per gram (pCi/g), averaged over the first 15 centimeters (cm) of soil below the surface, and
>
> 2) Fifteen pCi/g, averaged over 15-cm-thick layers of soils more than 15 cm below the surface."

In addition, 40 CFR Part 192 provides criteria for applying supplemental standards for the cleanup and stabilization of other radionuclides that present a hazard commensurate with radium-226 (Ra-226) (40 CFR §192.21 [1993]), such as thorium-230 (Th-230). A Generic Protocol for Thorium-230 Cleanup/Verification at UMTRA Project sites under development by the DOE UMTRA Project Office (Appendix A) has received U.S. Nuclear Regulatory Commission (NRC) verbal approval for implementation. Fundamental provisions of the protocol are as follows:

- Th-230 concentrations exceeding Ra-226 concentrations will be remediated such that Ra-226 concentrations one thousand years in the future, including both *in situ* Ra-226 and Ra-226 produced by natural decay of Th-230 over a 1000-year period, when averaged over 100 m^2, will not exceed either 5 pCi/g in the first 15-cm surface soil layer, or 15 pCi/g in successive 15-cm subsurface layers, above background (Generic Protocol).

- For deeply buried material, stop excavations when the RAECOM computer code, using site-specific parameters, calculates a Rn-222 flux of 3.9 pCi/m^{2}s and expected long-term conditions are appropriate, or when construction safety or feasibility becomes a concern.

- Excavation of elevated Th-230 encountered below the water table in the saturated zone will be assessed relative to the practicality with which dewatering can be performed. An as low as reasonably achievable (ALARA) analysis using pathway techniques will be performed in cases where a major portion of the site contains Th-230 which extends into the saturated zone, and excavation into the zone is impractical.

There are no promulgated standards for the cleanup of residual soil concentrations of total uranium (U_{total}). A separate Special Study is being conducted to assess potential impacts of residual uranium soil contamination on groundwater, and to evaluate the need for developing supplemental remediation standards based on pathway analysis and ALARA considerations.

The EPA standards were originally based on an understanding of radiologically contaminated, fine-grained, tailings-like soil. However, a recent NRC evaluation of the soil cleanup standards for cobbly soil has led to the conclusion that standards should have a universal interpretation of bulk soil concentrations, where bulk is defined as the total activity in picocuries divided by the total sample mass in grams, independent of the radionuclide distribution as a function of soil size fraction (Appendix B). Recognizing that UMTRA Project site cleanup activities will entail the cleanup of radiologically contaminated cobbly soil, the NRC also has concurred on a procedure developed by the DOE's TAC for excavation control and verification of cobbly subsoil (Appendix B). The accepted protocol is based on establishing a representative mass partition function (f) that is the ratio of the mass of the soil fraction retained on a #4 sieve to the mass of the soil fraction passing a #4 sieve, and the characteristic radionuclide concentration on the larger soil size fraction retained on a #4 mesh sieve. The mass partition function can be developed and applied for the entire site (Soil Verification Alternative 2 [Statistical]), Section 5.9 of the cobbly soil cleanup procedure or for each 100 m^2 grid (Site Verification Alternative 1 [Grid Specific]), Section 5.8 of the cobbly soil cleanup procedure. Bulk radionuclide concentration can be determined using the mass partition function, the radionuclide concentration on the larger size soil fraction, and radiometric/radiochemical measurements of only the finer soil fraction passing a #4 sieve.

The standards given above are based on bulk Ra-226 concentrations elevated above background level. Measurements of background radioactivity near the Gunnison, Colorado, processing site, have resulted in the following determinations (DOE, 1992):

- Background gamma exposure rates at one meter above the earth average 16.6 microroentgens per hour (μR/hr).

- Background Ra-226 concentrations near the processing site average 1.7 pCi/g.

- Background Rn-222 concentrations in air at various locations near the processing site average approximately 1.0 picocuries per liter (pCi/L).

1.2 REMEDIAL ACTION

The remedial action at the processing site will be conducted to remove the tailings and contaminated materials to meet the above-delineated EPA bulk soil cleanup standards for surface and subsurface soils. The site areas disturbed by remedial action excavation will be either contoured or backfilled with radiologically uncontaminated soil and contoured to restore the site. The final contours will produce a final surface grade that will create positive drainage from the site.

2.0 RADIOLOGICAL EVALUATION

Two site characterizations were conducted (June 1990 and November 1992) to more accurately determine the cobbly nature of the subsoil underlying the Gunnison, Colorado, processing site, and to ascertain: 1) the mass partitioning of the subpile soil relative to a #4 mesh sieve, and 2) the radiological contamination associated with the soil size fractions passing and retained on a #4 mesh sieve. The purpose of this investigation was to obtain the necessary parameters to characterize the bulk radionuclide concentrations for the site foundation soil, particularly the subpile area. Earlier investigations were based on either samples containing only the finer soil fraction, or, in the event that samples were unavailable, analytical modeling assumptions that the subsoil was composed of only finer grained material. With these more recent site characterization data, an appropriate excavation depth for remediating radiologically contaminated cobbly subsoil may be determined that complies with the recent DOE bulk interpretation of the Ra-226 and Th-230 soil cleanup standards that NRC concurred on. It also provides necessary information regarding the way in which excavation control and verification should be performed.

2.1 FIRST TEST PIT OPERATION AND RESULTS

The first test pit operation (June 1990) consisted in constructing, with a backhoe, 28 test pits distributed over the site, as well as in the near off-site environment, and obtaining cobbly soil samples. Test pit locations are shown in Figure 2.1. As seen in the figure, 10 test pits were dug in the pile area, nine in the mill yard/ore storage area, five along East Gold Basin Road berms, and four near the tailings pile perimeter. The depth excavated into the cobbly foundation soil ranged from 1.5 ft to 7 ft (0.5 m to 2 m), and averaged 3.2 ft (1.0 m). Soil samples of the finer soil size fraction passing a #4 mesh sieve were collected from approximately every 1-ft (0.3-m) depth increment, and analyzed for Ra-226 and Th-230 (a total of 97 samples). In addition, 14 bulk samples of cobbly soil were collected from individual 1 ft (0.3 m) depth increments for 10 selected test pits, and were portioned relative to a #4 sieve to assess the radionuclide distributions relative to this soil size division: one sample each for eight test pits, and two samples each for three test pits. Soil size fractions retained and passing a #4 mesh sieve were analyzed for Ra-226, Th-230, Th-232, and total uranium. A mass partition function, the ratio of the mass of large size soil sample fraction retained on a #4 mesh sieve to the mass of the finer size soil fraction passing a #4 mesh sieve, was also determined for each of the 10 test pits, as well. Table 2.1 summarizes the range and average radionuclide concentrations as a function of soil size partitioning relative to a #4 mesh sieve. The mass partition function, f, for the cobbly soil ranged from 0.17 to 6.26, and had an average and standard deviation 3.29 and 1.87, respectively.

The field lithological logs and off-site laboratory and on-site measurement results are contained in Appendix C. On analysis of the individual test pit radionuclide depth profiles, one notes that this data indicates that differential migration of Th-230 relative to Ra-226 has occurred, particularly in the cobbly subpile soil.

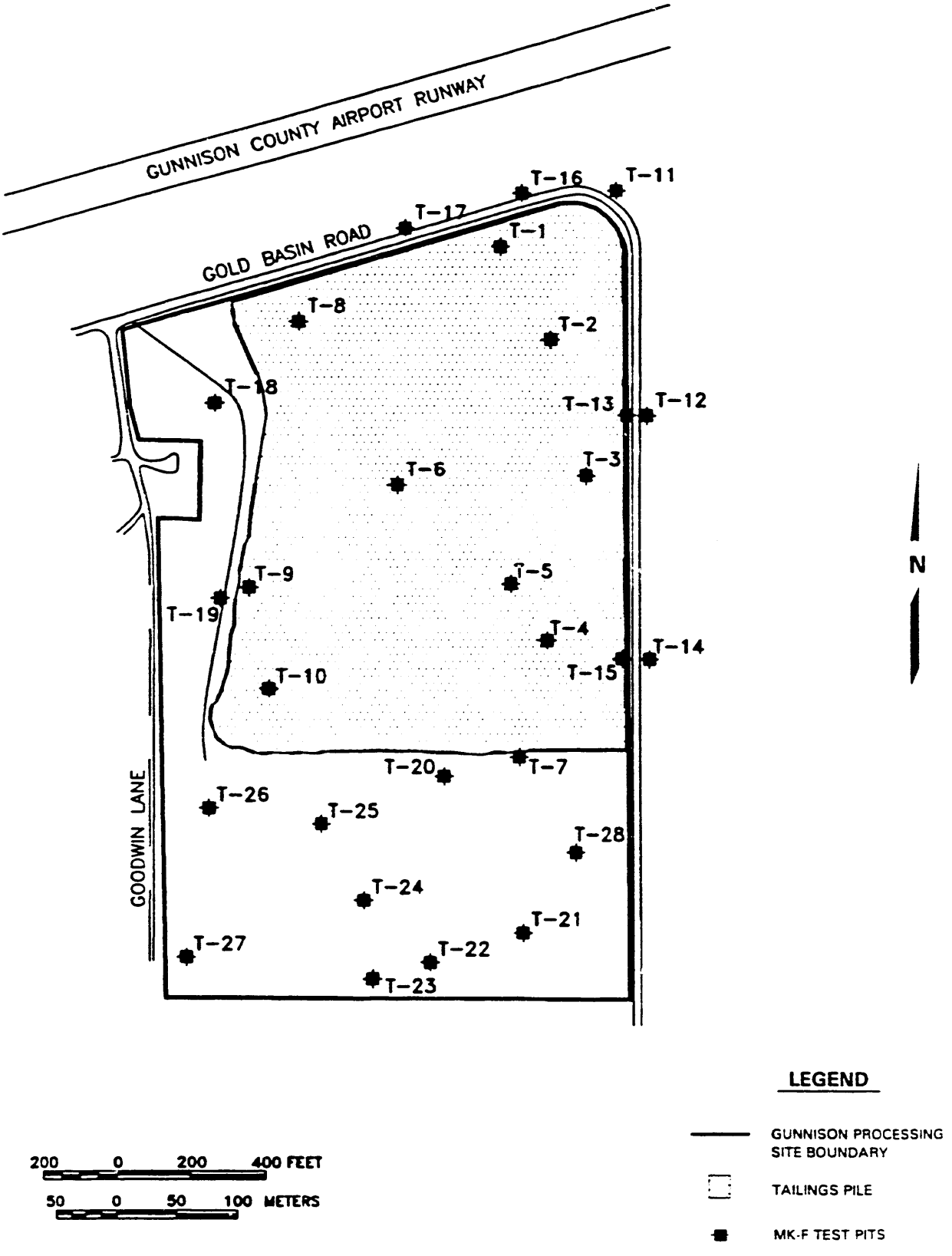

FIGURE 2.1
TEST PIT LOCATIONS FOR FIRST COBBLY SUBSOIL INVESTIGATION: JUNE 1990
GUNNISON PROCESSING SITE, COLORADO

Table 2.1 Range and average radionuclide concentrations as a function of size partitioning relative to #4 mesh sieve for composite test pit samples: June 1990 characterization

	Test pit location					
	Subpile plus offpile (10 pits)		Subpile (5 pits)		Offpile (5 pits)	
Soil size fraction	Range	Mean	Range	Mean	Range	Mean
Cobbles >#4 Mesh Sieve						
Ra-226 (pCi/g)[a]	1.2 - 3.2	1.74	1.2 - 3.2	1.74	1.0 - 3.2	1.74
Th-230 (pCi/g)	0.7 - 19	6.0	1.3 - 19	11	0.5 - 1.5	0.96
Th-232 (pCi/g)	0.5 - 1.5	1.0	0.5 - 1.5	1.1	0.6 - 1.1	0.9
U_{total} (ppm)[b]	1.3 - 40	8.8	4.8 - 40	16.2	1.3 - 1.6	1.4
Fines <#4 Mesh Sieve						
Ra-226 (pCi/g)	0.8 - 14	3.7	3.0 - 4.6	3.4	0.8 - 14	4.0
Th-230 (pCi/g)	1.1 - 180	58.1	1.1 - 180	111.8	1.0 - 15	4.4
Th-232 (pCi/g)	0.8 - 1.9	1.2	0.9 - 1.9	1.3	0.8 - 1.4	1.1
U_{total} (ppm)	1.5 - 87	28.4	34 - 87	54.2	1.5 - 6.1	2.6

[a]pCi/g = picocuries per gram.
[b]ppm = parts per million.

Although typically only a 1-ft (0.3 m) deep excavation would be required to comply with the EPA bulk Ra-226 cleanup standard, an additional 1.5 ft (0.5 m) of soil removal would be required to ensure that the total bulk Ra-226 ingrowth from residual Th-230 in 1000 years does not exceed 15 pCi/g above background.

2.2 SECOND TEST PIT OPERATION AND RESULTS

To more closely delineate subpile radiological concentrations and to develop the necessary statistical parameters to apply the NRC-approved excavation and verification protocol for cobbly soil (Soil Verification Alternative 2 [Statistical], Section 5.9 of the cobbly soil cleanup procedure), a second test pit operation was conducted in November 1992. Since the protocol was being designed when the first test pit (June 1990) investigation was being performed, the second test pit operation was necessary to compliment the initial cobbly soil data base.

Twenty additional test pits were excavated into the pile subsoil to an average depth of 5 ft (1.5 m), and three background pits were constructed to the same depth in the off-site area. Figure 2.2 shows the test pit locations. Test pits were excavated and the cobbly soil sampled in 1 ft (0.3 m) increments in accordance with the NRC protocol (Appendix B). At the time of the test pit operation, groundwater ranged from 2 to 8 ft (0.6 to 2.4 m) below the tailings/foundation soil interface, and was encountered in 17 of the 23 test pits. The cobbly soil was sieved using a #4 mesh sieve, and composite soil samples for each test pit were obtained for the soil fractions retained on, and passing the sieve. Both soil fractions were weighed, and analyzed for Ra-226, Th-230, Th-232, and total uranium. An aliquot of only the fine soil size fraction was also obtained from each 1 ft (0.3 m) test pit depth increment from 19 test pits, and separately analyzed for these radionuclides. Table 2.2 summarizes the range and average radionuclide concentrations as a function of soil size partitioning relative to a #4 mesh sieve for the composite soil samples from each test pit. The mass partition functions, f, for the 23 test pits ranged from 0.94 to 4.59, and averaged 3.31 with a standard deviation of 0.80.

Field lithological logs, and off-site laboratory and on-site measurement results are given in Appendix D. The results obtained from both test pit operations are compatible. The radiological analysis of the finer soil size fraction for 1-ft (0.3-m) depth increment samples from 19 test pits (data in Appendix D) clearly indicate that Ra-226 is readily adsorbed/precipitated within the first foot to 1.5 ft (0.5 m) of subpile soil. However, differential migration of Th-230 relative to Ra-226 has produced significantly elevated concentrations of Th-230 at depth. During test pit operations, moderate to heavy rust staining of the cobbly soil and groundwater was observed. This staining is presumably due to the formation of ferric hydroxide precipitates, and elevated Th-230/uranium concentrations are generally associated with this staining.

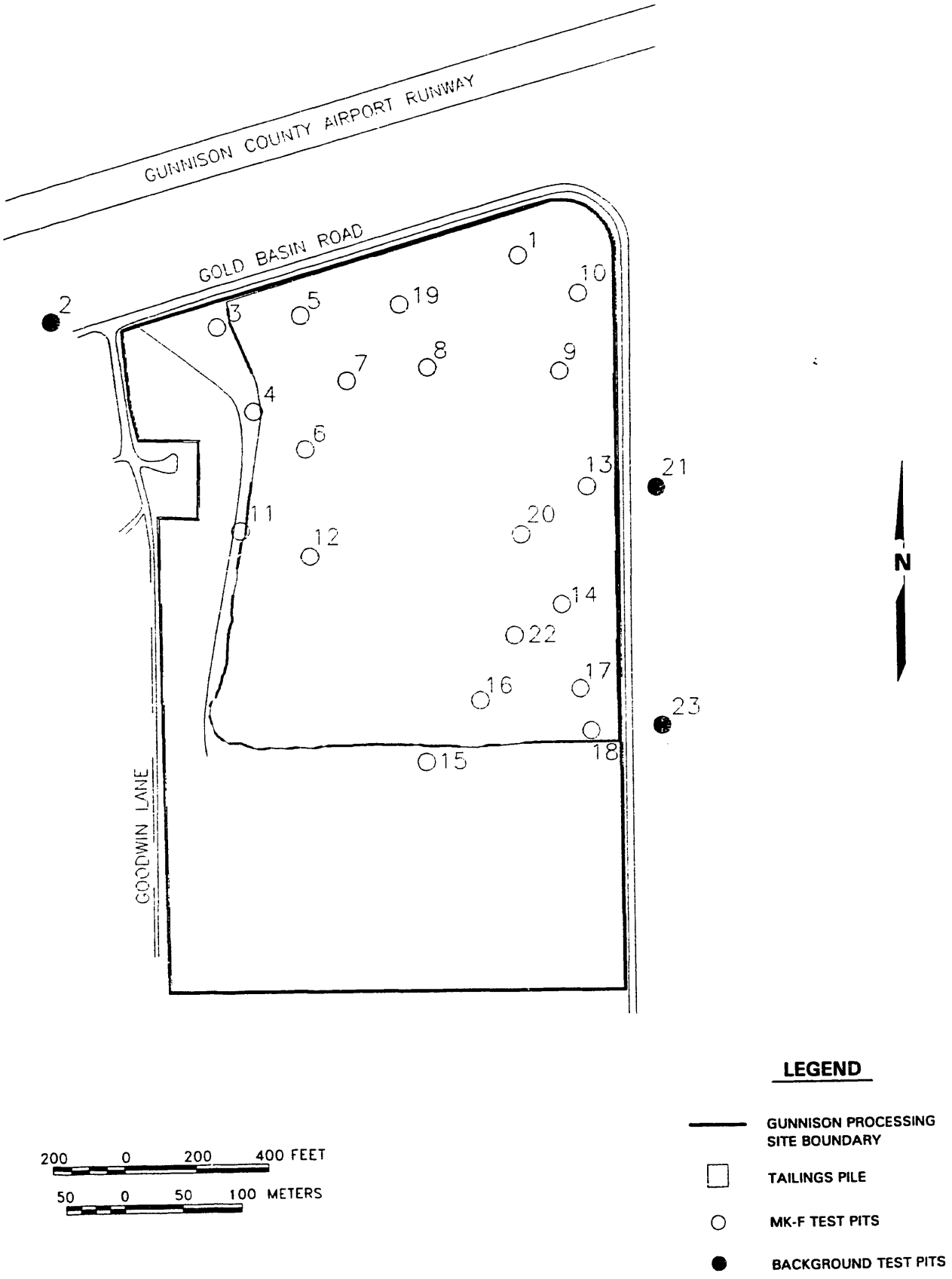

FIGURE 2.2

TEST PIT LOCATIONS FOR SECOND COBBLY SUBSOIL INVESTIGATION: NOVEMBER 1992, GUNNISON PROCESSING SITE, COLORADO

Table 2.2 Range and average radionuclide concentrations as a function of size partitioning relative to #4 mesh sieve for composite test pit samples: November 1992

Soil size fraction	Test pit location			
	Subpile plus offpile (20 test pits)		Background (3 pits)	
	Range	Mean	Range	Mean
Cobbles >#4 Mesh Sieve				
Ra-226 (pCi/g)[a]	1.2 - 4.0	2.2	1.6 - 2.5	1.9
Th-230 (pCi/g)[b]	0.8 - 69	20.8	1.9 - 3.2	2.7
Th-232 (pCi/g)	0.6 - 3.6	1.6	1.2 - 1.7	1.5
U_{total} (ppm)[b]	2.2 - 20	11.2	1.3 - 2.2	1.8
Fines <#4 Mesh Sieve				
Ra-226 (pCi/g)	1.7 - 15	4.1	1.1 - 2.5	1.7
Th-230 (pCi/g)	3.8 - 660	140	1.3 - 16	7.1
Th-232 (pCi/g)	0.8 - 20	5.9	1.2 - 1.3	1.25
U_{total} (ppm)	2.4 - 86	30	1.9 - 2.0	2.0

[a]pCi/g = picocuries per gram.
[b]ppm = parts per million.

2.3 STATISTICAL PARAMETERS FOR COBBLY SOILS: COMBINED ANALYSIS

To obtain the necessary statistical parameters to appropriately perform site characterization, excavation control, and verification for the observed cobbly site soil (Soil Verification Alternative 2 [Statistical], Section 5.9 of the cobbly soil cleanup procedure in Appendix B), the results of the two separate test pit investigations are combined to yield a average mass partition function of 3.30, with a standard deviation of 1.20 for the 33 test pits considered. At the lower 95 percent confidence limit, the site statistical mass partition function, f_L, to be used for site verification is 2.96 (from 33 test pits' data). Therefore, approximately 25 percent ($1/[1+f_L]$) of the cobbly subsoil, by weight, is less than a #4 mesh sieve, and 75 percent ($f_L/[1+f_L]$) of the cobbly subsoil, by weight, is greater than a #4 mesh sieve, at the lower 95 percent confidence limit.

As noted in Tables 2.1 and 2.2, the Ra-226 and Th-232 concentrations for the larger size soil fraction retained on a #4 mesh sieve are approximately equal for subpile and offpile/background areas, Th-230 and total uranium concentrations are compatible for offpile and background areas, and Th-230 and total uranium concentrations are elevated in the subpile relative to corresponding offpile and background values. Therefore, to provide representatively conservative radionuclide concentrations for the larger size soil fraction, it is appropriate to construct separate average concentrations for the offpile and subpile regimes. The average mass partition functions and radionuclide concentrations (larger size soil fraction) and corresponding standard deviations for the subpile, offpile, and background areas are summarized in Table 2.3, and were determined by combining the data used to develop Table 2.1 (June 1990) and Table 2.2 (November 1992). The site background bulk Ra-226 concentration was determined to be 1.8 pCi/g from the mass-weighted average of the data for the background pits in Table 2.2 (f = 2.96 was used for weighting).

The calculated mean and statistical upper 95 percent confidence limit radionuclide concentrations are presented in Table 2.4 for the subpile, offpile, and background areas.

Table 2.3 Summary of mass partition functions and radionuclide concentrations for composite soil samples retained on a #4 mesh sieve: June 1990 and November 1992 investigations

Test pit ID and statistical summary	Location	Mass partition function f = (M > #4)/ (M < #4)	Radionuclide concentration mass fraction >#4 sieve			
			Ra-226 (pCi/g)	Th-230 (pCi/g)	Th-232 (pCi/g)	U_{total} (ppm)
1[a]	Subpile	3.87	2.5	15	1.7	2.2
2	Background	4.59	2.5	3.2	1.2	1.9
3	Subpile	3.73	1.3	29	2.3	2.6
4	Subpile	3.10	1.2	3.7	0.3	4.1
5	Subpile	2.15	1.9	29	2.5	8.6
6	Subpile	3.65	1.8	1.6	0.6	14
7	Subpile	2.66	1.9	7.5	0.7	20
8	Subpile	2.70	2.0	0.8	0.5	20
9	Subpile	4.42	3.0	47	2.9	7.0
10	Subpile	3.38	3.1	21	1.2	5.1
11	Subpile	3.28	2.0	12	0.9	1.9
12	Subpile	2.39	1.3	3.1	0.6	23
13	Subpile	3.31	2.5	41	3.6	6.3
14	Subpile	0.94	1.5	13	1.2	20
15	Subpile	3.43	2.8	1.6	0.9	1.6
16	Subpile	3.22	1.6	10	0.7	32
17	Subpile	3.68	2.8	7.1	1.6	13
18	Subpile	3.34	2.1	41	2.0	6.0
19	Subpile	4.04	2.2	22	2.4	13
20	Subpile	3.12	2.7	42	2.3	11
21	Background	3.93	1.6	1.9	1.5	2.2
22	Subpile	4.22	4.0	69	2.2	11
23	Background	2.93	1.7	3.1	1.7	2.2
TP2[b]	Subpile	2.93	1.2	19	0.5	9.8
TP4	Subpile	4.22	3.2	6.2	1.1	40
TP6	Subpile	3.80	1.3	1.3	1.0	20
TP8	Subpile	1.32	1.5	19	1.5	4.8

Table 2.3 Summary of mass partition functions and radionuclide concentrations for composite soil samples retained on a #4 mesh sieve: June 1990 and November 1992 investigations (concluded)

Test pit ID and statistical summary	Location	Mass partition function f = (M > #4)/ (M < #4)	Radionuclide concentration mass fraction >#4 sieve			
			Ra-226 (pCi/g)	Th-230 (pCi/g)	Th-232 (pCi/g)	U_{total} (ppm)
TP10	Subpile	3.00	1.5	10	1.4	6.3
TP15	Offpile	2.94	1.2	0.7	1.1	1.4
TP17	Offpile	2.34	2.0	1.2	1.2	1.5
TP20	Offpile	6.26	1.0	0.5	0.7	1.6
TP23	Offpile	0.17	1.3	0.9	0.9	1.3
TP26	Offpile	5.89	3.2	1.5	0.6	1.4
Average	Subpile/ Offpile/Bkg[c]	3.30	2.0	15	1.4	9.6
	Subpile	3.20	2.1	19	1.5	12
	Offpile	3.52	1.7	1.0	0.9	1.4
	Background	3.82	1.9	2.7	1.5	2.1
Standard Deviation	Subpile/ Offpile/Bkg	1.20	0.7	17	0.8	9.6
	Subpile	0.84	0.8	18	0.9	9.7
	Offpile	2.55	0.9	0.4	0.3	0.1
	Background	0.84	0.5	0.7	0.3	0.2

[a]Test pit numbers 1-23, November 1992 investigation.
[b]Test pit with TP designations, June 1990 investigation.
[c]Bkg = background locations.

Table 2.4 Calculated radionuclide mean concentrations and mean concentrations at the upper 95 percent confidence interval for the larger soil size fraction, as a function of subpile, offpile, and background locations

	Mean/mean concentration at upper 95% confidence limit (pCi/g)		
Radionuclide	**Subpile**	**Offpile**	**Background**
Ra-226	2.1/2.4	1.7/2.6	1.9/2.7
Th-230	19/25	1.0/1.4	2.7/3.9
Th-232	1.5/1.8	0.90/1.2	1.5/2.0
U_{total}[a]	12/15	1.4/1.5	2.1/2.4

[a]Uranium concentrations in parts per million (ppm).

3.0 CONCLUSIONS

For **site characterization**, bulk radiological concentrations in the offpile and subpile regions will be calculated using the following:

$$C_B = C_{<\#4}\,[1/(1+f)] + C_{>\#4}\,[f/(1+f)],$$

where

$C_{<\#4}$ = the site measured radionuclide concentration of the finer soil size fraction passing a #4 mesh sieve measured in the on-site laboratory,

$C_{>\#4}$ = the site average radionuclide concentration of the larger soil size fraction retained on a #4 mesh sieve for the area in question from Table 2.4, and

f = the site average mass partition fraction, 3.30, from Table 2.3.

However, for **site verification**, the statistical average values at the upper and lower 95 percent confidence limits are used in the relation above for $C_{>\#4}$, as a function of radionuclide, and f, respectively, to separately calculate bulk concentrations for the offpile and subpile areas.

On this basis, for cobbly subsoil to comply with the bulk cleanup standards (total Ra-226 concentrations from residual Ra-226 and Th-230 to not exceed 15 pCi/g above background, 1.8 pCi/g bulk Ra-226 concentration), the corresponding concentrations in the finer soil size fraction (passing a #4 mesh sieve) in the offpile areas could vary as follows:

1) $C_{<\#4\,Ra}$ = 58.8 pCi/g Ra-226, when the Th-230 concentrations on the finer fraction, $C_{<\#4\,Th}$, are less than or equal to 62.2 pCi/g;

2) $C_{<\#4\,Th}$ = 168.4 pCi/g Th-230, if there is evidence that the Th-230 has differentially migrated relative to Ra-226, and the residual bulk Ra-226 concentration is 1.8 pCi/g ($C_{<\#4\,Ra}$ = 1.7 pCi/g), corresponding to average background concentrations; or

3) Th-230 concentrations (pCi/g) determined by the following relation for residual Ra-226 concentrations measured on the finer soil size fraction, ($C_{<\#4\,Ra}$), in the range of 1.7 to 58.8 pCi/g,

$$C_{<\#4\,Th} = 171.6 - 1.86 \times C_{<\#4\,Ra}$$

As noted earlier, Ra-226 is readily adsorbed or precipitated within the first 1 to 1.5 ft (0.3 to 0.5 m) of the subpile cobbly soil, and available data indicates that differential migration of Th-230 has occurred to depths below 3.0 to 4.0 ft (0.9 to 1.2 m) beneath the tailings/subpile interface over about 30 percent of the subpile area. In areas where differential migration has occurred, residual bulk Ra-226 concentrations are within the

range of background. Therefore, excavation control and verification in a large percent of the subpile area will depend on Th-230 concentrations. Accordingly, for the subpile area, the maximum residual Ra-226 and Th-230 concentrations on the finer soil size fraction that would comply with the bulk Ra-226/Th-230 standards (15 pCi/g total residual Ra-226 above background, 1.8 pCi/g bulk Ra-226 concentration) are:

1) 99.7 pCi/g Th-230, if there is evidence that the Th-230 has differentially migrated relative to Ra-226, and the residual bulk Ra-226 concentration is 1.8 pCi/g, corresponding to average background concentrations ($C_{<\#4\ Ra}$ = 1.7 pCi/g);

2) Th-230 concentrations (pCi/g) are determined from the residual Ra-226 concentrations measured on the finer soil size fraction, ($C_{<\#4\ Ra}$), in the range of 1.7 to 55 pCi/g by the relation

$$C_{<\#4\ Th} = 102.9 - 1.86 \times C_{<\#4\ Ra}$$

Composite and individual 1.0 ft (0.3 m) depth increment measurements of Th-232 concentrations indicate the remedial action for elevated Th-232 will not be a consideration on the Gunnison processing site.

If subsequent site characterization to determine excavation limits complying with the bulk concentration standards (total Ra-226 not exceeding 15 pCi/g) indicates that shallow groundwater is expected to be encountered, the provisions of the Generic Protocol for Thorium Cleanup/Verification at UMTRA Project Sites (Appendix A, Protocol for Contamination in the Saturated Zone) will be applied.

Uranium contamination of the subpile cobbly soil, as noted in the Introduction, is being investigated as a separate Special Study, and any cleanup requirements will be addressed in that investigation.

4.0 REFERENCES

DOE (U.S. Department of Energy), 1992. *Environmental Assessment of Remedial Action at the Gunnison Uranium Mill Tailings Site Near Gunnison, Colorado*, final, DOE/EA-0372, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

CODE OF FEDERAL REGULATIONS

40 CFR Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," U.S. Environmental Protection Agency (1993).

UNITED STATES CODE

42 USC §7901 *et seq.*, *Uranium Mill Tailings Radiation Control Act*, November 8, 1978.

APPENDIX A

GENERIC PROTOCOL FOR THORIUM-230 CLEANUP/VERIFICATION AT UMTRA PROJECT PROCESSING SITES

Generic Protocol for Thorium-230 Cleanup/Verification at UMTRA Project Sites

The excavation of materials contaminated with thorium-230 (Th^{230}) at one or more UMTRA Project sites may require extensive, deep removal of soil materials to ensure that the radium-226 (Ra^{226}) concentrations will comply with EPA's surface and subsurface soil cleanup standards (i.e., 40 CFR 192). The following discussion presents a unified approach for the future application of standards for Th^{230} at the UMTRA Sites.

1. Introduction

The cleanup of radiologically contaminated soils on UMTRA Project sites provides explicit requirements for the remediation of soils contaminated with Radium-226 (Ra^{226}), which include limits of 5 and 15 picocuries/gram (pCi/g) for the initial and successive 15 centimeter (cm) deep layers, respectively, averaged over an area of 100 m^2. If other radionuclides are encountered in sufficient quantities and concentrations to constitute a significant radiological hazard, the supplemental standards provisions of 40 CFR 192.21 and 40 CFR 192.22 provide guidance for performing remedial action for these radionuclides in a manner that comes as close to meeting the applicable standard as is reasonable under the circumstances.

Thorium-230 (Th^{230}), which naturally decays, with a half-life of 77,000 years, to form Ra^{226} is also present in uranium mill tailings and contaminated soils. Therefore, it may be readily shown that for soils containing initial Ra^{226} and Th^{230} concentrations, at time $t=0$, of $Ra^{226}(t=0)$ and $Th^{230}(t=0)$, respectively, the Ra^{226} concentration at any later time, t, is:

$$Ra^{226}(t) = Ra^{226}(t=0)\, e^{-\lambda t} + Th^{230}(t=0)\,(1 - e^{-\lambda t}),$$

where λ is the decay constant for Ra^{226}, or 4.32×10^{-4} yrs^{-1}.

Furthermore, the geochemical behavior of Ra^{226} and Th^{230} in typical UMTRA site environments have been observed to be significantly different. Under neutral or basic soil conditions, neither Ra^{226} nor Th^{230} are preferentially mobile geochemically (i.e., both radionuclides will form chemical compounds that have similar potential for migrating into soils). However, under acidic conditions, the chemical forms taken by these radionuclides are significantly different in their potential for depth migration in soil, with Th^{230} being more mobile than Ra^{226}.

In windblown tailings areas, mill yards, and ore storage areas of UMTRA sites, it has been observed that: 1) the surface and subsurface soils are normally at neutral pH; 2) the radiological material does not contain abundant quantities of free acid; and 3) the Ra^{226} and Th^{230} concentrations are in near secular equilibrium (their activities are approximately equal). The near secular equilibrium for the radiological contamination in these areas results from the fact that most of the uranium ores processed were in near equilibrium. Therefore, the application of soil cleanup procedures for Ra^{226} according to EPA standards would also reduce the Th^{230} concentrations to acceptable levels by default, and the total Ra^{226} as a function of time will not exceed 5 or 15 pCi/g, for surface and subsurface soil respectively.

However, under acidic soil conditions that may prevail in the foundation soil under uranium mill tailings, the subpile region, or in surface and subsurface soils of raffinate or evaporation

pond, the different geochemical interactions of Ra^{226} and Th^{230} will cause these radionuclides to differentially migrate. Generally, under these conditions, Ra^{226} is adsorbed or co-precipitated on soil within a depth of one to two feet, and Th^{230} migrates deeper into the subsoil until neutralization of the transporting pore water occurs, where it is removed from solution by the formation of insoluble precipitates or co-precipitates (thorium or thoro-ferro hydroxides, for example). For example, at the Spook, Wyoming site, Th^{230} differentially migrated as deep as 20 feet below the raffinate pond before being stabilized by neutralization. In order to be in harmony with the supplemental standards provisions to reduce Th^{230} concentrations to as low as reasonably achievable (ALARA), and to come as close to meeting otherwise applicable standards as is reasonable under the circumstances, an excavation depth less than 20 feet was selected as a viable solution for this site.

It may be concluded that the cleanup of the initial Ra^{226} contamination according to standards does not necessarily mitigate against the ultimate ingrowth of residual Ra^{226} with time due to the radioactive decay of residual Th^{230} in all areas within a site. As a consequence, residual Ra^{226} concentrations at a later date, due to ingrowth from Th^{230} contamination, may pose an undesirable health hazard. Therefore, the supplemental standards provision of 40 CFR 192 requires the development of a cleanup criterion for Th^{230}, which is health protective by reducing exposures to levels that are ALARA, keeping in consideration the measures necessary to implement the remedial actions under the circumstances that exist at the site. The following procedure establishes appropriate remedial action concentration limits for Th^{230}, and is proposed to be implemented at UMTRA Project sites after concurrence from all governing agencies involved with activities at each site agree to its implementation.

2. Generic Protocol

As can be seen from the equation presented in the introduction, the overall 1000-year maximum concentration of Ra^{226} in the soils will either be equal to the present Ra^{226} inventory (if Th^{230} concentrations are equal to or less than Ra^{226} concentrations), or the total Ra^{226} inventory one thousand years in the future (if Th^{230} concentrations exceed Ra^{226} concentrations). If Ra^{226} concentrations are equal to or exceed Th^{230} concentrations, the site will already meet the Th^{230} supplemental standard by default when the site is remediated to the 40 CFR 192 standards for Ra^{226}.

(1) Therefore, the supplemental standard chosen for Th^{230} needs only to ensure that the overall Ra^{226} concentration one thousand years in the future, when averaged over 100 square-meter areas, will not exceed either 5 pCi/g in the first 15 cm layer or 15 pCi/g in successive 15 cm layers.

It should be noted that, in keeping with the NRC interpretation of the EPA's soil cleanup standards, the Ra^{226} concentrations are considered to be bulk concentrations, as determined by the recently developed, NRC-approved protocol for excavation control and soil verification of cobbly subsoils.

2.1 Protocol for Contamination at Depth

As the depths of excavations become deeper to remove elevated Th^{230}, the thickness of overlying fill material that is eventually used to remediate the site will increase. As a result,

attenuation of radon-222 (Rn^{222}) diffusing through the overlying fill material will also increase. Therefore, as the overlying clean fill material thickness increases, the resultant attenuation of the radon generated from the associated ingrowth of Ra^{226} will allow higher residual concentrations of Th^{230} to be left in place, while still attaining a level of protection equivalent to the intent of the Ra^{226} soil cleanup standards. To determine this concentration, the NRC model (presented in the Draft Generic Environmental Impact Statement on Uranium Milling; NUREG-0511; April 1979) can be used to determine the radon-222 (Rn^{222}) flux that would produce 0.02 Working Levels (WL) in a hypothetical structure built on a 100 square-meter (m^2) grid. The following equation was used:

$C = FAB/VR*1000$, where:

C = Rn^{222} concentration (pCi/l)
F = Rn^{222} flux (pCi/m^2-s)
A = Area over which the flux enters (m^2)
B = Flux reduction factor for entering structure (unitless)
V = Volume of the structure (m^3)
R = Effective Rn^{222} removal rate (s^{-1})
1000 = conversion factor (l/m^3)

In areas where basements are feasible (based on local construction practices and deep groundwater table), it should be assumed that the thickness of fill material is eight feet less than the depth of the excavation. Using $A = 103m^2$, $B = 0.5$, $V = 250m^3$, and $R = 1.98 \times 10^{-4}\ s^{-1}$, a flux of 3.9 pCi/$m^2$-s would produce indoor air concentrations of approximately 4.0 pCi/l Rn^{222}. Assuming radon daughters are present at 50% equilibrium, this would correspond to 0.02 WL.

(2) Thus, the RAECOM computer code can be used to calculate the resultant flux from higher concentrations at depth in order to determine if further excavation is warranted. As long as the calculated flux is less than 3.9 pCi/m^2-s, it can be assumed that equivalent protection is provided. The calculations shall use site-specific parameters when available. Reasonably conservative parameters that consider the expected site conditions shall be used when site-specific data are unavailable.

2.2 Protocol for Contamination in the Saturated Zone

Another scenario potentially impacting excavations to remove elevated Th^{230} concentrations is when groundwater is encountered at shallow depths. Since the Th^{230} contamination has been present within the saturated zone long enough for soluble constituents to have been mobilized, it is reasonable to assume that any remaining Th^{230} that may be encountered within a saturated zone will not be appreciably mobilized by pH neutral groundwater. Furthermore, it is known that the diffusion coefficient decreases dramatically as soils approach full saturation until it reaches values typical of water (Radon Attenuation Handbook for Uranium Mill Tailings Cover Design; NUREG/CR-3533; April 1984). It is therefore reasonable to assume that Rn^{222} generated within a saturated zone generally will not diffuse to the surface. Finally, it is very difficult to perform deep, cost effective excavations within a saturated zone.

(3) Therefore, whenever shallow groundwater is encountered, the following options will be considered:

(a) Excavation into the saturated zone will be considered when water pumping or other controls are reasonable and when high concentrations of Th^{230} extend only a short distance into the saturated zone.

(b) An ALARA analysis will be performed in cases where a major portion of the site contains Th-230 which extends into the saturated zone, and excavation into the zone is impractical. The ALARA analysis will use reasonably conservative assumptions to project future doses.

(c) If water pumping or other controls are not reasonable, excavation will halt at the level of the saturated zone.

3. Verification Sampling

Under typical site conditions, verification of the Th^{230} supplemental standard is to be achieved by a three-tiered sampling approach.

(4) In areas within an UMTRA processing site that are suspected of preferentially mobilizing thorium contamination over radium contamination (e.g., under raffinate pits), based upon process knowledge or other sources such as previous sampling data, 100% of the grids are to be sampled and analyzed for Th^{230}.

(5) In subpile areas, 10% of the grids will be sampled.

(6) In areas where process knowledge and characterization data indicates no potential for preferential mobilization (e.g., windblown tailings and ore storage areas), grids will not be sampled for Th^{230}.

An analysis of verification data from the Tuba City, Arizona, UMTRA site, which has completed remediation and used this strategy, found no instances in the area sampled at the rate of 1 out of 25 grids where Th^{230} concentrations would cause future (i.e., at $t = 1000$ years) expected Ra^{226} concentrations to exceed 40 CFR 192 standards for Ra^{226}. Furthermore, preliminary results confirm the expectation that Th^{230} concentrations are generally equal to or less than Ra^{226} concentrations in areas other than beneath the raffinate pits, and Ra^{226} concentrations are well correlated to Th^{230} concentrations in these areas.

If any verification samples exceed the Th^{230} criteria of this protocol, the surrounding eight grids will be examined to determine whether or not these grids also exceed the criteria. If sample results have not been generated for the surrounding grids already, archived samples of such grids will be analyzed. If any of the surrounding grids also exceed the Th^{230} criteria, the surrounding eight grids around such grids will also be examined. This process will continue until no more of the surrounding grids exceed the Th^{230} criteria. All grids that exceed the criteria will undergo further remediation unless there is sufficient justification and concurring parties agreement to do otherwise.

4. Conclusion

Based upon the above discussions, the following generic protocol shall be used for the excavation of Th^{230} at all future UMTRA Project sites:

(1) Excavate bulk Th^{230} to a 1000-year corrected bulk Ra^{226} concentration of 5 or 15 pCi/g (as appropriate) in 15-cm layers;

(2) For deeply buried material, stop excavations when the RAECOM computer code, using site-specific parameters, calculates a Rn^{222} flux of 3.9 pCi/m^2-s;

(3) Consider the following options whenever shallow groundwater is encountered:

(a) Excavate into the saturated zone when water pumping or other controls are reasonable, especially when high concentrations of Th^{230} extend only a short distance into the saturated zone.

(b) An ALARA analysis will be performed in cases where a major portion of the site contains Th-230 which extends into the saturated zone, and excavation into the zone is impractical. The ALARA analysis will use reasonably conservative assumptions to project future doses.

(c) Halt excavations at the level of the saturated zone when water pumping or other controls are not reasonable.

(4) Perform verification sampling for bulk Th^{230} in all grids underneath raffinate pits or other areas suspected of having a mechanism to preferentially mobilize Th^{230} over Ra^{226};

(5) Perform verification sampling for bulk Th^{230} in 10% of the grids underneath sub-pile areas; and

(6) Do not perform verification sampling for bulk Th^{230} in grids for which process knowledge and characterization data indicates no potential for preferential migration.

APPENDIX B

U.S. DEPARTMENT OF ENERGY/U.S. NUCLEAR REGULATORY COMMISSION CORRESPONDENCE

PROCEDURE FOR BULK RADIONUCLIDE DETERMINATION, EXCAVATION CONTROL, AND SITE VERIFICATION FOR SOILS CONTAINING COBBLES

Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque New Mexico 87115

SEP 0 6 1991

FEDERAL EXPRESS

Mr. John Surmeier
Chief, Uranium Recovery Branch
Division of Low-Level Waste
Management & Decommissioning
Office of Nuclear Materials Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Mail Stop 5-E-2
1 White Flint North
11555 Rockville Pike
Rockville, MD 20852

Dear Mr. Surmeier:

Historically, the majority of Ra-226 contaminated materials being cleaned up at Uranium Mill Tailings Remedial Action (UMTRA) Project sites consisted of tailings, ore spoils, tailings intermixed with fine-grained soils (windblown and vicinity properties) and fine-grained soils under residual milling waste (tailings and raffinate ponds). However, in 1988, conditions encountered while remediating Th-230 contamination which persisted once Ra-226 had been removed at both the Riverton, Wyoming, and Durango, Colorado, sites were substantially different.

At both sites, which were located on alluvial floodplains, subsurface soils consisted of a large percentage of cobbles and gravels which were retained on a #4 sieve (4.76 mm). In addition, it was determined that approximately 95 percent of the total concentration of radioactivity was deposited on the fines (those soils passing a #4 sieve).

Based on these considerations and the fact that cleanup verification sampling routinely employed by the Remedial Action Contractors did not readily accommodate sampling and analysis of materials greater than #4 sieve, the following protocol for Th-230 cleanup/verification to a bulk subsurface concentration of 35 pCi/g was adopted and approved by the U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) in modifications to the Remedial Action Plans for those sites.

1. Determine the "fines mass fraction" by collecting several (10) representative bulk field samples, and separating fractions greater than and less than a #4 sieve:

   fines mass fraction = mass fines/mass total = unitless fraction

2. Determine Ra-226 (or Th-230) concentration (passing the #4 sieve) in verification samples collected and analyzed according to standard methodology described in MK-Ferguson Company (MK-F) Procedure RAC-015, "Verification Procedures for Vicinity Properties and Tailings Sites."

3. Determine "bulk" Ra-226 (or Th-230) concentration during cleanup and verification by correcting the Ra-226 (or Th-230) concentration on fines as follows:

   bulk Ra-226 concentration = (fines Ra-226 concentration) X (fines mass fraction) or,
   bulk Th-230 concentration = (fines Th-230 concentration) X (fines mass fraction)

The DOE proposes to adopt this basic protocol, on a site specific basis, as a standard operating practice for cleanup and verification of both residual Ra-226 and Th-230 contamination at UMTRA sites yet to be remediated. The bulk concentrations of Ra-226 and Th-230 determined by the above procedure will comply with the remediation standard for Ra-226, and supplemental cleanup requirements for Th-230, as specified in 40 CFR 192. Bulk Ra-226 concentrations will not exceed 5 and 15 pCi/g for respective 15 cm deep surface and subsurface layers averaged over 100 m^2. Similarly, the bulk concentration of subsurface Th-230 in 15 cm depth increments will not exceed 35 pCi/g averaged over 100 m^2. The details of the protocol will be more completely described in an added section to Procedure RAC-015 which will address when the protocol would be implemented; the number of samples needed to provide the initial value for the fines mass fraction; the frequency of updating/verifying the fines mass fraction as work progresses across a site; how the fines mass fraction used will be logged on field data sheets, etc. It will also be included in future updates of the Technical Approach Document and referenced as appropriate in Remedial Action Plans for sites where it will be applied.

The sites where this protocol could be applied would likely include Grand Junction, Gunnison, Rifle, Slick Rock, and Naturita, Colorado, since they are all located on alluvial floodplains possessing characteristics similar to those described above. Therefore, the DOE requests the NRC's concurrence that such a protocol is consistent with the requirements of 40 CFR 192 and that its contractors should be directed to formally incorporate the protocol into standard operating procedures and address its potential application in site Remedial Action Plans.

If you should have any further questions regarding this request, please call Mr. Don Metzler of my staff at (FTS) 845-5657.

Sincerely,

Clinton B. Smythe

for Mark L. Matthews, P.E.
Project Manager
Uranium Mill Tailings Remedial Action
Project Office

cc:
F. Bosiljevac, UMTRA
S. Hill, TAC
M. Miller, TAC
D. Gonzales, TAC
J. Oldham, MK-F
D. Carlson, MK-F
M. Madsen, CN-Geotech

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 17 1991

Mr. Mark L. Matthews P.E.
Project Manager
Uranium Mill Tailings Remedial Action
Project Office
Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Matthews:

Your letter of September 6, 1991, requested U.S. Nuclear Regulatory Commission (NRC) concurrence in the use of a procedure for determining and verifying radium-226 concentrations at locations with large quantities of cobbly material. Your letter states that at several Title I sites, DOE has encountered large quantities of radium-226 or thorium-230 contaminated material with a high content of cobbly material (greater than a No. 4 sieve size). Your tests show that the contained radioactivity is concentrated in the finer fraction with the coarse fraction containing negligible quantities (less than 5 percent). Procedures presently in use by your contractors for sampling and analyses are designed for relatively fine grained homogeneous soils with a minimum of larger material and are not adequate to characterize the radioactive concentrations in the heterogeneous size material being encountered. Your proposed approach would rely on measurement of the radium-226 or thorium-230 content in the finer fraction to obtain an average concentration for the entire sample.

We agree that determining an average radium-226 or thorium-230 content over an entire sample would be consistent with the Environmental Protection Agency (EPA) standards in 40 CFR 192 if the radium-226 content of the two size fractions and the percentage of each size fraction are properly factored. Part 192.12 states that the concentration of radium-226 in land can be averaged over an area of 100 square meters to meet the standards of not exceeding background level by more than 5 pCi/g averaged over the first 15 cm of soil below the surface and 15 pCi/g averaged over 15 cm thick layers of soil more than 15 cm below the surface.

You plan to address the details of the procedure in a section to be added to Procedure RAC-015 which will define when the procedure would be used, the number and distribution of samples to be taken, the determination of the radium-226 distribution and size fractions, and other appropriate details.

We agree that the proposed approach has the potential for maintaining compliance with EPA's standards while avoiding over excavation of contaminated

material. However, for final concurrence, we will have to review the details of your revised Procedure RAC-015 and the effects of its implementation on a site-specific basis. Any questions can be addressed to Allan Mullins of my staff at FTS-492-0578.

Sincerely,

John J. Surmeier, Chief
Uranium Recovery Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

cc: D. Metzler, DOE, Alb.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 1 1992

Mr. Albert R. Chernoff, Project Manager
Uranium Mill Tailings Remedial Action
Project Office
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Chernoff:

We have reviewed the procedure on "Bulk Radionuclide Determination, Excavation Control, and Site Verification For Cobbly Soils" sent with your letter of March 26, 1992, and supplemented by a revised Page 12 sent by facsimile on March 30, 1992. We hereby concur with its use on U.S. Department of Energy Uranium Mill Tailings Remedial Action Project sites containing a high percentage of cobbly subsoil. This procedure, designated RAC-OP-003, should be referenced in the specific Remedial Action Plans for those sites where it will be used.

One item of note concerns the section of the procedure discussing authority (Section 1.3). This section should be revised to reference this letter of concurrence rather than the September 17, 1991, letter cited, which agreed with the concept but did not concur with the procedure.

Any questions should be addressed to Allan Mullins of my staff at FTS 964-2578.

Sincerely,

John J. Surmeier, Chief
Uranium Recovery Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

cc: D. Metzler, DOE Alb
P. Mann, DOE Alb
D. Gonzalez, TAC

Soil Verification Using Cobbles-To-Fines Correction

1.0 SCOPE

1.1 Purpose

This procedure will be used for determining and verifying average bulk radionuclide concentrations for radium-226 (Ra-226), thorium-230 (Th-230), and, if necessary, thorium-232 (Th-232) at locations where the subsoil consists of a percentage of cobbles in the bulk sample sufficient to affect measurement of the total radionuclide concentration. Excavation control and verification will be based on bulk concentrations determined by this procedure.

1.2 Applicability

This procedure may be applied in areas designated for routine soil excavation and verification (see RAC-OP-003) where the subsoil media contains a high percentage of cobbles.

1.3 Authority

Letter to A.R. Chernoff, DOE/UMTRA from J.J. Surmeier, NRC dated April 4, 1992.

2.0 REFERENCES

2.1 RAC Health Physics Procedure RAC-RP-005 - Radiological Instrumentation.

2.2 RAC Health Physics Procedure RAC-OP-002 - Excavation Control Procedure

2.3 RAC Health Physics Procedure RAC-OP-003

3.0 DEFINITIONS

3.1 Cobbles - The portion of a composite soil sample which will <u>not</u> pass through a #4 mesh sieve.

3.2 Fines - The portion of a composite soil sample which will pass through a #4 mesh sieve.

3.3 Mass partition function, f, of a cobbly soil sample - the ratio of the dry mass of the cobbles ($M_{>\#4}$), to the dry mass of the fines ($M_{<\#4}$):

$f = M_{>\#4}/M_{<\#4}$ (cobble to fine ratio),

where the total dry mass of the sample, M_T, is

$$M_T = M_{>\phi} + M_{<\phi}.$$

3.4 Radiological concentration (Ra-226, Th-230, or Th-232), in picocuries per gram (pCi/g), for the fines or cobbles, are designated by $C_{<\phi}$ and $C_{>\phi}$, respectively.

3.5 Bulk radionuclide concentration (Ra-226, Th-230, or Th-232), in pCi/g, is designated by C_B, and calculated using

$$C_B = \text{Total Sample Radioactivity (pCi) / Total Dry Mass of Sample (g)}$$

$$C_B = (C_{<\phi} \times M_{<\phi} + C_{>\phi} \times M_{>\phi})/ (M_{<\phi} + M_{>\phi})$$

$$C_B = C_{<\phi} (1/(1+f)) + C_{>\phi} (f/(1+f)).$$

3.6 Student t distribution (t) - the mathematical quantity used to define the distribution of test statistics for small sample populations; used herein to determine the lower and upper 95 percent confidence values for mass partition function and cobble radionuclide concentrations respectively.

3.7 Running Average - The determination of statistical quantities based on the available data and recalculated as more data becomes available.

3.8 Statistical Mass Partition Function (f_L) - The mass partition function (f), at the lower 95 percent confidence value calculated from test pit or running average data.

3.9 Statistical Cobble Radionuclide Concentration ($C_{>U}$) - The cobble radionuclide concentration ($C_{>\phi}$) at the upper 95 percent confidence value calculated from test pit or running average data.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 All instruments used under this procedure shall have valid calibration.

4.1.2 Backup data (correlations, etc.) must be acquired, retained on-site, and made available for audit, on all methods and analyses used for excavation control and verification measurements.

4.2 Tools, Material, Equipment

4.2.1 Buckets, wheelbarrows, #4 mesh sieves or screens (4.8 millimeter), shovels or backhoe, weighing scale up to 200 lbs., drying oven, and other materials, as necessary, to obtain representative bulk soil samples. It should be noted that a 1/4 inch hardware cloth is approximately equivalent to a #4 mesh sieve, and may be used in lieu of a #4 mesh sieve.

4.3 Precautions/Limits

N/A

4.4 Acceptance Criteria

N/A

5.0 PROCEDURE

5.1 Site Evaluation

5.1.1 This guidance applies to processing sites and vicinity property areas. If the work area under consideration is less than 0.5 acre, the mass partition function (f) will be based on soil sampling from one centrally located test pit.

5.1.2 The statistical mass partition function (f_L) and statistical cobble radionuclide concentration ($C_{>u}$) may be determined by analysis of samples collected from test pits prior to construction. The purpose for developing a statistical mass partition function is only to obtain an estimate of the excavation depth required for compliance with radiological cleanup standards.

5.1.3 Approximately 30 uniformly distributed sampling locations (test pits) will be used for the entire site. Fewer test pits may be used on small sites with prior approval from the HP & E Manager.

5.1.4 If test pit excavation activities are performed during remedial action, the statistical mass partition function (f_L) shall be obtained by calculating a running average of the corresponding parameters obtained as test pit work progresses across the site.

5.2 Test Pit Soil Sampling and Analysis

5.2.1 Dig each test pit to the estimated depth of contamination at the location, and record the test pit surface elevation and maximum depth of each test pit.

5.2.2 Collect one composite sample from each test pit. The composite soil sample shall be comprised of all the material contained in a standard shovel from each one foot increment (no material sha'l be discarded). Sampling shall begin at the cobbly soil surface or tailings/cobbly soil interface and continue through a minimum of 5 feet of cobbly material or all the cobbly material (whichever is less).

5.2.3 Sieve the composite sample through a #4 mesh sieve, collecting the fines and cobbles in separate buckets of known weight. Weigh both fractions separately. Thoroughly mix the fine fraction and extract two (2) representative 500 gram can samples.

5.2.4 Determine the percent moisture content by weight of one of the can samples and calculate the adjusted dry weight of the fines. Calculate the adjusted dry weight of the cobbles assuming a moisture content of 1.5 percent. Record all pertinent information on the Cobbles to Fines Calculation Sheet (Attachment 1). Calculate the mass partition function (f) for the test pit using the adjusted dry weight of the fines and cobbles in the relation defined in Definition 3.3.

5.2.5 The second can shall be analyzed by the site laboratory for Ra-226 (and Th-232 if necessary) and sent to the vendor laboratory for Ra-226 and Th-230 analysis (and Th-232 if necessary). Record on-site and vendor analysis results on Attachment 1.

Note: Analysis for Th-232 shall only be performed if the site characterization indicates Th-232 is present.

5.2.5.1 Using the initial on-site analysis results and the vendor analysis results for all test pit or running average samples, a Ra-226 correction factor shall be established using the following equation:

$$Ra\text{-}226\ C.F. = \frac{R_1 + R_2 + \ldots R_n}{n}$$

where, C.F. = correction factor,
R_n = Vendor results (pCi/g) divided by initial OCS, results (pCi/g) for the nth sample (i.e., 1, 2, ...n), and
n = number of ratios.

5.2.5.2 The correction factor shall be updated using the pertinent analyses results from QA samples (section 5.10).

5.2.6 Ship the fraction retained on the #4 sieve from each test pit to the vendor laboratory, in the 5-gallon bucket. This material shall be cleaned, crushed, and analyzed for Ra-226, Th-230 and, if necessary, Th-232. Record vendor analysis results on Attachment 1.

5.2.7 Calculate the bulk radionuclide concentration (C_B) for the test pit using the mass partition function (f) for the test pit (section 5.2.4), the vendor radiological concentration of the fines ($C_{<\#4}$), and the radiological concentration of the cobbles ($C_{>\#4}$) in the equation defined in Definition 3.5. Bulk radionuclide concentrations should be calculated for Ra-226, Th-230, and Th-232 (if necessary).

5.3 Establish background bulk radionuclide concentrations for Ra-226, Th-230, and, if necessary, Th-232, by the sampling and analyses detailed in steps 5.2.1 through 5.2.6 at three uncontaminated background locations containing cobbly subsoil.

5.4 Statistical Mass Partition Function - Alternative 1 (Test Pits)

5.4.1 Upon completion of test pit sampling, pertinent data shall be compiled on the Statistical Data Sheet (Attachment 2), and the statistical mass partition function shall be calculated using the following equation:

$$f_L = \bar{f} - t(s/\sqrt{n})$$

where, f_L = statistical average mass partition function at the lower 95 percent confidence value,
$\bar{f}$ = mean mass partition functions of n samples,
s = sample standard deviation for the n samples,
t = t from Attachment 3, and
n = number of observations.

5.4.2 The mean of the sample population is determined as follows:

$$\bar{f} = \frac{f_1 + f_2 + \ldots f_n}{n}$$

where, $f_{1,2 \text{ or } n}$ = the value of f for sample 1, 2, or n; and
n = the number of samples.

5.4.3 The standard deviation is calculated as follows:

$$S = \frac{\sqrt{\sum_{n=1}^{n} (f_n - \bar{f})^2}}{n - 1}$$

where, S = sample standard deviation,
f_n = value of f for sample n,
$\bar{f}$ = mean of f for n samples, and
n = number of samples.

5.4.4 The statistical cobble radionuclide concentration for Ra-226, Th-230 and Th-232 (if necessary) shall be calculated using the following equation:

$$C_{>u} = \bar{C} + t(s/\sqrt{n})$$

where, $C_{>u}$ = The statistical cobble radionuclide concentration at the upper 95 percent confidence value,
$\bar{C}$ = mean radionuclide concentration of the n samples,
s = standard deviation of the 30 samples,
t = t from Attachment 3, and
n = number of samples.

5.5 Statistical Mass Partition Function - Alternative 2 (Running Average)

5.5.1 The statistical mass partition function (f_L) and the statistical cobble radionuclide concentration ($C_{>u}$) may be obtained by calculating a running average of the corresponding parameters using the equations

in sections 5.4.1 and 5.4.4 respectively. Compile data on the Statistical Data Sheet and recalculate f_L and $C_{>u}$ as data is obtained from each new test pit.

5.6 The statistical mass partition function and statistical cobble radionuclide concentration for alternative 1 or 2, will only be used for excavation control to obtain an estimate of the final excavation depth to comply with EPA's radiological cleanup standards. Final excavation depths and verification will be determined as described in section 5.7 through 5.9.

5.6.1 By solving the equation in section 3.5 for $C_{<\#4}$ and using the statistical mass partition function (f_L) and the statistical cobble radionuclide concentration ($C_{>u}$) an estimate of the allowable fines radionuclide concentration may be obtained as follows:

$$C_{<\#4} = \frac{C_B - C_{>u}\,[f_L/(1 + f_L)]}{[1/(1 + f_L)]}$$

where, $C_{<\#4}$ = The estimated fines radionuclide concentration,
C_B = the applicable limit (i.e., 5 or 15 pCi/g for Ra-226 or Th-232 or 35 pCi/g for Th-230),
f_L = statistical mass partition function, and
$C_{>u}$ = statistical cobble radionuclide concentration.

5.7 Verification Soil Sampling & Analysis

5.7.1 Grid the entire site into squares of 100 yd^2 (~100 m^2). Grids shall be uniformly distributed over the site so as to obtain representative data. Record location and elevation for each 100 yd^2 grid.

5.7.2 Further subdivide each grid where excavation control is being performed into approximately 10 x 10 foot squares (see below). Subdividing grids may normally be done visually by the technician performing the survey. Soil sample extraction will be performed at each of the nine 10 x 10 foot squares within the grid. Each soil plug should consist of all the material contained in a standard shovel. This will include soil, rock, and small/large gravel. No material is to be discarded. The soil plug will be taken to a depth of 15 centimeters (cm). Sample collection shall be random (non-biased).

(30')

(30')

0	0	0
0	0	0
0	0	0

0 = sample location

5.7.3 The nine soil plugs (80-100 lbs combined weight) comprise a composite sample.

5.7.4 Sieve the composite sample through a #4 mesh sieve, collecting the fines and cobbles in separate buckets of known weight. Thoroughly mix the fine fraction.

5.8 Site Verification Alternative 1 (Grid Specific)

5.8.1 For verification alternative 1, weigh both fractions separately and record information on Attachment 1.

5.8.2 Extract two (2) 500g can samples of the fine fraction for moisture content and radiological analysis.

5.8.3 Determine the moisture content of the fines and calculate the adjusted dry weight. Calculate the adjusted dry weight of cobbles assuming a moisture content of 1.5 percent. Calculate and record the mass partition function for the grid (Attachment 1).

5.8.4 Analyze the second can sample of fines for Ra-226 and, if necessary, Th-232 with the on-site OCS. Calculate the corrected radionuclide concentration using the site Ra-226 correction factor determined in section 5.2.5.1.

5.8.5 Calculate the bulk radionuclide concentration C_b for the grid using the grid specific mass partition function, radionuclide concentration of the fines (the initial corrected concentration shall be used for calculating the Ra-226 bulk radionuclide concentration) and the statistical cobbles

radionuclide concentration ($C_{>u}$) in the formula in section 3.5. All data shall be recorded on Form F1-OP-003-4.

5.8.6 Dry, seal and store the sample for 20 day on-site analysis.

5.8.7 After a minimum of 20 days, reanalyze the sample and calculate the final bulk radionuclide concentration (C_B) for the grid.

5.9 Site Verification Alternative 2 (Statistical)

5.9.1 For each 100 m^2 grid, a 9-plug composite soil sample of the fines soil will be obtained following the technique outlined in Section 5.7.

5.9.2 Extract a 500g can sample of the fine fraction for radiometric analysis. Discard the larger size soil fraction.

5.9.3 Analyze the can sample for Ra-226 and, if necessary, Th-232 with the on-site OCS. Calculate the corrected radionuclide concentration using the site correction factor determined in section 5.2.5.1.

5.9.4 Calculate the bulk radionuclide concentration for the grid using the radionuclide concentration of the fines (the initial corrected concentration shall be used for calculating the Ra-226 bulk radionuclide concentration), the statistical mass partition function (f_L) and the statistical cobble radionuclide concentration ($C_{>u}$) in the formula from section 3.5 as modified below.

$$C_B = C_{<\#4}[1/(1 + f_L)] + C_{>u}\,[f_L/(1 + f_L)]$$

Record the pertinent data on the Alternative 2 Bulk Concentration Data Sheet (Attachment 4).

5.8.6 Dry, seal and store the sample for 20 day on-site analysis.

5.8.7 After a minimum of 20 days, reanalyze the sample and calculate the final bulk radionuclide concentration (C_B) for the grid.

5.10 The verification sample from the 25th 100 m^2 grid of each block will be sent to an outside Vendor laboratory for independent Ra-226, Th-230, and, if necessary, Th-232 analyses in accordance with Quality Assurance requirements.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 All data shall be recorded on the appropriate data sheet.

7.0 ATTACHMENTS

7.1 Attachment 1 - Cobble to Fines Calculation Sheet (F1-OP-003-4)

7.2 Attachment 2 - Statistical Data Sheet (F2-OP-003-4)

7.3 Attachment 3 - Critical Values of t.

7.4 Attachment 4 - Alternative 2 Bulk Concentration Data Sheet (F4-OP-003-4)

Attachment 1

COBBLES TO FINES CALCULATION SHEET

Site: _____ Sheet _____ of _____

Sample/Grid I.D. _____ Date: _____

Fines	Cobbles	Moisture Content Fines
Wt. Sample & Bucket _____	Wt. Sample & Bucket _____	Wet Wt. Sample/Pan _____
Wt. Bucket _____	Wt. Bucket _____	Dry Wt. Sample/Pan _____
Wt. Sample _____	Wt. Sample _____	Tare Wt. Pan* _____
Adjusted Dry Wt. ($M_{<.04}$)* _____	Adjusted Dry Wt. ($M_{>.04}$)** _____	Wt. Water* _____
		Wt. Soil** _____
		Percent Water(*/**) _____

* Adjusted Dry Wt. of the Fines = Wt Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>.04}/M_{<.04}$ = _____

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>.04}$)				
On-Site Analysis Fines ($C_{<.04}$)	*	N/A		
	**			
	***			
Vendor Analysis Fines ($C_{<.04}$)				
Bulk Radionuclide Concentration (C_B)	#			
	##			
	###			

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: _____

Reviewed By: _____ Date: _____

F1-OP-003-4

STATISTICAL DATA SHEET

Site: _____ Date: _____ Sheet ____ of ____

Test Pit No.	f	$C_{>96}$ Vendor			$C_{<96}$ On-Site		$C_{<96}$ Vendor			$^{226}Ra_2/^{226}Ra_1$
		^{226}Ra	^{230}Th	^{232}Th	$^{226}Ra_1$	^{232}Th	$^{226}Ra_2$	^{230}Th	^{232}Th	

Statistical Mass Partition Function (f_L) = _____

Statistical Cobble Radionuclide Concentration ($C_{>U}$) = ^{226}Ra _____ ^{230}Th _____ ^{232}Th _____

^{226}Ra Correction Factor (C.F.) = _____

Reviewed By: _____ Date: _____

F2-OP-003-4

Attachment 2

Attachment 3

CRITICAL VALUES OF t

n-1	$t_{.050}$
1	6.314
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860
9	1.833
10	1.812
11	1.796
12	1.782
13	1.771
14	1.761
15	1.753
16	1.746
17	1.740
18	1.734
19	1.729
20	1.725
21	1.721
22	1.717
23	1.714
24	1.711
25	1.708
26	1.706
27	1.703
28	1.701
29	1.699
inf.	1.645

Attachment 4

ALTERNATIVE 2 BULK CONCENTRATION DATA SHEET

SITE: _____ Radiological Analysis (Fines) DATE: _____

Grid I.D. Number	$C_{<\phi}$ ^{226}Ra (pCi/g)		Bulk ^{226}Ra Concentration (pCi/g)	$C_{<\phi}$ ^{232}Th (pCi/g)	Bulk ^{232}Th Concentration (pCi/g)	^{230}Th Vendor Results	Bulk ^{230}Th Concentration (pCi/g)
	Initial	Initial Corrected	Initial Corrected				
	20 Day		20 Day				

Bulk Concentration $C_B = C_{<\phi}[1/(1+f)] + C_{>\phi}[f/(1+f_t)]$

Statistical Cobbles Radionuclide Concentration $C_{>\phi}$ _____ Statistical Mass Partition Function f_t _____ ^{226}Ra correction factor _____

Reviewed By: _____ Date: _____

F4-OP-003-4

APPENDIX C

TEST PIT LITHOLOGICAL LOGS AND RADIOLOGICAL DATA COBBLY SUBSOIL INVESTIGATION JUNE 1990

LITHOLOGICAL LOGS
COBBLY SUBSOIL INVESTIGATION
JUNE 1990

GUNNISON COLORADO SITE

P.O. 3050-511-10061

Coordinates for Backhoe Trench Locations

Designation	X Coordinate (N-S)	Y Coordinate (E-W)	Elevation
T-1	3071.76	1903.26	7653.69
T-2	2806.67	2031.11	~~7657.14~~ 7657.74
T-3	2449.40	2143.06	~~7655.48~~ 7657.11
T-4	1966.41	2011.26	~~7655.19~~ 7657.80
T-5	2154.87	1978.26	~~7657.80~~ 7659.80
T-6	2370.67	1594.91	7659.18
T-7	1832.66	1652.17	7655.13
T-8	2862.32	1345.24	7651.37
T-9	2116.88	1231.48	7652.37
T-10	1813.09	1274.80	7551.30
T-11	3248.15	2247.82	7651.35
T-12	2587.31	2319.92	7647.70
T-13	2594.05	2243.68	7649.11
T-14	1889.17 ~~1898.00~~	2339.79 ~~[illegible]~~ ~~2347.07~~	~~7640.65~~ 7643.80
T-15	1902.37	2249.37	~~7642.59~~ 7646.59
T-16	3248.27	1979.58	7652.71
T-17	3157.41	1655.61	7651.25
T-18	2620.67	1129.94	7643.55
T-19	2087.90	1148.26	7645.35
T-20	1576.95	1765.66	~~7640.71~~ 7644.71
T-21	1160.62 ~~1249.70~~	1991.34 ~~1987.97~~	~~7639.26~~ 7643.67
T-22	1049.39	1792.60	~~7640.78~~ 7642.78
T-23	1023.78	1627.60	~~7640.32~~ 7642.32
T-24	1224.90	1567.93	~~7641.92~~ 7643.82
T-25	1455.72	1452.75	~~7641.57~~ 7643.57
T-26	1480.40	1257.75	~~7642.48~~ 7643.48
T-27	1072.78	1307.85	~~7640.22~~ 7643.22
T-28	1302.33 ~~1352.35~~	2134.05	~~7640.44~~ 7643.44
FAA BLDG.	3235.98	1857.59	7653.87

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-1

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
WIREMAN	BACKHOE	7' x 20'	6-2-90	6-2-90		8'	M. STOFFEL

DEPTH FT	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-8" TOPSOIL: fine silty sand, dry, dark brown, with roots	
2		SM-ML	8"-3'10" TAILINGS: very fine silty sand, light grey-tan, dry to damp.	
4		SC	3'10"-5' ORIGINAL GROUND: clayey sand, dark brown, damp	
6	R, R, R	GP	5' GRAVELS AND COBBLES, sandy, brown, damp, cobbles and gravel are rounded, to 7" diam, sand is medium to coarse grained	
8	R		6'9" sand is coarser, reddish-brown, moist	
			8' wet	
10			BOTTOM OF HOLE = 8.5'	

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SHEET	TEST PIT NO.
1 OF 1	T-1

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-2

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
WIREMAN	BACKHOE	3 x 17	6-1-90	6-1-90		13.5'	M. STOFFEL

DEPTH FEET	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-6" TOPSOIL: fine silty sand, dry, dark brown, with roots, few cobbles to 4" diam.	
2		SM - ML	6"-8'6" TAILINGS: fine to very fine sand, dry to damp, light grey-tan, medium dense - loose	
4				
6				
8		GP	8'6" ORIGINAL GROUND: Sandy gravels and cobbles, damp to moist, dark brown, cobbles to 8" diameter, rounded, medium-grained sand, trace of silt and clay.	
10	R, B		10' reddish-brown, sand is coarse-grained, no fines	
	R			
	R			
12	R		11' medium-coarse-grained sand, tan, damp	
	R			
			12' moist	
14			13' wet	
16			BOTTOM OF HOLE = 13.5'	
18				
20				

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SHEET	TEST PIT NO.
1 OF 1	T-2

TEST PIT LOG

PROJECT NO.	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-3

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
WIREMAN	BACKHOE	5×12'	6-1-90	6-1-90		11.5'	M. STOFFEL

DEPTH FT	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-1' TOPSOIL: Silty sand with gravels and cobbles, brown, dry, with roots	
2		SM	1-6.5' TAILINGS: fine-grained sand, damp, grey-tan	
4				
6				
		CH	6.5-8.5' SLIME TAILINGS: silty clay, damp to moist, dark grey highly plastic	
8				
	R	GP	8.5' ORIGINAL GROUND: Sandy gravels and cobbles, dark brown, dry, cobbles are rounded, to 8" diam; sand is coarse-grained	
10	R			
	R		9.5' reddish-brown, wet, more pea-size gravel, less sand.	
12				
14			BOTTOM OF HOLE = 11.5'	
16				
18				
20				

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SHEET	TEST PIT NO.
1 OF 1	T-3

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
MTRA	GUNNISON	TAILINGS PILE	3885-40	T-4

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
FIREMAN	BACKHOE	3 x 11'	5-31-90	5-31-90		15.5'	M. STOFFEL

DEPTH FT	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
		SM	0-1'3" TOPSOIL: Silty sand with gravels and cobbles, dry, dark brown, with roots; cobbles are rounded to 6" diam.	
		SM	1'3"-11'6" TAILINGS: fine sand, light grey with discontinuous thin layers of tan and reddish-brown sand, dry; the reddish-brown sands are clayey.	
			10' dark-grey fine sand, damp	
		CH	11'6"-12'6" TAILINGS: silty clay, grey, damp, highly plastic	
		GP	12'6" ORIGINAL GROUND: cobbles, rounded, to 7" diam, with coarse grained sand, brown-grey, damp	
	R, B			
	R		wet	
			BOTTOM OF HOLE = 15.5'	

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SHEET	TEST PIT NO.
1 OF 1	T-4

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-5

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
Schmalz	TRACKHOE	6'x22'	6-2-90	6-2-90		17'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-6" TOPSOIL: Silty sand, dark brown, damp, with roots	
		SM	6"-6' TAILINGS: fine silty sand, dry, light grey	
2				
4				
6		CH	6'-13.5' SLIME TAILINGS: Silty clay, dry, dark grey, highly plastic	
8				
10				
12				
14		GP	13.5' ORIGINAL GROUND: Sandy gravels and cobbles to 6" diam, damp-moist, brown to reddish brown, sand is coarse grained	
16	R			
	R		17' wet	
18			BOTTOM OF HOLE = 17'	
20				

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SHEET	TEST PIT NO.
1 OF 1	T-5

HEH420

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-6

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
Schmalz	TRACKHOE	10'x23'	6-2-90	6-2-90		16.5'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-4" TOPSOIL: Silty fine sand, with a few gravels, dark brown, dry, with roots.	
2		SM-ML	4"-7' TAILINGS: Silty very fine sand, light tan-grey, dry	
4				
6				
8		CH	7'-10' SLIME TAILINGS: Silty clay, dark grey, damp moist, highly plastic	
10		GP	10' ORIGINAL GROUND: Sandy gravels and cobbles to 6" diam, damp, dark brown, trace of roots.	
12	R R, B			
14	R			
16	R		16.5' wet	
18			BOTTOM OF HOLE = 16.5'	
20				

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SHEET	TEST PIT NO.
1 OF 1	T-6

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-7

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
Schmalz	TRACKHOE	7'x22'	6-2-90	6-2-90		not encountered	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-1.5' TOPSOIL: Silty sand, damp, dark brown, with roots	
2		SM-ML	1.5-8.5' TAILINGS: Silty very fine sand, dry, light tan-grey	
4				
6				
8				
10		CH	8.5-11.5' SLIME TAILINGS: Silty clay, grey, dry, highly plastic	
12	R	GP	11.5' ORIGINAL GROUND: Sandy gravels and cobbles, rounded to 6" diam, reddish-brown to brown, damp, medium to coarse-grained sand	
	R			
14	R			
	R			
16			BOTTOM OF HOLE = 15'	
18				
20				

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SHEET	TEST PIT NO.
1 OF 1	T-1

4420

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-8

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
FOREMAN	BACKHOE	5'x15'	6-1-90	6-1-90		7'	M. STOFFEL

DEPTH FT	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
		SM	0-6" TOPSOIL: Gravelly silty sand, dark brown, dry-damp, with cobbles	
		SM-ML	6"-3' TAILINGS: fine to very fine silty sand, dry to damp, light grey-tan	
4		CH	3'-6' SLIME TAILINGS: Silty clay, tan, grey, streaked with yellow, moist, soft, highly plastic 4' dark grey	
	R,B R	GP	6' ORIGINAL GROUND: Sandy gravel and cobbles to 6" diam., dark brown, trace of silt and clay, moist, with roots 7' wet, more coarse gravel, reddish-brown lense	

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SHEET	TEST PIT NO.
1 OF 1	T-8

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-9

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
WIREMAN	BACKHOE	6'x16'	6-1-90	6-1-90		9.5'	M. STOFFEL

DEPTH Ft	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-1.5' TOPSOIL: Gravelly silty sand, with cobbles to 4" diam, dark brown, dry-damp, with roots	
2		SM-ML	1.5-4.5' TAILINGS: very fine silty sand, light tan, dry-damp	
4				
6		CH	4.5-7' SLIME TAILINGS: Silty clay, highly plastic, damp-moist, dark gray 5' streaks of reddish-brown.	
		GC	7-8' Sandy gravels in a yellow clay tailings matrix	
8	R	GP	8' ORIGINAL GROUND: Sandy gravels with cobbles to 6" diam., reddish-brown, moist, sands are medium-coarse grained	
	R		9' wet	
10				
12				
14				
16				
18				
20				

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SHEET	TEST PIT NO.
1 OF 1	T-9

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	TAILINGS PILE	3885-40	T-10

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
Schmalz	TRACKHOE	7'x20'	6-2-90	6-2-90		11.5'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0		SM	0-1.5' TOPSOIL: Silty sand, dry-damp, dark brown, with roots	
2		SM-ML	1.5-4.25' TAILINGS: Silty very fine sand, dry, light grey-tan	
4		CH	4.25-7.5' SLIME TAILINGS: Silty clay, grey, damp, highly plastic	
6				
8		CL	7.5'-8.5' ORIGINAL GROUND: Fine sandy clay, damp, dark brown, with roots	
10	R, B	GP	8.5' Sandy gravels and cobbles, rounded, to 6" diam, brown to reddish brown, sand coarse grained, damp	
	R			
12	R		10.5' moist	
	R		11.5' wet	
14			BOTTOM OF HOLE = 14'	
16				
18				
20				
			* HOLE WAS ENLARGED FOR PUMP TEST	

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

SHEET	TEST PIT NO.
1 OF 1	T-10

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA - GUNNISON	PROCESSING SITE	NE of pile 30 ft. NE of pavement	3885-40	T-11

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
J. Partch	Deere 510B Backhoe	3'x12'	6/1/90 14:40	15:15		5.7'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	SP	0-8" Fine to medium clean sand, light yellow-gray dry to slightly moist; grass roots probably Wind-Blown Tailings	Thick reedy grass and sage-brush at surface
1				
2	R-2	GW	8"-4' Silty sandy gravel, medium brown, moist (damp to wet at depth); 25% alluvial cobbles up to 8" diameter; small roots down to 3'	
3	R-3			
4	R-4			
5	R-5	GW	4'-TD As above; slightly coarser, less silt; orange iron staining	▽ GWT = 5.7'
6			TD = 6'	
7				
8				
9			NOTE: Hoe operator believes material is disturbed (not natural), possibly due to construction of the adjacent paved county road.	
10				

MORRISON-KNUDSEN ENGINEERS, INC.
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SHEET	TEST PIT NO.
1 of 1	T-11

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	ALONG ROAD EAST OF TAILINGS PILE	3885-40	T-12

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
LINCOLN-DEVORE	SHOVEL - HAND DUG	2.5' x 1.5'	6-4-90	6-4-90		2.7'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R	SM	Silty fine sand, few cobbles to 3" diam, dark brown, damp with roots to 1'.	
	R		1' less silty, more cobbles, to 5" diam, trace of tailings sand	
2	R	GP	Sandy Gravels and Cobbles, sand is medium-coarse-grained, moist, cobbles to 7" diam.	
4			2.5' wet	
6			BOTTOM OF HOLE = 2.75'	
8				
10				
12	R			

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SHEET 1 OF 1

TEST PIT NO. 1-12

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	EAST OF TAILINGS PILE	3885-40	T-13

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
PARTCH	BACKHOE	3.5'x10'	6-1-90	6-1-90		NOT ENCOUNTERED	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R	SM-ML	Fine Sandy Silt with gravels and cobbles, rounded, to 6" diam. dark brown, dry to damp, roots to 1'	
	R			
2	R			
4	R	GP	Sandy Gravels and cobbles, reddish brown, sand is coarse grained moist, no fines	
	R			
			BOTTOM OF HOLE = 5'	
6				
8				
10				
12				
14				
16				
18				
20				

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

SHEET 1 OF 1

TEST PIT NO. T-13

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA	GUNNISON	ALONG ROAD EAST OF TAILINGS PILE	3885-40	T-14

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
LINCOLN-DEVORE	SHOVEL - HAND DUG	1' ϕ	6-4-90	6-4-90		1.0'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R	SM	Silty Sand, some clay, few rounded gravels, roots, dark brown, wet (TOPSOIL)	
	R	GP	Sandy Gravels and Cobbles, brown, to 3" diam, rounded, medium to coarse-grained sand, wet	
2			BOTTOM OF HOLE = 1.75'	
4				
6				
8				
10				

MORRISON-KNUDSEN ENGINEERS, INC.
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SHEET	TEST PIT NO.
1 of 1	T-14

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
ULTRA - GUNNISON	PROCESSING SITE	17' W of fence; E edge of pile	3885-40	T-15

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
J. Partch	Deere 510B Backhoe	3 x 10'	6/1/90 8:30A	9:10A		5 1/2'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	GW	0 - 2 1/2' Sandy silty Gravel; 25% rounded alluvial cobbles up to 6" diameter; 10% silt, grass roots	Grassy surface with occasional cobbles
1	S-1			
2	R-2			
	R-3			
3		GW	2 1/2' - TD Sandy Gravel; no silt, orange iron-stained medium to coarse sand (20%); cobbles as above	
4	R-4			
	R 5			
5				▽ GWT = 5 1/2'
6			TD = 6 1/2'	
0				

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SHEET	TEST PIT NO.
1 OF 1	T-15

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UNTRA - GUNNISON	PROCESSING SITE	15' N of airport fence ; N of pile	3885-40	T-16

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
J. Partch	Deere 510B Backhoe	4'x11'	6/1/90 11:50A	12:30		6½'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	GW	0-5' Sandy Gravel ; trace silt, more in top 1½' ; 15% rounded cobbles up to 6" in diameter ; grass roots down to 2' depth ; moist	Gravel - cobble surface ; no grass
1				
2	R-2			
3	R-3		- slight coarsening with depth, maximum cobble size : 9"	- considerable caving of sides of hole
4	R-4			
5	R-5			
6	R-6	GW	5'-TD As above ; no silt ; orange iron staining , damp to wet	
7	R-7		TD=7'	▽ GWT = 6½'
8				
9				
10				

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SHEET	TEST PIT NO.
1 OF 1	T-16

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA - GUNNISON	PROCESSING SITE	15' N of airport fence; N of pile	3885-40	T-17

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY
J. Partch	Deere 510B Backhoe	3' x 10'	6/1/90 13:55	14:35		5 1/2'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	GW	Airport Fill* Silty sandy Gravel; slightly more sand & silt than elsewhere; 10% rounded cobbles up to 6" diameter; dry to moist	Bare gravel/soil surface; occasional weeds and grass
1	S-1			
	R-2		18" - TD As above; slightly coarser, less silt; moister with depth; minor roots to 4'	
2	R-3			
3	R-4	GW		
4	R-5			
5				GWT = 5 1/2'
6			TD = 6'	
7				
8				
9				
10			* Area to 110' N of fence was leveled in summer, 1987	

MORRISON-KNUDSEN ENGINEERS, INC.
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SHEET	TEST PIT NO.
1 of 1	T-17

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UNTRA GUNNISON	PROCESSING SITE	Ditch; W edge of pile	3885-40	T-18

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY
B. Cadwell (laborer)	Hand dig - shovel	1' x 1'	6/2/90	6/2/90		—	Eerik Rennat (on 6/4/90)

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	CL	0 - 8" Sandy silty Clay; wet; grass and grass roots; plastic, medium brown; 5% ± sand	4' NE of center of ditch (total flow: ½ - 1 cfs)
1	R-2	CL		3" deep water; pasture grasses
2			8" - TD Sandy Clay with gravel; slight coarsening with depth	
3			estimated: - 50% medium brown plastic clay	
4			- trace silt	
			- 20% medium sand	
5			- 25% alluvial gravel; rounded, up to 2" diameter; igneous and metamorphic rocks	
6				
7			TD = 20"	
8				Hole left open; filled and reclaimed on 6/6/90
9				
10				

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SHEET	TEST PIT NO.
1 OF 1	T 18

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA GUNNISON	PROCESSING SITE	Ditch; W edge of pile	3885-40	T-19

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
B Cadwell (laborer)	hand dug · shovel	1'x1'	6/2/90	6/2/90		—	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	ML	0-8" Organics and clayey Silt; grass and grass roots medium brown; trace of sand; wet	1" deep water; 2' E of fence and center of ditch, pasture grasses
1	R-2	SC	8" - TD Clayey Sand w/ Gravel, slight coarsening with depth; estimated - 20% clay & silt - 50% sand, medium to coarse - 30% alluvial gravel, rounded, maximum diameter 3"	
2				
3				
4				
5			-TD=18"-	
6				
7				
8				Hole left open, filled and reclaimed on 6/6/90
9				
10				

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SHEET	TEST PIT NO.
1 of 1	T-19

1420

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
[illegible]	GUNNISON	MILL AREA	3885 40	T-20

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
WIREMAN	BACKHOE	3'x 14'	5-31-90	5-31-90		5.8'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R	SP-GP	GRAVELLY SAND, with some fines, dark brown, damp-dry, medium dense-dense, with rounded cobbles to 5" diam	
	R			
2	R, B		1' light brown, dry, sandier, medium-coarse-grained, with pea gravel and larger cobbles to 7" diam., no fines	
4				
6			6' wet, brown, cobbles to 8" diam	
8				
10			BOTTOM OF HOLE = 10'	
12				
14				
16				
18				
20				

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SHEET	TEST PIT NO.
1 of 1	T 20

[redacted]

[redacted]	LOCATION	JOB NO.	TEST PIT NO.
	[illegible]	3885-40	T-21

[redacted]	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
		8'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	ML	0-6": Silty Topsoil, 25% cobbles; grass roots; slightly moist	
1				
2	R-2	GW	6"-TD Sandy Gravel, well graded; medium sand; 40% rounded alluvial cobbles (igneous & metamorphic rocks), maximum diameter: 10"; damp	
3	R-3			
4				slight caving of hole
5				
6				
7				
8				▽ GWT = 8'
9				
10			TD = 10'	

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SHEET	TEST PIT NO.
1 OF 1	T-21

TD Total Depth GWT Ground Water Table

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
[illegible]	PROCESSING SITE	near S boundary; S of water tower	3885-40	T-22

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
J. Partch	Deere 5108 Backhoe	[illegible]	5/31/90 9:55A	70:50A		9½'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	GW	0 - 1½' Silty sandy Gravel; dry to slighly moist; grass and small tree roots, 25% cobbles up to 6" diameter	Small ditch, 20' S at site boundary, is dry.
1	R-2		1½ - 3' Sandy Gravel; mostly dry; brown; - 40% rounded alluvial cobbles up to 8" diameter - 20% medium to coarse sand; no fines	
2	R-3	GW		
3			3' - TD As above; slightly moist to moist, wet below 9'	
4				
5				
6				
7				
8				
9				▽ GWT = 9.5'
10			TD = 10½' (10½ is maximum reach of backhoe due to position on rise)	

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SHEET	TEST PIT NO.
1 OF 1	T-22

TD - Total Depth GWT - Ground Water Table

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
[illegible]	[illegible]	SOUTH EDGE OF PROPERTY	3885 40	T-23

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
WIREMAN	BACKHOE	3'×11'	5-31-90	5-31-90		7'	M. STOFFEL

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R.	SM ML	Silty fine sand, with some clay, dark brown, dry-damp, with roots (TOPSOIL)	hole is excavated about 10' N of its originally surveyed location
2	R.B	SM	Silty sand, with some clay, brown, some rounded gravels, mostly pea size to 1" diam. 2' Interface between contaminated and uncontaminated material	
4		GP	Sandy Gravels, brown, damp, coarse-grained sand	
6			more gravels with depth, increasing to cobble size to 9" diam.	
8			6.7' wet	
			BOTTOM OF HOLE = 9'	
10				
12				
14				
16				
18				
20				

MORRISON-KNUDSEN ENGINEERS, INC.
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SHEET 1 OF 1

TEST PIT NO. T-23

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
[illegible]	PROCESSING SITE	Mill yard	3885-40	T-24

GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
	8 1/2'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
	R-1	GW	0-10" Silty sandy Gravel; dry; grass roots; 10% rounded cobbles	
	R-2 R-3	GW	10"-4' Sandy Gravel; trace silt; slightly moist; 30% rounded cobbles up to 8" diameter; occasional orange iron staining	some caving of hole
		GW	4'-TD As above; no silt, more and coarser sand (30%) less cobbles (20%); considerable iron staining below 7'; damp, wet below 8'	▽ GWT = 8 1/2'
			TD = 9 1/2'	

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SHEET	TEST PIT NO.
1 OF 1	T-24

D - Disturbed Sample S - Bulk Sample TD - Total Depth GWT - Ground Water Table

TEST PIT LOG

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA - GUNNISON	PROCESSING SITE	Mill yard; 200' S of pile	3885-40	T-25

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY
PJ Partch	Deere 510B Backhoe	3'	5/31/90 13:45	1/4/20		5'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	GW	0 - 1½' Sandy silty Gravel; brown-gray; slightly moist; small tree roots, 20% rounded alluvial cobbles up to 5" diameter	
1				
½	R-2			
3	R-3	GW	1½' - TD As above, less silt (trace); slight coarsening with depth; up to 30% cobbles up to 8" diameter	
4				— harder digging
5			some iron staining near GWT	▽ GWT = 5'
6				(Depths to standing water: 14:05 7.0' 15:05 5.0')
7				
			TD = 7½'	
8				
9				
10				

MORRISON-KNUDSEN ENGINEERS, INC.
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SHEET 1 OF 1

TEST PIT NO. T-25

R - Radiological Sample S - Bulk Sample TD - Total Depth. GWT - Ground Water Table

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA - GUNNISON	PROCESSING SITE	SW of pile	3885-40	T-26

CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
Parich	Deere 510B Backhoe	17 x 14	5/31/90 16:00	6/6/45		3 1/2'	Eerik Rennat

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1		0 - TD Sandy Gravel; trace of silt; 40% rounded alluvial cobbles up to 8" diameter; slightly moist (wet at depth); less sand-size material than adjacent holes (15%); occasional roots to 3'	Occasional grass & small aspen trees on gravel surface
1	S-1			
	R-2			
2	R-3	GW		
3				▽ GWT = 3 1/2'
4				
5			} (6/6/90) During pump test: oily layer noted at 56"-60" depth, primarily on W side of pit; some small roots at this level - probably an earlier ground surface	(6/6/90) During pump test: most inflow is from W side of trench; probably recharging from flowing irrigation ditch 150' to W
6				
7				- some caving of hole
8			TD = 8.2'	- left open for pump test
9				
10				- backfilled at 18:30; 6/6/90

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SHEET	TEST PIT NO.
1 of 1	T-26

4420 R - Radiological Sample S - Bulk Sample TD - Total Depth GWT - Ground Water Table

PROJECT	SITE	LOCATION	JOB NO.	TEST PIT NO.
UMTRA - GUNNISON	PROCESSING SITE	SW corner of site	3885-40	T-27

CONTRACTOR AND EQUIPMENT	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:
[illegible]	[illegible]	[illegible]	5/31/90	[illegible]		4.2'	Eerik Rennat

DEPTH	SAMPLE No.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R-1	GW	0 - 1½' Sandy silty Gravel; slightly moist, grass and small tree roots; 20% rounded alluvial cobbles up to 6" diameter; igneous & metamorphic rocks	Grassy surface; nearby bushes and small trees
1	R-2			
2		GW	1½' - TD As above; moist to wet; slight trace of silt; slightly more cobbles; a few roots to 3½' depth	
3				
4				▽ GWT = 4.2'
5			TD = 5'	
6				
7				
8				
9				
10				

MORRISON-KNUDSEN ENGINEERS, INC.
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SHEET	TEST PIT NO.
1 OF 1	T-27

R - Radiological Sample S - Bulk Sample TD - Total Depth GWT - Ground Water Table

TEST PIT LOG

[redacted]						LOCATION	JOB NO.	TEST PIT NO.
						MILL AREA	3885-40	T-28
CONTRACTOR	EXCAVATION METHOD	SIZE	BEGUN	COMPLETED	GROUND ELEV.	GR. WATER DEPTH	LOGGED BY:	
WIREMAN	BACKHOE	3' x 13'	5-31-90	5-31-90		4.9'	M. STOFFEL	

DEPTH	SAMPLE NO.	GRAPHIC LOG	MATERIAL DESCRIPTION AND CLASSIFICATION	REMARKS PHOTOGRAPH
0	R	SP-GP	Gravelly Sand, trace of clay, with cobbles to 6" diam., damp-dry, medium dense; dark brown	
	R			
	R		3' some pieces of wood	
			4' black "oily" soil, with strong odor, possibly petroleum products; cobbles increasing in size to 8" diam.	5.8' WATER COMING INTO HOLE
				10:50am WL = 5.8'
				1:40pm WL = 4.9'
10			BOTTOM OF HOLE = 10'	

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY

SHEET	TEST PIT NO.
1 OF 1	T-28

VENDOR LABORATORY COMPOSITE SOIL SAMPLE MEASUREMENTS: SIEVE ANALYSIS AND RADIOLOGICAL MEASUREMENTS FOR COMPOSITE SOIL SAMPLES <#4 AND >#4 MESH SIEVE COBBLY SUBSOIL INVESTIGATION

JUNE 1990

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE (216) 523-5600/TELEX 985542

REPLY TO: MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

90-3050-548

August 9, 1990

Mr. Mark L. Matthews
Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Information on Gunnison requested by TAC

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

This letter is provided to transmit information that has recently been requested by various persons at the TAC.

Attachment 1 contains laboratory test results for gradations, water content, specific gravity and absorption for the Disposal Site and gradations for the pile and subpile area of the Processing Site which were requested by Paul Darr and Jim Crain.

Attachment 2 contains laboratory test results on Ra-226 and Th-230 for the Processing Site which were requested by Doug Gonzales.

Attachment 3 contains Estimates of employee numbers which was prepared by MKES and was requested by Sandy Beranich.

If you have any questions, please contact John Briggs or Rob Cooney of my staff at 766-3093.

Sincerely,

MK-Ferguson Company

J. G. Oldham
Project Director

JGO/REC/JRB/sls
Enclosure
cc: P. Mann - DOE/UMTRA (w/enc.)
C. Smythe - DOE/UMTRA (w/o enc.)
D. Bierley - TAC/UMTRA (w/enc.)
4513K R. R.

bcc: R. E. Cooney (w/enc.)
D. R. Sanders - MKES (w/o enc.)
J. R. Briggs (w/enc.)
File - EDT (w/enc.)
File (w/o enc.)

RMB

MKE DOC.3885-GUN-L-09-01094-00

Lincoln DeVore, Inc.
Geotechnical Consultants
1441 Motor St.
Grand Junction, CO 81505
(303) 242-8968

July 9, 1990

Mr. Eerik A. Rennat
Morrison-Knudsen Environmental Services, Inc.
180 Howard Street
San Francisco, CA 94105

Re: Sieve Analysis
Gunnison, CO

Dear Mr. Rennat:

Enclosed please find two copies of corrected Seive Analysis regarding above captioned job.

If we can be of any further assistance to you, please do not hesitate to contact this office at any time.

Respectfully submitted,

LINCOLN DeVORE, Inc.

By:
Edward M. Morris
Branch Manager

LD Job No.: 72199-J

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-2 9 1/2' - 10'

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"	7363	40.48	59.52%
3"	9603	52.80	47.20%
2"	10568	58.10	41.90%
1-1/2"	10649	58.55	41.45%
1"	11523	63.35	36.65%
3/4"	11906	65.46	34.54%
1/2"	12631	69.45	30.55%
3/8"	13048	71.74	28.26%
#4	13562	74.57	25.43%
#10	14233	78.25	21.75%
#20	15091	82.97	17.03%
#40	16107	88.56	11.44%
#100	17138	94.23	5.77%
#200	17516	96.31	3.69%

SIEVE ANALYSIS
Soil Wt. gm
18188.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-4 14' Slightly Cemented

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"	0	0	100.00%
7"	0	0	100.00%
6"	6100	34.42	65.58%
5"	6100	34.42	65.58%
4"	6100	34.42	65.58%
3"	6100	34.42	65.58%
2"	7360	41.53	58.47%
1-1/2"	8850	49.93	50.07%
1"	10930	61.67	38.33%
3/4"	11980	67.59	32.41%
1/2"	12870	72.61	27.39%
3/8"	13500	76.17	23.83%
#4	14332	80.86	19.14%
#10	14710	82.99	17.01%
#20	15302	86.33	13.67%
#40	16139	91.06	8.94%
#100	17124	96.61	3.39%
#200	17483	98.64	1.36%

SIEVE ANALYSIS
Soil Wt. gm
17724.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-6 12.25' - 13'

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"	1591	8.01	91.99%
3"	4998	25.17	74.83%
2"	6357	32.01	67.99%
1-1/2"	8491	42.75	57.25%
1"	10684	53.80	46.20%
3/4"	12053	60.69	39.31%
1/2"	13736	69.16	30.84%
3/8"	14515	73.09	26.91%
#4	15719	79.15	20.85%
#10	16310	82.12	17.88%
#20	17340	87.31	12.69%
#40	19026	95.80	4.20%
#100	19672	99.05	.95%
#200	19716	99.27	.73%

SIEVE ANALYSIS
Soil Wt. gm
19860.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-8 6' - 7' Interface

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"		0	100.00%
3"	0	0	100.00%
2"	3700	24.18	75.82%
1-1/2"	4450	29.08	70.92%
1"	5600	36.60	63.40%
3/4"	6665	43.56	56.44%
1/2"	7420	48.50	51.50%
3/8"	7910	51.70	48.30%
#4	8710	56.93	43.07%
#10	9250	60.46	39.54%
#20	10176	66.51	33.49%
#40	11299	73.85	26.15%
#100	12897	84.29	15.71%
#200	13304	86.95	13.05%

SIEVE ANALYSIS
Soil Wt. gm
15300.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-10 8 1/2' - 9 1/2' Slightly Cemented

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"		0	100.00%
3"	2632	22.39	77.61%
2"	3457	29.41	70.59%
1-1/2"	5586	47.52	52.48%
1"	6208	52.81	47.19%
3/4"	7069	60.13	39.87%
1/2"	7682	65.35	34.65%
3/8"	8134	69.19	30.81%
#4	8817	75.00	25.00%
#10	9285	78.98	21.02%
#20	9835	83.66	16.34%
#40	10586	90.05	9.95%
#100	11185	95.14	4.86%
#200	11296	96.09	3.91%

SIEVE ANALYSIS
Soil Wt. gm
11756.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-15

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"		0	100.00%
3"	2090	10.83	89.17%
2"	2560	13.26	86.74%
1-1/2"	6570	34.04	65.96%
1"	8720	45.18	54.82%
3/4"	10010	51.87	48.13%
1/2"	11600	60.10	39.90%
3/8"	12580	65.18	34.82%
#4	14400	74.61	25.39%
#10	15450	80.05	19.95%
#20	16595	85.98	14.02%
#40	17840	92.44	7.56%
#100	18771	97.26	2.74%
#200	18953	98.20	1.80%

SIEVE ANALYSIS
Soil Wt. gm
19300.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-17 0' - 2'

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"		0	100.00%
3"	2210	15.90	84.10%
2"	4770	34.32	65.68%
1-1/2"	5650	40.65	59.35%
1"	6680	48.06	51.94%
3/4"	7380	53.09	46.91%
1/2"	8120	58.42	41.58%
3/8"	8560	61.58	38.42%
#4	9734	70.03	29.97%
#10	10250	73.74	26.26%
#20	10849	78.05	21.95%
#40	11599	83.45	16.55%
#100	12633	90.88	9.12%
#200	13070	94.03	5.97%

SIEVE ANALYSIS
Soil Wt. gm
13900.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-20 3'

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"	7040	34.65	65.35%
3"	9043	44.50	55.50%
2"	10050	49.46	50.54%
1-1/2"	12350	60.78	39.22%
1"	14250	70.13	29.87%
3/4"	15228	74.94	25.06%
1/2"	15970	78.59	21.41%
3/8"	16630	81.84	18.16%
#4	17520	86.22	13.78%
#10	18030	88.73	11.27%
#20	18893	92.98	7.02%
#40	19555	96.24	3.76%
#100	20117	99.00	1.00%
#200	20207	99.44	.56%

SIEVE ANALYSIS
Soil Wt. gm
20320.00

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-23 2' - 21/2'

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"		0	100.00%
5"		0	100.00%
4"		0	100.00%
3"		0	100.00%
2"		0	100.00%
1-1/2"	0	0	100.00%
1"	55	3.02	96.98%
3/4"	82	4.55	95.45%
1/2"	156	8.71	91.29%
3/8"	209	11.53	88.47%
#4	258	14.23	85.77%
#10	315	17.39	82.61%
#20	470	25.92	74.08%
#40	824	45.47	54.53%
#100	1299	71.69	28.31%
#200	1420	78.35	21.65%

SIEVE ANALYSIS
Soil Wt. gm
1811.90

PROJECT LOCATION: Gunnison Processing Site
SAMPLE LOCATION: T-26 0' - 2'

SIEVE No.	SOIL Wt. gm	% Retained	% Finer
8"		0	100.00%
7"		0	100.00%
6"	0	0	100.00%
5"	5387	26.97	73.03%
4"	7296	36.53	63.47%
3"	10159	50.86	49.14%
2"	11576	57.96	42.04%
1-1/2"	12422	62.19	37.81%
1"	13557	67.88	32.12%
3/4"	14306	71.63	28.37%
1/2"	15034	75.27	24.73%
3/8"	16481	82.52	17.48%
#4	17074	85.49	14.51%
#10	17516	87.70	12.30%
#20	17705	88.64	11.36%
#40	18572	92.99	7.01%
#100	19529	97.78	2.22%
#200	19697	98.62	1.38%

SIEVE ANALYSIS
Soil Wt. gm
19973.00

BARRINGER LABORATORIES INC.

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SPARKS NEVADA 89431
PHONE (702) 356-1198

23-Jul-90

277-1687

Helene Langlois
MK-FERGUSON (Gunnison)
P.O. Box 9136
Albuquerque, NM 87119

Page: 1
Copy: 2 of 3
Set : 1

Attn:
Project: Gunnison

Received: 19-Jun-90 15:19
PO #: 3050-511-10004 #006

Job: 902621E

Status: Final

Sample Type: Soil Method 705

Sample Id	Ra-226 Total pCi/g	Error 2σ*	Th-230 Total pCi/g	Error 2σ*
GUN-SS-0001-T-3-CELL	54	±4	200	±10
GUN-SS-0002-T-3-CELL	27	±3	103	±4
GUN-SS-0003-T-3-CELL	15	±2	116	±4
GUN-SS-0004-T-4-CELL	110	±10	91	±4
GUN-SS-0005-T-4-CELL	20	±2	16	±2
GUN-SS-0006-T-13-CELL	130	±10	62	±3
GUN-SS-0007-T-13-CELL	3.7	±0.9	19	±2
GUN-SS-0008-T-13-CELL	7.5	±1.3	39	±3
GUN-SS-0009-T-13-CELL	9.6	±1.5	16	±2
GUN-SS-0010-T-13-CELL	5.4	±1.2	17	±2
GUN-SS-0011-T-15-CELL	2.8	±0.9	30	±2
GUN-SS-0012-T-15-CELL	4.1	±1.0	102	±4
GUN-SS-0013-T-15-CELL	2.4	±0.8	88	±4
GUN-SS-0014-T-15-CELL	2.7	±0.8	105	±4
GUN-SS-0015-T-15-CELL	3.8	±1.0	210	±10
GUN-SS-0016-T-20-CELL	120	±10	62	±3
GUN-SS-0017-T-20-CELL	8.7	±1.4	7.6	±1.2
GUN-SS-0018-T-20-CELL	4.5	±1.1	3.4	±0.8
GUN-SS-0019-T-21-CELL	7.8	±1.4	6.5	±1.1
GUN-SS-0020-T-21-CELL	19	±2	21	±2
GUN-SS-0021-T-21-CELL	1.9	±0.7	4.6	±0.9
GUN-SS-0022-T-22-CELL	3.8	±0.9	2.3	±0.7
GUN-SS-0023-T-22-CELL	2.1	±0.7	0.9	±0.5
GUN-SS-0024-T-22-CELL	4.6	±1.0	1.1	±0.5
GUN-SS-0025-T-23-CELL	2.0	±0.7	1.4	±0.5
GUN-SS-0026-T-23-CELL	1.3	±0.6	1.1	±0.5
GUN-SS-0027-T-24-CELL	1.4	±0.6	1.5	±0.6
GUN-SS-0028-T-24-CELL	1.3	±0.6	1.4	±0.5
GUN-SS-0029-T-24-CELL	1.5	±0.6	0.7	±0.4
GUN-SS-0030-T-25-CELL	3.4	±1.0	2.5	±0.7

pile

BARRINGER LABORATORIES INC.

GOLDEN COLORADO
PHONE
SPARKS NEVADA
PHONE

6-Jul-90

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Attn:
Project: Gunnison

Received: 19-Jun-90 08:48
PO #: 3050-511-10004 #003

Job: 902623F

Status: Final

Sample Type: Soil

Sieve Analysis

$t_{n-1(9)} = 2.262$

Sample Id		% of tot.wt.
GUN-SS-0001-T2-SPL	(Passing Fraction) #4	22
GUN-SS-0002-T4-SPL		20
GUN-SS-0003-T6-SPL		23
GUN-SS-0004-T8-SPL		27
GUN-SS-0005-T10-SPL		17
GUN-SS-0006-T15-SPL		25
GUN-SS-0007-T17-SPL		40
GUN-SS-0008-T20-SPL		20
GUN-SS-0009-T23-SPL		85
GUN-SS-0010-T26-SPL		22
GUN-SS-0001-T2-SPL	(Non-Passing Fraction)	78
GUN-SS-0002-T4-SPL		80
GUN-SS-0003-T6-SPL		77
GUN-SS-0004-T8-SPL		73
GUN-SS-0005-T10-SPL		83
GUN-SS-0006-T15-SPL		75
GUN-SS-0007-T17-SPL		60
GUN-SS-0008-T20-SPL		80
GUN-SS-0009-T23-SPL		15
GUN-SS-0010-T26-SPL		78

$26 \pm \frac{22}{\sqrt{10}} 2.26$

$n = 26 \pm 15.7$

$\bar{x} \pm t_{\frac{1-c}{2}(n-1)} \frac{s}{\sqrt{n}}$

<26>

s = 22

<70>

$m = \epsilon(M+m)$

$M = (1-\epsilon)(M+m)$

$\bar{c} = \frac{Mc + mc}{M+m}$

$\bar{c} = (1-\epsilon)c + \epsilon c$

maximize % in fines

26 ± 16

10

4 2.1

average 26

average 106

2 of 4

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23-Jul-90

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Page: 2
Copy: 2 of 3
Set : 1

Received: 19-Jun-90 15:19

Attn:
Project: Gunnison

PO #: 3050-511-10004 #006

Status: Final

Job: 902621E

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ*	Th-230 Total pCi/g	Error 2σ*
GUN-SS-0031-T-25-CELL	1.2	±0.6	1.2	±0.5
GUN-SS-0032-T-25-CELL	1.3	±0.6	0.8	±0.4
GUN-SS-0033-T-26-CELL	0.9	±0.5	0.6	±0.4
GUN-SS-0034-T-26-CELL	1.3	±0.6	0.8	±0.4
GUN-SS-0035-T-26-CELL	1.5	±0.6	0.8	±0.4
GUN-SS-0036-T-27-CELL	1.0	±0.5	0.8	±0.4
GUN-SS-0037-T-27-CELL	1.3	±0.6	1.3	±0.5
GUN-SS-0038-T-28-CELL	3.6	±1.0	4.3	±0.9
GUN-SS-0039-T-28-CELL	2.3	±0.9	1.4	±0.5
GUN-SS-0040-T-28-CELL	2.9	±0.9	2.1	±0.6
GUN-SS-0041-T-1-CELL	1.7	±0.7	93	±4
GUN-SS-0042-T-1-CELL	3.1	±0.3	58	±3
GUN-SS-0043-T-1-CELL	1.3	±0.6	7.7	±1.2
GUN-SS-0044-T-1-CELL	3.8	±1.0	240	±10
GUN-SS-0045-T-2-CELL	2.5	±0.8	83	±4
GUN-SS-0046-T-2-CELL	6.6	±1.3	190	±10
GUN-SS-0047-T-2-CELL	4.0	±1.0	60	±3
GUN-SS-0048-T-2-CELL	6.4	±1.2	51	±3
GUN-SS-0049-T-2-CELL	5.4	±1.1	54	±3
GUN-SS-0050-T-5-CELL	4.6	±1.0	69	±3
GUN-SS-0051-T-5-CELL	8.3	±1.4	55	±3
GUN-SS-0052-T-6-CELL	1.0	±0.5	2.6	±0.7
GUN-SS-0053-T-6-CELL	1.4	±0.6	1.0	±0.5
GUN-SS-0054-T-6-CELL	1.0	±0.5	1.9	±0.6
GUN-SS-0055-T-6-CELL	1.5	±0.6	0.9	±0.5
GUN-SS-0056-T-7-CELL	2.2	±0.7	74	±4
GUN-SS-0057-T-7-CELL	4.4	±1.0	92	±4
GUN-SS-0058-T-7-CELL	4.1	±1.0	32	±2
GUN-SS-0059-T-7-CELL	2.5	±0.8	11	±1
GUN-SS-0060-T-8-CELL	3.2	±0.9	140	±10

BARRINGER LABORATORIES INC.

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23-Jul-90

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Attn:
Project: Gunnison

Received: 19-Jun-90 15:19
PO #: 3050-511-10004 #006

Job: 902621E

Status: Final

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ*	Th-230 Total pCi/g	Error 2σ*
GUN-SS-0061-T-9-CELL	2.3	±0.8	84	±4
GUN-SS-0062-T-9-CELL	2.1	±0.8	73	±4
GUN-SS-0063-T-10-CELL	2.3	±0.8	99	±4
GUN-SS-0064-T-10-CELL	2.9	±0.9	103	±4
GUN-SS-0065-T-10-CELL	8.4	±1.4	22	±2
GUN-SS-0066-T-10-CELL	0.4	±0.4	5.2	±1.0
GUN-SS-0067-T-11-CELL	21	±2	21	±2
GUN-SS-0068-T-11-CELL	3.6	±0.9	3.0	±0.8
GUN-SS-0069-T-11-CELL	2.5	±0.8	2.1	±0.5
GUN-SS-0070-T-11-CELL	3.7	±1.1	68	±3
GUN-SS-0071-T-11-CELL	3.6	±1.0	130	±10
GUN-SS-0072-T-12-CELL	29	±3	14	±2
GUN-SS-0073-T-12-CELL	25	±2	11	±1
GUN-SS-0074-T-12-CELL	4.6	±1.0	1.7	±0.6
GUN-SS-0075-T-14-CELL	2.0	±0.8	2.2	±0.7
GUN-SS-0076-T-14-CELL	0.8	±0.5	0.7	±0.4
GUN-SS-0077-T-16-CELL	2.8	±0.8	2.2	±0.7
GUN-SS-0078-T-16-CELL	1.4	±0.6	1.0	±0.5
GUN-SS-0079-T-16-CELL	1.0	±0.5	1.5	±0.6
GUN-SS-0080-T-16-CELL	0.8	±0.5	0.7	±0.4
GUN-SS-0081-T-16-CELL	1.6	±0.6	7.7	±1.2
GUN-SS-0082-T-16-CELL	2.2	±0.7	80	±4
GUN-SS-0083-T-16-CELL	2.7	±0.8	58	±3
GUN-SS-0084-T-17-CELL	2.1	±0.7	1.5	±0.6
GUN-SS-0085-T-17-CELL	19	±2	12	±1
GUN-SS-0086-T-17-CELL	2.2	±0.7	2.3	±0.7
GUN-SS-0087-T-17-CELL	1.5	±0.6	0.9	±0.4
GUN-SS-0088-T-17-CELL	1.4	±0.6	1.8	±0.6
GUN-SS-0089-T-18-CELL	1.4	±0.6	1.7	±0.6
GUN-SS-0090-T-18-CELL	4.9	±1.1	1.0	±0.5

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23-Jul-90

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Attn:
Project: Gunnison

Received: 19-Jun-90 15:19
PO #: 3050-511-10004 #006

Job: 902621E

Status: Final

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ*	Th-230 Total pCi/g	Error 2σ*
GUN-SS-0091-T-19-CELL	8.3	±1.4	37	±3

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SPARKS NEVADA 89431
PHONE: (702) 358 1158

23-Jul-90

Helene Langlois
MK-FERGUSON (Gunnison)
P.O. Box 9136
Albuquerque, NM 87119

Page: 1
Copy: 1 of 3
Set : 1

Attn:
Project: Gunnison

Received: 21-Jun-90 10:20
PO #: 3050-511-10004 #007

Job: 902644E

Status: Final

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ*	Th-230 Total pCi/g	Error 2σ*
GUN-SS-0092-T-19	13	±2	130	±10
GUN-SS-0093-T-8	2.4	±0.8	200	±10

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE EREVIEW PLAZA
CLEVELAND OHIO U S A 44114
PHONE (216) 523 5600 TELEX 985542

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR UMTRA PROJECT
PO BOX 9136
ALBUQUERQUE NEW MEXICO U S A 87119

October 9, 1990

90-3050-719

Mr. Mark L. Matthews
Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Requested Data for Gunnison Site

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

As per request from the Gunnison Design Planning Meeting on September 19, 1990, please forward the amended Barringer Report and test pit logs T-1 through T-28 to Doug Gonzales, and the test pit logs L-1 through L-14 to Paul Darr.

If you have any questions, please contact John Briggs or Rob Cooney of my staff at 766-1667.

Sincerely,

MK-Ferguson Company

J. G. Oldham
Project Director

JGO/REC/JRB/sls

Enclosures

cc: D. Leske - GRJ (w/o enc.)
R. Rager - TAC/UMTRA (w/enc.)
D. Gonzales - TAC/UMTRA (w/enc.)
P. Darr - TAC/UMTRA (w/enc.)

4692K

MKE DOC. 3885-GUN-R-09-01202-00

BARRINGER LABORATORIES INC.

18000 W. 8th Ave.
Golden, Colorado 80401
Phone: (303) 277-1557
FAX: (303) 277-1689

TELECOPY TRANSMITTAL

TO: MK-Ferguson
Greg Richardson

FROM: Dave Lasher, Gary Zito

DATE: 7-17

WE ARE SENDING 4 PAGES.

For
Doug Gonzales

BARRINGER LABORATORIES INC.

[illegible] W 8TH AVE. SUITE [illegible]
GOLDEN COLORADO 80401
PHONE (303) 277 1687

1455 DEMING WAY, SUITE 16
SPARKS NEVADA 89431
PHONE: [illegible]

16-Jul-90

Helene Langlois
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P.O. Box 9136
Albuquerque, NM 87119

Page: 1
Copy: 1 of 2
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Attn:
Project: Gunnison

Received: 19-Jun-90 08:46
PO #: 3050-511-10004 #005

Job: 902623E

Status: Final

AMENDED REPORT

Sample Type: Soil 196 ppm

Sample Id	As µg/g	Pb µg/g	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Pas.Frac.)	124	8	
GUN-SS-0002-T4-SPL 14'	175	24	
GUN-SS-0003-T6-SPL 12.25'-13'	9.7	4	pile
GUN-SS-0004-T8-SPL 6'-7'	89	16	
GUN-SS-0005-T10-SPL 8.5'-9.5'	10.3	10	
GUN-SS-0006-T15-SPL 0-2'	2.4	9	
GUN-SS-0007-T17-SPL 0-2'	5.8	14	
GUN-SS-0008-T20-SPL 3' 1'-2'b	1.2	4	
GUN-SS-0009-T23-SPL 25'	1.4	9	
GUN-SS-0010-T26-SPL 0-2'	1.3	6	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Non-Pass) 1'	7.1	4	pile
GUN-SS-0002-T4-SPL 14'	24.1	5	
GUN-SS-0003-T6-SPL 12.25'-13' 1'	5.5	5	
GUN-SS-0004-T8-SPL 6'-7' 1'	37.8	4	
GUN-SS-0005-T10-SPL 8.5'-9.5'	2.4	2	
GUN-SS-0006-T15-SPL 0-2'	1.2	3	
GUN-SS-0007-T17-SPL 0-2'	1.2	4	
GUN-SS-0008-T20-SPL 3'	6.2	10	
GUN-SS-0009-T23-SPL 25'	1.1	4	
GUN-SS-0010-T26-SPL 0-2'	0.8	5	

Sample Id	Se µg/g	Ra-226 Total pCi/g	Error 2σ*	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Pas.Frac.)	<0.1	4.6	±1.0	
GUN-SS-0002-T4-SPL 14'	<0.1	4.2	±1.1	pile
GUN-SS-0003-T6-SPL 12.25'-13'	<0.1	1.4	±0.6	
GUN-SS-0004-T8-SPL 6'-7'	<0.1	4.0	±1.0	
GUN-SS-0005-T10-SPL 8.5'-9.5'	<0.1	3.0	±0.9	

BARRINGER LABORATORIES INC.

COLDEN, COLORADO 80401
PHONE (303) 277 1687

1400 DEMING WAY, SUITE 18
SPARKS, NEVADA 89431
PHONE (702) 358 1180

16-Jul-90

Helene Langlois
MK-FERGUSON (Gunnison)
P.O. Box 9136
Albuquerque, NM 87119

Page: 2
Copy: 1 of 2
Set : 1

Attn:
Project: Gunnison

Received: 19-Jun-90 08:46
PO #: 3050-511-10004 #005

Job: 902623E

Status: Final

AMENDED REPORT

Sample Type: Soil

Sample Id	Se µg/g	Ra-226 Total pCi/g	Error 2σ*	
GUN-SS-0006-T15-SPL 0-2'	<0.1	2.5	±0.8	
GUN-SS-0007-T17-SPL 0-2'	<0.1	14	±2	
GUN-SS-0008-T20-SPL 3'	<0.1	1.6	±0.6	
GUN-SS-0009-T23-SPL 25'	<0.1	0.8	±0.5	
GUN-SS-0010-T26-SPL 0-2'	<0.1	1.3	±0.6	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Non-Pass)	<0.1	1.2	±0.6	>**
GUN-SS-0002-T4-SPL 14'	<0.1	3.2	±0.9	
GUN-SS-0003-T6-SPL 12.25'-13'	<0.1	1.3	±0.6	piles
GUN-SS-0004-T8-SPL 6'-7'	<0.1	1.5	±0.6	1.74
GUN-SS-0005-T10-SPL 8.5'-9.5'	<0.1	1.5	±0.6	
GUN-SS-0006-T15-SPL 0-2'	<0.1	1.2	±0.6	
GUN-SS-0007-T17-SPL 0-2'	<0.1	2.0	±0.7	off-pile
GUN-SS-0008-T20-SPL 3'	<0.1	1.8	±0.5	<1.74>
GUN-SS-0009-T23-SPL 25'	<0.1	1.3	±0.6	
GUN-SS-0010-T26-SPL 0-2'	<0.1	3.2	±0.9	

Sample Id	Th-230 Total pCi/g	Error 2σ*	Th-232 Total pCi/g	Error 2σ*	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Pas.Frac.)	180	±10	1.2	±0.6	
GUN-SS-0002-T4-SPL 14'	78	±4	0.9	±0.5	
GUN-SS-0003-T6-SPL 12.25'-13'	1.1	±0.5	1.1	±0.5	piles
GUN-SS-0004-T8-SPL 6'-7'	180	±10	1.5	±0.6	
GUN-SS-0005-T10-SPL 8.5'-9.5'	120	±10	1.9	±0.7	
GUN-SS-0006-T15-SPL 0-2'	3.7	±0.8	1.4	±0.6	
GUN-SS-0007-T17-SPL 0-2'	15	±3	0.8	±0.5	
GUN-SS-0008-T20-SPL 3'	1.1	±0.5	0.9	±0.5	
GUN-SS-0009-T23-SPL 25'	1.3	±0.5	1.2	±0.6	
GUN-SS-0010-T26-SPL 0-2'	1.0	±0.5	1.1	±0.5	

BARRINGER LABORATORIES INC.

19000 W. 6TH AVE., SUITE 300
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SPARKS, NEVADA 89431
PHONE (702) 358-1198

16-Jul-90

Helene Langlois
MK-FERGUSON (Gunnison)
P.O. Box 9136
Albuquerque, NM 87119

Page: 3
Copy: 1 of 2
Set : 1

Attn:
Project: Gunnison

Received: 19-Jun-90 08:46
PO #: 3050-511-10004 #005

Job: 902623E

Status: Final

AMENDED REPORT

Sample Type: Soil

Sample Id	Th-230 Total pCi/g	Error 2σ*	Th-232 Total pCi/g	Error 2σ*	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Non-Pass)	19	±2	0.5	±0.4	
GUN-SS-0002-T4-SPL 14'	6.2	±1.1	1.1	±0.5	
GUN-SS-0003-T6-SPL 12.25'-13'	1.3	±0.5	1.0	±0.5	pile
GUN-SS-0004-T8-SPL 6'-7'	19	±2	1.5	±0.6	
GUN-SS-0005-T10-SPL 8.5'-9.5'	10	±1	1.4	±0.6	
GUN-SS-0006-T15-SPL 0-2'	0.7	±0.4	1.1	±0.5	
GUN-SS-0007-T17-SPL 0-2'	1.2	±0.5	1.2	±0.6	off-pile
GUN-SS-0008-T20-SPL 3'	0.5	±0.4	0.7	±0.4	
GUN-SS-0009-T23-SPL 25' ?	0.9	±0.5	0.9	±0.5	
GUN-SS-0010-T26-SPL 0-2'	1.5	±0.5	0.6	±0.4	

< 11.1 pile
all < 6.037
< 0.967 off-pile

Sample Id	U Total µg/g	K-40 Total pCi/g(1)	Error 2σ*	K-40 Total pCi/g(2)	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Pas.Frac.)	56	4.0	±2.9	1.3	
GUN-SS-0002-T4-SPL 14'	82	0.0	±6.6	1.0	pile
GUN-SS-0003-T6-SPL 12.25'-13'	48	37	±3	1.3	
GUN-SS-0004-T8-SPL 6'-7'	46	47	±3	2.3	
GUN-SS-0005-T10-SPL 8.5'-9.5'	34	47	±3	1.8	
GUN-SS-0006-T15-SPL 0-2'	1.7	44	±3	1.8	
GUN-SS-0007-T17-SPL 0-2'	6.1	31	±4	1.9	off-pile
GUN-SS-0008-T20-SPL 3'	2.0	25	±3	1.4	
GUN-SS-0009-T23-SPL 25'	1.5	25	±3	1.6	
GUN-SS-0010-T26-SPL 0-2'	1.8	24	±3	1.3	
GUN-SS-0001-T2-SPL 9 1/4'-10'(Non-Pass)	9.8	25	±3	1.0	
GUN-SS-0002-T4-SPL 14'	40	26	±3	1.9	
GUN-SS-0003-T6-SPL 12.25'-13'	20	30	±3	1.6	
GUN-SS-0004-T8-SPL 6'-7'	4.8	29	±3	1.4	
GUN-SS-0005-T10-SPL 8.5'-9.5'	6.3	30	±3	1.5	

BARRINGER LABORATORIES INC.

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16-Jul-90

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Page: 4
Copy: 1 of 2
Set : 1

Attn:
Project: Gunnison

Received: 19-Jun-90 08:46
PO #: 3050-511-10004 #005

Job: 902623E

Status: Final

AMENDED REPORT

Sample Type: Soil

Sample Id	U Total µg/g	K-40 Total pCi/g(1)	Error 2σ*	K-40 Total pCi/g(2)
GUN-SS-0006-T15-SPL 0-2'	1.4	31	±3	1.6
GUN-SS-0007-T17-SPL 0-2'	1.5	36	±3	2.0
GUN-SS-0008-T20-SPL 3'	1.6	33	±3	1.9
GUN-SS-0009-T23-SPL 25'	1.3	38	±3	1.6
GUN-SS-0010-T26-SPL 0-2'	1.4	39	±3	1.6

(1) Note: As determined by gamma spectroscopy. Although an attempt was made to determine the extent of interference from Ra-226/Radon 222 within the Potassium-40 region of interest, problems were encoutered with these samples.

These results are the best available from our detection equipment and existing procedure. There is some doubt as to their accuracy.

(2) Note: As determined by UCP and the ratio K-40/K = 0.0118%.

SPARKS NEVADA
PHONE

6-Jul-90

que, NM 87119

Attn:
Project: Gunnison

Received: 19-Jun-90 08:46
PO #: 3050-511-10004 #003

Job: 902623F

Status: Final

Sample Type: Soil

Sample Id	Sieve Analysis % of tot.wt.
GUN-SS-0001-T2-SPL (Passing Fraction)	22
GUN-SS-0002-T4-SPL	20
GUN-SS-0003-T6-SPL	23
GUN-SS-0004-T8-SPL	27
GUN-SS-0005-T10-SPL	17
GUN-SS-0006-T15-SPL	25
GUN-SS-0007-T17-SPL	40
GUN-SS-0008-T20-SPL	20
GUN-SS-0009-T23-SPL	85
GUN-SS-0010-T26-SPL	22
GUN-SS-0001-T2-SPL(Non-Passing Fraction)	78
GUN-SS-0002-T4-SPL	80
GUN-SS-0003-T6-SPL	77
GUN-SS-0004-T8-SPL	73
GUN-SS-0005-T10-SPL	83
GUN-SS-0006-T15-SPL	75
GUN-SS-0007-T17-SPL	60
GUN-SS-0008-T20-SPL	80
GUN-SS-0009-T23-SPL	15
GUN-SS-0010-T26-SPL	78

ON-SITE RADIOLOGICAL MEASUREMENTS OF 1-FT DEPTH INCREMENT SOIL SAMPLES <#4 MESH SIEVE COBBLY SUBSOIL INVESTIGATION

JUNE 1990

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: [illegible]

GRID COORDINATES: T-1

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION [illegible]	WET	7-12-90	1122	1274.6	2.0	SEW
	DRY	7-13-90	1201	957.5	1.5	SEW
	UNEQUILIBRATED					
SAMPLE ID: [illegible]			EMANATION	0.25		
RSO REVIEW [signature]			TH-230		93	

DATE SAMPLED: 6-2-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: [illegible]
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1132
DRY WEIGHT: 623

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION [illegible]	WET	7-12-90	1123	1173.5	2.1	SEW
	DRY	7-13-90	1202	1234.7	2.3	SEW
	UNEQUILIBRATED					
[illegible]			EMANATION	-0.06		
RSO REVIEW [signature]			TH-230		61	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: [illegible]
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1132
DRY WEIGHT: 534

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION [illegible]	WET	7-12-90	1130	646.5	1.1	SEW
	DRY	7-13-90	1209	134.3	0.3	SEW
	UNEQUILIBRATED					
[illegible]			EMANATION	0.72		
RSO REVIEW [signature]			TH-230		7.7	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: [illegible]
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1132
DRY WEIGHT: 538

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 8-8.5'	WET	7-12-90	1132	2265.7	3.6	SEW
	DRY	7-13-90	1211	481.9	1.0	SEW
	UNEQUILIBRATED					
[illegible]			EMANATION	0.78		
RSO REVIEW [signature]			TH-230		240	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: [illegible]
DATE OPENED: 7-12-90
TIME OPENED: [illegible]
DATE RESEALED: 7-13-90
TIME RESEALED: 1132
DRY WEIGHT: 503

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-2

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 9.25-10'	WET	7-12-90	1139	1038.8	1.8	SEW
	DRY	7-13-90	1218	657.1	1.2	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0045			EMANATION	0.37		
RSO REVIEW			TH-230		82	

DATE SAMPLED: 6-2-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 578.2
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1142
DRY WEIGHT: 559

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 10-11'	WET	7-12-90	1140	3919.1	6.8	SEW
	DRY	7-13-90	1219	1891.4	3.2	SEW
	UNEQUILIBRATED					
GUN-SS-0046			EMANATION	0.52		
RSO REVIEW			TH-230		190	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 580.4 *
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1142
DRY WEIGHT: 590

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 11-11.5'	WET	7-12-90	1148	2414.0	4.2	SEW
	DRY	7-13-90	1251	928.1	1.8	SEW
	UNEQUILIBRATED					
GUN-SS-0047			EMANATION	0.62		
RSO REVIEW			TH-230		60	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 568.1
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1142
DRY WEIGHT: 530

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 12-12.5'	WET	7-12-90	1150	3346.0	6.1	SEW
	DRY	7-13-90	1252	2221.3	4.0	SEW
	UNEQUILIBRATED					
GUN-SS-0048			EMANATION	0.34		
RSO REVIEW			TH-230		51	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 549.8
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1142
DRY WEIGHT: 549

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/GUNNISON

GRID COORDINATES: T-2

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 13-13.5'	WET	7-12-90	1158	3339.5	5.5	SEW
	DRY	7-13-90	1300	2273.3	4.2	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0049 EMANATION 0.32

RSO REVIEW [signature] TH-230 54

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 609.6g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1248
DRY WEIGHT: 542

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-3

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 8.5'	WET	7/12/90	0751	31105	51.2	SEW
	DRY	7-13-90	0805	15659	27.3	SEW
3-6" BELOW INTERFACE	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0001			EMANATION	0.50		
RSO REVIEW			TH-230		200	

DATE SAMPLED: 6/1/90
TIME SAMPLED: —
DATE SEALED: 6/4/90
TIME SEALED: 1500
WET WEIGHT: 608 gm
DATE OPENED: 7/12/90
TIME OPENED: 0805
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 573

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 9.5-10'	WET	7/12/90	0752	16864	26.8	SEW
	DRY	7-13-90	0807	10441	17.8	SEW
	UNEQUILIBRATED					
GUN-SS-0002			EMANATION	0.38		
RSO REVIEW			TH-230		103	

DATE SAMPLED: 6/1/90
DATE SEALED: 6/4/90
WET WEIGHT: 629.2 gm
DATE OPENED: 7/12/90
TIME OPENED: 0805
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 585

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 10-11.5'	WET	7/12/90	0800	11587	15.6	SEW
	DRY	7-13-90	0814	7188	11.7	SEW
	UNEQUILIBRATED					
GUN-SS-0003			EMANATION	0.38		
RSO REVIEW			TH-230		116	

DATE SAMPLED: 6/1/90
DATE SEALED: 6/4/90
WET WEIGHT: 744.4 gm
DATE OPENED: 7/12/90
TIME OPENED: 0812
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 612

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-4

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 12.5-15'	WET	7/12/90	0801	56379	101.7	SEW
	DRY	7-13-90	0815	40158	74.0	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0004 EMANATION 0.29

RSO REVIEW [signature] TH-230 91

DATE SAMPLED: 5-31-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 554.5 g
DATE OPENED: 7/12/90
TIME OPENED: 0812
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 543

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 15-15.5'	WET	7/12/90	0808	10680	16.9	SEW
	DRY	7-13-90	0822	8441.2	14.7	SEW
	UNEQUILIBRATED					

GUN-SS-0005 EMANATION 0.21

RSO REVIEW [signature] TH-230 16

DATE SAMPLED: 5/31/90
DATE SEALED: 6-4-90
WET WEIGHT: 632.4 g
DATE OPENED: 7-12-90
TIME OPENED: 0824
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 575

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-5

INTERFACE AT 13.5'

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET	7-12-90	1159	3171.4	5.6	SEW
15-16'	DRY	7-13-90	1301	2410.5	4.3	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0050 EMANATION 0.24

RSO REVIEW [signature] TH-230 69

DATE SAMPLED: 6-2-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 563.9g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1248
DRY WEIGHT: 562

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET	7-12-90	1214	7955.7	12.6	SEW
16-17'	DRY	7-13-90	1325	6036.3	10.8	SEW
	UNEQUILIBRATED					

GUN-SS-0051 EMANATION 0.24

RSO REVIEW [signature] TH-230 55

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 632g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1310
DRY WEIGHT: 557

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION

RSO REVIEW TH-230

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION

RSO REVIEW TH-230

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-6

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 11.75-12.25'	WET	7-12-90	1223	4585	0.8	SEW
	DRY	7-13-90	1335	489.6	0.9	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0053			EMANATION	-0.07		
RSO REVIEW			TH-230		1.0	

DATE SAMPLED: 6-2-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 565.1
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1323
DRY WEIGHT: 564

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 12.25-13'	WET	7-12-90	1216	789.6	1.5	SEW
	DRY	7-13-90	1326	386.7	0.7	SEW
	UNEQUILIBRATED					
GUN-SS-0052			EMANATION	0.51		
RSO REVIEW			TH-230		2.6	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 538.3
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1310
DRY WEIGHT: 527
SEW ~~1323~~

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 13.25-13.75'	WET	7-12-90	1225	649.2	1.2	SEW
	DRY	7-13-90	1337	370.0	0.8	SEW
	UNEQUILIBRATED					
GUN-SS-0054			EMANATION	0.43		
RSO REVIEW			TH-230		1.9	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 531.2
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1323
DRY WEIGHT: 490

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 15.5-16'	WET	7-12-90	1328	946.6	1.7	SEW
	DRY	7-13-90	1344	574.5	1.0	SEW
	UNEQUILIBRATED					
GUN-SS-0055			EMANATION	0.39		
RSO REVIEW			TH-230		0.9	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 563.7
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1323
DRY WEIGHT: 551

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-7

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 12.5-13'	WET	7-12-90	1329	1304.6	2.5	SEW
	DRY	7-13-90	1345	845.3	1.7	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0056 EMANATION 0.35

RSO REVIEW [signature] TH-230 69

DATE SAMPLED: 6-2-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 523.8
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1323
DRY WEIGHT: 503

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 13-13.5'	WET	7-12-90	1337	3689.6	6.9	SEW
	DRY	7-13-90	1352	2272.0	4.1	SEW
	UNEQUILIBRATED					

GUN-SS-0057 EMANATION 0.38

RSO REVIEW [signature] TH-230 92

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 536.7 *
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1334
DRY WEIGHT: 552

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 13.5-14.5'	WET	7-12-90	1338	1836.0	3.3	SEW
	DRY	7-13-90	1354	1218.6	2.2	SEW
	UNEQUILIBRATED					

GUN-SS-0058 EMANATION 0.34

RSO REVIEW [signature] TH-230 32

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 564.9
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1334
DRY WEIGHT: 564

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 14.5-15'	WET	7-12-90	1300	1492.5	2.8	SEW
	DRY	7-13-90	1401	1135.9	2.0	SEW
	UNEQUILIBRATED					

GUN-SS-0059 EMANATION 0.24

RSO REVIEW [signature] TH-230 11

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 526.7 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1334
DRY WEIGHT: 570

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/Ferguson

GRID COORDINATES: T-8

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 6-7'	WET	7-12-90	1302	1919.2	2.9	SEW
	DRY	7-13-90	1402	1168.2	1.8	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-35-0060		EMANATION	0.39			
RSO REVIEW			TH-230	140		

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 658.6g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1334
DRY WEIGHT: 640

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 7-8'	WET	7-12-90	1614	2263.5	3.0	SEW
	DRY	7-13-90	1624	1633.5	2.6	SEW
	UNEQUILIBRATED					
GUN-35-0093		EMANATION	0.28			
RSO REVIEW			TH-230			

DATE SAMPLED: 6-1-90
DATE SEALED: 6-15-90
WET WEIGHT: 765.3g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1502
DRY WEIGHT: 637

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
		EMANATION				
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WEIGHT:
TIME OPENED:
DATE OPENED:
DATE RESEALED:
TIME RESEALED:
WEIGHT:

TH-230 results not completed as of 7/17/90

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
		EMANATION				
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WEIGHT:
TIME OPENED:
DATE OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/GUNNISON

GRID COORDINATES: J-9

INTERFACE AT 8'

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 8-9'	WET	7-12-90	1347	1204.4	2.1	SEW
	DRY	7-13-90	1409	866.8	1.6	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-55-0061			EMANATION	0.28		
RSO REVIEW			TH-230		84	

DATE SAMPLED: 6-1-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 581.3 g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1346
DRY WEIGHT: 545

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 9-10'	WET	7-12-90	1348	1102.1	1.7	SEW
	DRY	7-13-90	1411	841.2	1.5	SEW
	UNEQUILIBRATED					
GUN-55-0062			EMANATION	0.24		
RSO REVIEW			TH-230		73	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 663 g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1346
DRY WEIGHT: 578

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: 7- 10

INTERFACE AT 7.5'

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 8.5-9.5'	WET	7-12-90	1404	1487.7	2.7	SEW
	DRY	7-13-90	1418	1035.0	1.7	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0063 EMANATION 0.30

RSO REVIEW [signature] TH-230 99

DATE SAMPLED: 6-2-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 557.6 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1346
DRY WEIGHT: 608

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 10.5-11'	WET	7-12-90	1406	1845.8	2.9	SEW
	DRY	7-13-90	1419	1098.5	1.7	SEW
	UNEQUILIBRATED					

GUN-SS-0064 EMANATION 0.41

RSO REVIEW [signature] TH-230 103

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 633.3g *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1346
DRY WEIGHT: 645

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 11.5-12'	WET	7-12-90	1413	425.2	0.7	SEW
	DRY	7-13-90	1427	542.0	0.9	SEW
	UNEQUILIBRATED					

GUN-SS-0065 EMANATION -0.28

RSO REVIEW [signature] TH-230 21

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 600.7g *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1355
DRY WEIGHT: 614

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 12.5-13'	WET	7-12-90	1415	181.6	0.3	SEW
	DRY	7-13-90	1428	137.4	0.2	SEW
	UNEQUILIBRATED					

GUN-SS-0066 EMANATION 0.24

RSO REVIEW [signature] TH-230 5.2

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 692g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1355
DRY WEIGHT: 654

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-11

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1422	5934.7	9.4	SEW
	DRY	7-13-90	1435	4349.5	7.2	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0067 EMANATION 0.27

RSO REVIEW [signature] TH-230 21

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 634.0
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1355
DRY WEIGHT: 607

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1423	1944.9	3.3	SEW
	DRY	7-13-90	1437	1689.2	3.1	SEW
	UNEQUILIBRATED					

GUN-SS-0068 EMANATION 0.13

RSO REVIEW [signature] TH-230 3.0

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 592.2
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1355
DRY WEIGHT: 550

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1431	1589.1	2.6	SEW
	DRY	7-13-90	1444	1238.5	1.9	SEW
	UNEQUILIBRATED					

GUN-SS-0069 EMANATION 0.22

RSO REVIEW [signature] TH-230 2.1

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 614.9 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1403
DRY WEIGHT: 655

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 3-4'	WET	7-12-90	1432	2525.8	4.0	SEW
	DRY	7-13-90	1445	1731.6	2.6	SEW
	UNEQUILIBRATED					

GUN-SS-0070 EMANATION 0.31

RSO REVIEW [signature] TH-230 68

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 637.8 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1403
DRY WEIGHT: 667

M-K-FERGUSON COMPANY
A & ORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-11

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 4-5'	WET	7-12-90	1439	1615.6	2.5	SEW
	DRY	7-13-90	1452	811.0	1.2	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0071 EMANATION 0.50

RSO REVIEW [signature] TH-230 130

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 639.9 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1403
DRY WEIGHT: 676

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-12

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1441	13880	24.0	SEW
	DRY	7-13-90	1454	9739.9	18.1	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0072			EMANATION	0.30		
RSO REVIEW [signature]			TH-230		14	

DATE SAMPLED: 6-4-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 578.8
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1403
DRY WEIGHT: 539

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-1.25'	WET	7-12-90	1448	16567	24.5	SEW
	DRY	7-13-90	1501	11995	21.4	SEW
	UNEQUILIBRATED					
GUN-SS-0073			EMANATION	0.28		
RSO REVIEW [signature]			TH-230		11	

DATE SAMPLED: 6-4-90
DATE SEALED: 6-4-90
WET WEIGHT: 677.2
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1414
DRY WEIGHT: 560

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2.25-2.75'	WET	7-12-90	1449	1116.7	1.7	SEW
	DRY	7-13-90	1503	928.9	1.3	SEW
	UNEQUILIBRATED					
GUN-SS-0074			EMANATION	0.17		
RSO REVIEW [signature]			TH-230		1.7	

DATE SAMPLED: 6-4-90
DATE SEALED: 6-4-90
WET WEIGHT: 671.1 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1414
DRY WEIGHT: 695

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW ____			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-13

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0810	63629	121.2	SEW
	DRY	7-13-90	0824	44159	79.9	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0006 EMANATION 0.31

RSO REVIEW [signature] TH-230 62

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 525 *
DATE OPENED: 7-12-90
TIME OPENED: 0824
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 553

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0817	16135	3.4	SEW
	DRY	7-13-90	0831	1318.6	3.0	SEW
	UNEQUILIBRATED					

GUN-SS-0007 EMANATION 0.18

RSO REVIEW [signature] TH-230 19

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 473.3
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 441

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-2.5'	WET	7-12-90	0819	2286.3	4.3	SEW
	DRY	7-13-90	0832	1222.6	2.3	SEW
	UNEQUILIBRATED					

GUN-SS-0008 EMANATION 0.47

RSO REVIEW [signature] TH-230 39

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 532
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0745
DRY WEIGHT: 532

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 3-4'	WET	7-12-90	0826	6467.4	11.8	SEW
	DRY	7-13-90	0839	4070.1	7.4	SEW
	UNEQUILIBRATED					

GUN-SS-0009 EMANATION 0.37

RSO REVIEW [signature] TH-230 15

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 548.7
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 548

CELL EMANATION SAMPLING LOG

PROJECT/ SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T- 13

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 4-5'	WET	7/12/90	0828	2691.7	4.0	SEW
	DRY	7-13-90	0841	2340.6	3.7	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0010 EMANATION 0.13

RSO REVIEW [signature] TH-230 17

DATE SAMPLED: 6/1/90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 676.5 g
DATE OPENED: 7/12/90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 638

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-14

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1457	978.8	1.6	SEW
	DRY	—	—	—	—	—
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0075			EMANATION	—		
RSO REVIEW			TH-230		2.0	

DATE SAMPLED: 6-4-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 614
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: —
DRY WEIGHT: —

* FAILED LEAK TEST

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-1.7'	WET	7-12-90	1458	547.7	0.7	SEW
	DRY	7-13-90	1510	762.0	1.1	SEW
	UNEQUILIBRATED					
GUN-SS-0076			EMANATION	-0.39		
RSO REVIEW			TH-230		0.7	

DATE SAMPLED: 6-4-90
DATE SEALED: 6-4-90
WET WEIGHT: 738
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1414
DRY WEIGHT: 700

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-15

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0835	1155.8	2.1	SEW
	DRY	7-13-90	0849	745.3	1.4	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0011			EMANATION	0.36		
RSO REVIEW			TH-230		30	

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 546.4g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 524

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0836	1840.7	3.1	SEW
	DRY	7-13-90	0850	1419.3	2.4	SEW
	UNEQUILIBRATED					
GUN-SS-0012			EMANATION	0.23		
RSO REVIEW			TH-230		102	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 586.5
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 585

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	0853	1079.6	2.0	SEW
	DRY	7-13-90	0858	438.6	0.8	SEW
	UNEQUILIBRATED					
GUN-SS-0013			EMANATION	0.6		
RSO REVIEW			TH-230		86	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 539.3g *
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 567

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 3-4'	WET	7-12-90	0855	1337.5	2.2	SEW
	DRY	7-13-90	0859	601.4	1.0	SEW
	UNEQUILIBRATED					
GUN-SS-0014			EMANATION	0.6		
RSO REVIEW			TH-230		105	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 621.7g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 599

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / Ferguson

GRID COORDINATES: T-15

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 4.5'	WET	7-12-90	0902	2620.8	3.7	SEW
	DRY	7-13-90	0906	1688.5	2.7	SEW
	UNEQUILIBRATED					
SAMPLE ID: GW-SS-0015			EMANATION	0.36		
RSO REVIEW [signature]			TH-230		210	

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 716.5g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 618

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-16

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1505	1149.6	2.0	SEW
	DRY	7-13-90	1512	996.1	1.9	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-55-0077			EMANATION	0.13		
RSO REVIEW			TH-230		2.2	

DATE SAMPLED: 6-1-90
TIME SAMPLED: -
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 567.8g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1414
DRY WEIGHT: 538

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1506	771.6	1.2	SEW
	DRY	7-13-90	1519	505.1	0.8	SEW
	UNEQUILIBRATED					
GUN-55-0078			EMANATION	0.35		
RSO REVIEW			TH-230		1.0	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 626.9g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1427
DRY WEIGHT: 600

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1514	373.5	0.6	SEW
	DRY	7-13-90	1521	488.9	0.9	SEW
	UNEQUILIBRATED					
GUN-55-0079			EMANATION	-0.31		
RSO REVIEW			TH-230		1.5	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 595.5g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1427
DRY WEIGHT: 568

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 3-4'	WET	7-12-90	1515	206.7	0.4	SEW
	DRY	7-13-90	1528	384.0	0.7	SEW
	UNEQUILIBRATED					
GUN-55-0080			EMANATION	-0.86		
RSO REVIEW			TH-230		0.7	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 567.1g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1427
DRY WEIGHT: 546

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-16

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 4-5'	WET	7-12-90	1522	688.3	1.2	SEW
	DRY	7-13-90	1529	642.1	1.1	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0081			EMANATION	0.07		
RSO REVIEW			TH-230		7.7	

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 585.9 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1427
DRY WEIGHT: 610

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 5-6'	WET	7-12-90	1524	1023.8	1.8	SEW
	DRY	7-13-90	1536	423.1	0.7	SEW
	UNEQUILIBRATED					
GUN-SS-0082			EMANATION	0.59		
RSO REVIEW			TH-230		77	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 555.3g *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1445
DRY WEIGHT: 616

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 6-7'	WET	7-12-90	1531	727.4	1.1	SEW
	DRY	7-13-90	1538	779.9	1.3	SEW
	UNEQUILIBRATED					
GUN-SS-0083			EMANATION	-0.07		
RSO REVIEW			TH-230		58	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 653.7g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1445
DRY WEIGHT: 584

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-17

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1539	10162	20.6	SEW
	DRY	7-13-90	1549	6133.6	12.0	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0085			EMANATION	0.40		
RSO REVIEW			TH-230		12	

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 492.4 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1445
DRY WEIGHT: 512

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1541	1113.7	2.2	SEW
	DRY	7-13-90	1558	893.7	1.8	SEW
	UNEQUILIBRATED					
GUN-SS-0086			EMANATION	0.20		
RSO REVIEW			TH-230		2.3	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 517.2
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1455
DRY WEIGHT: 491

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1532	261.3	0.5	SEW
	DRY	7-13-90	1548	662.7	1.3	SEW
	UNEQUILIBRATED					
GUN-SS-0084			EMANATION	-1.54		
RSO REVIEW			TH-230		1.5	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 496.7
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1445
DRY WEIGHT: 496

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 3-4'	WET	7-12-90	1548	506.1	1.0	SEW
	DRY	7-13-90	1600	538.2	1.3	SEW
	UNEQUILIBRATED					
GUN-SS-0087			EMANATION	-0.06		
RSO REVIEW			TH-230		0.9	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 505.6
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1455
DRY WEIGHT: 415

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/Ferguson

GRID COORDINATES: T-17

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 4.5'	WET	7-12-90	1549	167.4	0.3	SEW
	DRY	7-13-90	1607	214.4	0.3	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUU-SS-0088 EMANATION -0.28

RSO REVIEW [signature] TH-230 1.8

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 657.8 g
DATE OPENED: 7-13-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1455
DRY WEIGHT: 628

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/GUNNISON

GRID COORDINATES: T- 18

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1557	770.4	1.2	SEW
	DRY	7-13-90	1608	363.8	0.5	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0089			EMANATION	0.53		
RSO REVIEW			TH-230		1.7	

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 668.2 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1455
DRY WEIGHT: 701

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1.5'	WET	7-12-90	1558	353.2	0.5	SEW
	DRY	7-13-90	1616	371.3	0.6	SEW
	UNEQUILIBRATED					
GW-SS-0090			EMANATION	-0.05		
RSO REVIEW			TH-230		1.0	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-4-90
WET WEIGHT: 658.9g
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1502
DRY WEIGHT: 623

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: J-19

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1607	3926.2	5.4	SEW
	DRY	—	—	—	—	—
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0092			EMANATION	—		
RSO REVIEW			TH-230			

DATE SAMPLED: 6-1-90
TIME SAMPLED: —
DATE SEALED: 6-15-90
TIME SEALED: 1500
WET WEIGHT: 728.5
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1
DRY WEIGHT: —

* LEAK TEST FAILED

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1.5'	WET	7-12-90	1605	4084.2	8.3	SEW
	DRY	7-13-90	1617	1802.4	3.4	SEW
	UNEQUILIBRATED					
GUN-SS-0091			EMANATION	0.56		
RSO REVIEW			TH-230		39	

DATE SAMPLED: 6-1-90
DATE SEALED: 6-15-90
WET WEIGHT: 489.8 *
DATE OPENED: 7-12-90
TIME OPENED: 1545
DATE RESEALED: 7-13-90
TIME RESEALED: 1502
DRY WEIGHT: 538

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION —	WET	—	—	—	—	—
	DRY	—	—	—	—	—
	UNEQUILIBRATED					
			EMANATION	—		
RSO REVIEW			TH-230			

DATE SAMPLED: —
DATE SEALED: —
WET WEIGHT: —
DATE OPENED: —
TIME OPENED: —
DATE RESEALED: —
TIME RESEALED: —
DRY WEIGHT: —

SS-0092

TH 230 results not completed as of 7/12/90

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION —	WET	—	—	—	—	—
	DRY	—	—	—	—	—
	UNEQUILIBRATED					
			EMANATION	—		
RSO REVIEW			TH-230			

DATE SAMPLED: —
DATE SEALED: —
WET WEIGHT: —
DATE OPENED: —
TIME OPENED: —
DATE RESEALED: —
TIME RESEALED: —
DRY WEIGHT: —

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/GUNNISON

GRID COORDINATES: T-20

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0903	397.3	0.6	SEW
	DRY	7-13-90	0908	678.2	1.1	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0016 EMANATION 0.71

RSO REVIEW [signature] TH-230 62

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 616.2 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0815
DRY WEIGHT: 638

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0910	3973.1	6.5	SEW
	DRY	7-13-90	0915	2036.7	3.4	SEW
	UNEQUILIBRATED					

GUN-SS-0017 EMANATION 0.49

RSO REVIEW [signature] TH-230 7.8

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 608.1 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0857
DRY WEIGHT: 604

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	0912	2587.6	4.1	SEW
	DRY	7-13-90	0916	1616.6	2.5	SEW
	UNEQUILIBRATED					

GUN-SS-0018 EMANATION 0.38

RSO REVIEW [signature] TH-230 3.4

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 636.9 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0857
DRY WEIGHT: 636

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED: ____
DATE SEALED: ____
WET WEIGHT: ____
DATE OPENED: ____
TIME OPENED: ____
DATE RESEALED: ____
TIME RESEALED: ____
DRY WEIGHT: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: Vitro/Gunnison

GRID COORDINATES: J-21

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0919	4630.1	7.3	SEW
	DRY	7-13-90	1020	2211.9	3.4	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-35-0019			EMANATION	0.52		
RSO REVIEW [signature]			TH-230		6.5	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 632.1g *
DATE OPENED: 7-12-90
TIME OPENED: 12:30
DATE RESEALED: 7-13-90
TIME RESEALED: 0857
DRY WEIGHT: 648

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0920	7520.2	12.1	SEW
	DRY	7-13-90	1021	4155.9	7.4	SEW
	UNEQUILIBRATED					
GUN-35-0020			EMANATION	0.45		
RSO REVIEW [signature]			TH-230		21	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 621.7g
DATE OPENED: 7-12-90
TIME OPENED: 15:30
DATE RESEALED: 7-13-90
TIME RESEALED: 0857
DRY WEIGHT: 564

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	0927	2192.4	3.6	SEW
	DRY	7-13-90	1030	1103.7	1.9	SEW
	UNEQUILIBRATED					
GUN-35-0021			EMANATION	0.50		
RSO REVIEW [signature]			TH-230		4.6	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 617.3
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0907
DRY WEIGHT: 569

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/GUNNISON

GRID COORDINATES: T-22

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0929	944.8	1.7	SEW
	DRY	7-13-90	1032	473.0	0.9	SEW
	UNEQUILIBRATED					

SAMPLE ID: GUN-SS-0022 EMANATION 0.50

RSO REVIEW [signature] TH-230 2.3

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 569.4g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0902
DRY WEIGHT: 546

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0936	665.5	1.1	SEW
	DRY	7-13-90	1039	575.2	0.9	SEW
	UNEQUILIBRATED					

GUN-SS-0023 EMANATION 0.14

RSO REVIEW [signature] TH-230 0.9

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 634g *
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0902
DRY WEIGHT: 661

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	0937	655.2	1.2	SEW
	DRY	7-13-90	1040	615.7	1.1	SEW
	UNEQUILIBRATED					

GUN-SS-0024 EMANATION 0.06

RSO REVIEW [signature] TH-230 1.1

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 567.1
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0902
DRY WEIGHT: 553

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					

EMANATION ____

RSO REVIEW ____ TH-230 ____

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-23

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0945	741.1	1.7	SEW
	DRY	7-13-90	1048	637.6	1.6	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0025			EMANATION	0.14		
RSO REVIEW			TH-230		1.4	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 448.1
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0908
DRY WEIGHT: 388

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0946	346.1	0.6	SEW
	DRY	7-13-90	1049	485.6	0.8	SEW
	UNEQUILIBRATED					
GUN-SS-0026			EMANATION	-0.4		
RSO REVIEW			TH-230		1.1	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 612.5g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0908
DRY WEIGHT: ~~388~~ 602

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-24

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	0954	1041.3	1.8	SEW
	DRY	7-13-90	1056	682.2	1.3	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0027			EMANATION	0.35		
RSO REVIEW			TH-230		1.4	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 568.8
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0908
DRY WEIGHT: 545

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	0955	483.1	0.8	SEW
	DRY	7-13-90	1058	642.1	1.1	SEW
	UNEQUILIBRATED					
GUN-SS-0028			EMANATION	-0.33		
RSO REVIEW			TH-230		1.4	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 599.5
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0908
DRY WEIGHT: 599

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1002	389.2	0.6	SEW
	DRY	7-13-90	1105	480.0	0.8	SEW
	UNEQUILIBRATED					
GUN-SS-0029			EMANATION	-0.23		
RSO REVIEW			TH-230		0.7	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 612.9 *
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0915
DRY WEIGHT: 635

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-25

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1003	2857.3	5.4	SEW
	DRY	7-13-90	1106	1887.8	3.6	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0030			EMANATION	0.34		
RSO REVIEW [signature]			TH-230		2.5	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 529.1
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0915
DRY WEIGHT: 529

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1011	686.9	1.1	SEW
	DRY	7-13-90	1114	915.1	1.6	SEW
	UNEQUILIBRATED					
GUN-SS-0031			EMANATION	-0.33		
RSO REVIEW [signature]			TH-230		1.2	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 599
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0915
DRY WEIGHT: 588

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1012	1307.5	2.1	SEW
	DRY	7-13-90	1115	999.7	1.9	SEW
	UNEQUILIBRATED					
GUN-SS-0032			EMANATION	0.24		
RSO REVIEW [signature]			TH-230		0.8	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 625
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 0915
DRY WEIGHT: 533

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW ____			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

1

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA/GUNNISON

GRID COORDINATES: T-26

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1020	562.0	0.9	SEW
	DRY	7-13-90	1123	293.9	0.5	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-55-0033			EMANATION	0.48		
RSO REVIEW			TH-230		0.6	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 658.5 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1115
DRY WEIGHT: 652

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1021	526.9	1.0	SEW
	DRY	7-13-90	1124	421.3	0.8	SEW
	UNEQUILIBRATED					
GUN-55-0034			EMANATION	0.20		
RSO REVIEW			TH-230		0.8	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 526.5 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1115
DRY WEIGHT: 548

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1028	477.4	0.7	SEW
	DRY	7-13-90	1135	257.4	0.4	SEW
	UNEQUILIBRATED					
GUN-55-0035			EMANATION	0.46		
RSO REVIEW			TH-230		0.8	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 615 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1115
DRY WEIGHT: 613

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-27

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1104	497.1	0.9	SEW
	DRY	7-13-90	1144	513.2	1.1	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-55-0037			EMANATION	-0.03		
RSO REVIEW			TH-230		1.3	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 539.1 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1123
DRY WEIGHT: 479

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1030	438.1	0.7	SEW
	DRY	7-13-90	1136	452.2	0.7	SEW
	UNEQUILIBRATED					
GUN-55-0036			EMANATION	-0.03		
RSO REVIEW			TH-230		0.7	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 608.9 g
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1115
DRY WEIGHT: 628

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION ____	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CHEM-NUCLEAR SYSTEMS, INC.

CELL EMANATION SAMPLING LOG

PROJECT/SITE NAME: UMTRA / GUNNISON

GRID COORDINATES: T-28

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 0-1'	WET	7-12-90	1106	1600	3.2	SEW
	DRY	7-13-90	1145	942.2	1.9	SEW
	UNEQUILIBRATED					
SAMPLE ID: GUN-SS-0038			EMANATION	0.41		
RSO REVIEW			TH-230		4.3	

DATE SAMPLED: 5-31-90
TIME SAMPLED: —
DATE SEALED: 6-4-90
TIME SEALED: 1500
WET WEIGHT: 497
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1123
DRY WEIGHT: 496

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 1-2'	WET	7-12-90	1113	371.3	0.7	SEW
	DRY	7-13-90	1152	673.0	1.3	SEW
	UNEQUILIBRATED					
GUN-SS-0039			EMANATION	-0.81		
RSO REVIEW			TH-230		1.4	

DATE SAMPLED: 5-31-90
DATE SEALED: 6-4-90
WET WEIGHT: 526.5
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1123
DRY WEIGHT: 526

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION 2-3'	WET	7-12-90	1114	773.3	1.2	SEW
	DRY	7-13-90	1154	597.2	1.2	SEW
	UNEQUILIBRATED					
GUN-SS-0040			EMANATION	0.23		
RSO REVIEW			TH-230		2.1	

DATE SAMPLED: 6-2-90
DATE SEALED: 6-4-90
WET WEIGHT: 629.3
DATE OPENED: 7-12-90
TIME OPENED: 1530
DATE RESEALED: 7-13-90
TIME RESEALED: 1123
DRY WEIGHT: 501

		DATE COUNTED	TIME COUNTED	FUNCTION	PCI/gm	COUNTED BY
ELEVATION	WET					
	DRY					
	UNEQUILIBRATED					
			EMANATION			
RSO REVIEW			TH-230			

DATE SAMPLED:
DATE SEALED:
WET WEIGHT:
DATE OPENED:
TIME OPENED:
DATE RESEALED:
TIME RESEALED:
DRY WEIGHT:

ATTACHME

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
[illegible]	GUN-SS-0001 T-3-cell	T-3	6-1-90		2	15216	1.08	25.6				✓	[illegible]	[illegible]
[illegible]	GUN-SS-0002-T-3-cell	T-3	6-1-90		2	10336	629.2	16.4				✓	[illegible]	[illegible]
[illegible]	GUN-SS-0003-T-3-cell	T-3	6-1-90		2	8031	744.4	10.8				✓	[illegible]	10' RG: 16.5'
[illegible]	GUN-SS-0004-T-4-cell	T-4	5-31-90		2	40220	554.5	72.5				✓	[illegible]	12.5' 14-15'
[illegible]	GUN-SS-[illegible]	T-1	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				✓	[illegible]	15-15.5'
[illegible]	GUN-SS-[illegible]	T-13	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				✓	[illegible]	[illegible]
[illegible]	GUN-SS-[illegible]	T-13	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				✓	[illegible]	1'-2'
[illegible]	GUN-SS-[illegible]	T-13	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				✓	[illegible]	RG 2'-2.5'
[illegible]	GUN-SS-[illegible]	T-13	[illegible]		2	[illegible]	[illegible]	[illegible]				✓	[illegible]	[illegible]

NOTE: All soil sample results are in pCi/gm

Site Correction factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}} \Big/ (\text{Ct. Time})\,(\text{Eff.})\,(\text{Sample Mass})^{*}$$

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07878

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MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHMEN

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
6-5-90	GUN-SS-0016 T-15-coll	T-15	6-1-90		2	2360.3	[illegible]	[illegible]				✓	SEW	2'-5'
6-5-90	GUN-SS-0011 T-15-coll	T-15	6-1-90		2	[illegible]	546.4	1.5				✓	SEW	0'-1'
6-5-90	GUN-SS-0012 T-15-coll	T-15	6-1-90		2	1109.9	[illegible]	1.9				✓	SEW	1'-2'
6-5-90	GUN-SS-0013 T-15-coll	T-15	6-1-90		2	[illegible]	[illegible]	1.1				✓	SEW	2'-3'
6-5-90	GUN-SS-0014 T-15-coll	T-15	6-1-90		2	577.8	621.7	1.6				✓	SEW	3'-4'
6-5-90	GUN-SS-0015 T-15-coll	T-15	6-1-90		2	1109	716.5	1.5				✓	SEW	4'-5'
6-5-90	GUN-SS-0016 T-20-coll	T-20	5-31-90		2	231.74	616.2	[illegible]				✓	SEW	0'-1'
6-5-90	GUN-SS-0017 T-20-coll	T-20	5-31-90		2	2514.7	608.1	3.8				✓	SEW	1'-2'
6-5-90	GUN-SS-0018 T-20-coll	T-20	5-31-90		2	1800	636.9	2.8				✓	SEW	2'-3'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

* - NOT DETERMINED

07878

015

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHME

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
6-5-90	GUN-SS-0019 T-21-cell	T-21	5-31-90		2	2454	632.1	3.9				✓	NEW	0-1'
6-5-90	GUN-SS-0020 T-21-cell	T-21	5-31-90		2	5558	621.7	8.9				✓	NEW	1-2'
6-5-90	GUN-SS-0021 T-21 cell	T-21	5-31-90		2	1632	617.3	2.6				✓	NEW	2'-3'
6-6-90	GUN-SS-0022 T-22-cell	T-22	5-31-90		2	683	569.4	1.2				✓	NEW	0-1'
6-6-90	GUN-SS-0023 T-22-cell	T-22	5-31-90		2	451	634	.71				✓	NEW	1-2'
6-7-90	GUN-SS-0024- T-22-cell	T-22	5-31-90		2	404	567.1	.71				✓	NEW	2'-3'
6-7-90	GUN-SS-0025 T-23-cell	T-23	5-31-90		2	531	448.1	1.2				✓	NEW	0'-1'
6-7-90	GUN-SS-0026 T-23-cell	T-23	5-31-90		2	953	612.5	1.6				✓	NEW	1'-2'
6-7-90	GUN-SS-0027 T-24-cell	T-24	5-31-90		2	693	568.8	1.2				✓	NEW	1-2' 0-1'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

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015

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHME

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
6-7-90	GUN-SS-0028 T-24-CELL	T-24	5-31-90		2	386.87	597.5	0.6				✓	SEW	1'-2'
6-7-90	GUN-SS-0029 T-24-CELL	T-24	5-31-90		2	567.43	617.4	0.9				✓	SEW	2'-3'
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *
Count Time = 500 sec, unless noted otherwise.
MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07878

015

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACH

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
6-7-90	GUN-SS-0030 T-25-cell	T-25	5-31-90		2	1439	529.1	2.7				✓	NEW	0-1'
6-8-90	GUN-SS-0031 T-25-cell	T-25	5-31-90		2	938	599	1.6				✓	NEW	1'-2'
6-8-90	GUN-SS-0032 T-25-cell	T-25	5-31-90		2	1085	625	1.7				✓	NEW	2'-3'
[illegible]	GUN-SS-0033 [illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				✓	[illegible]	0-1'
6-8-90	GUN-SS-0034 [illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				✓	[illegible]	[illegible]
6-11-90	GUN-SS-0035 T-26-cell	T-26	5-31-90		2	400	645	0.6				✓	SEW	2'-3'
[illegible]	GUN-SS-0036 T-27-cell	T-27	[illegible]		[illegible]	[illegible]	[illegible]	0.1				✓	SEW	[illegible]
6-11-90	GUN-SS-0037 T-27-cell	T-27	5-31-90		2	475.43	534.1	0.9				✓	SEW	0'-1'
6-11-90	GUN-SS-0038 T-28-cell	T-28	5-31-90		2	1116.7	417	2.2				✓	SEW	0'-1'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

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SITE H.P. MANAGER

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NK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHME

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
6-11-90	GUN-SS-0039 T-28-CEU	T-28	5-31-90		2	210.94	22.5	0.4				✓	SEW	1'-2'
6-11-90	GUN-SS-0040 T-28-CEU	T-28	5-31-90		2	851.87	584.7	1.5				✓	SEW	2'-3'
6-11-90	GUN-SS-0041 T-1-CEU	T-1	6-2-90		2	1149.1	629.3	1.8				✓	SEW	4.5'-5.5'
6-11-90	GUN-SS-0042 T-1-CEU	T-1	6-2-90		2	828.74	571.1	1.4				✓	SEW	5.5'-6.0'
6-11-90	GUN-SS-0043 T-1-CEU	T-1	6-2-90		2	458.77	583.7	0.8				✓	SEW	6.75'-7.25'
6-11-90	GUN-SS-0044 T-1-CEU	T-1	6-2-90		2	614.55	634.2	1.0				✓	SEW	8.0'-8.5'
6-11-90	GUN-SS-0045 T-2-CEU	T-2	6-2-90		2	440.18	578.2	0.8				✓	SEW	9.25'-10.0'
6-11-90	GUN-SS-0046 T-2-CEU	T-2	6-1-90		2	2125.1	580.4	3.7				✓	SEW	10'-11'
6-11-90	GUN-SS-0047 T-2-CEU	T-2	6-1-90		2	1452.9	583.1	2.6				✓	SEW	11.0'-11.5'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Calculation

$$4.65\sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

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MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHME

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
6-11-90	GUN-SS-0048 T-2-CELL	T-2	6-1-90		2	2144	549.8	3.9				✓	SEW	12.0'-12.5'
6-12-90	GUN-SS-0049 T-2-CELL	T-2	6-1-90		2	2196.5	609.6	3.6				✓	SEW	13.0'-13.5'
6-12-90	GUN-SS-0050 T-5-CELL	T-5	6-2-90		2	2669.5	563.9	4.7				✓	SEW	15'-16' INTERFACE AT 13.5' [illegible]
6-12-90	GUN-SS-0051 T-5-CELL	T-5	6-2-90		2	6405.2	632.0	10.1				✓	SEW	16'-17'
6-12-90	GUN-SS-0052 T-6-CELL	T-6	6-2-90		2	[illegible]	558.3	1.1				✓	SEW	12.25'-13' T.P.
6-12-90	GUN-SS-0053 T-6-CELL	T-6	6-2-90		2	676.87	565.1	1.2				✓	SEW	INTERFACE @ 10' 11.75'-12.25'
6-12-90	GUN-SS-0054 T-6-CELL	T-6	6-2-90		2	650.55	531.2	1.2				✓	SEW	13.25'-13.75'
6-12-90	GUN-SS-0055 T-6-CELL	T-6	6-2-90		2	869.3	563.7	1.5				✓	SEW	15.5'-16'
6-12-90	GUN-SS-0056 T-7-CELL	T-7	6-2-90		2	1152.9	523.8	2.2				✓	SEW	INTERFACE @ 11.5' 12.5'-13'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07878

015

ATTACHMENT

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
6-12-90	GUN-SS-0057 T-7-CELL	T-7	6-2-90		2	2576.4	556.7	4.8				✓	SEW	13.0'-13.5'
6-12-90	GUN-SS-0058 T-7-CELL	T-7	6-2-90		2	1155.7	544.7	2.1				✓	SEW	13.5'-14.5'
6-12-90	GUN-SS-0059 T-7-CELL	T-7	6-2-90		2	1028.7	526.7	1.9				✓	SEW	14.5'-15.0'
6-12-90	GUN-SS-0060 T-8-CELL	T-8	6-1-90		2	1215.6	658.6	1.8				✓	SEW	INTERFACE @ 6' 6'-7'
6-12-90	GUN-SS-0061 T-9-CELL	T-9	6-1-90		2	981.24	573.3	1.7				✓	SEW	INTERFACE @ 8' 8'-9'
6-12-90	GUN-SS-0062 T-9-CELL	T-9	6-1-90		2	580.43	630	0.9				✓	SEW	9'-10'
6-12-90	GUN-SS-0063 T-10-CELL	T-10	6-2-90		2	855.68	557.6	1.6				✓	SEW	INTERFACE @ 7.5' 8.5'-9.5'
6-12-90	GUN-SS-0064 T-10-CELL	T-10	6-2-90		2	568.74	653.3	1.4				✓	SEW	10.5'-11.0'
6-12-90	GUN-SS-0065 T-10-CELL	T-10	6-2-90		2	232.12	[illegible]	0.4				✓	SEW	11.5'-12'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226 "

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

7878

015-1

HK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHM

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
6-12-90	GUN-SS-0066 T-10-CELL	T-10	6-2-90		2	624.37	672.0	1.0				✓	SEW	12.5'-13'
6-12-90	GUN-SS-0067 T-11-CELL	T-11	6-1-90		2	8507.9	634.0	13.4				✓	SEW	0'-1'
6-12-90	GUN-SS-0068 T-11-CELL	T-11	6-1-90		2	1689.2	592.2	2.8				✓	SEW	1'-2'
6-12-90	GUN-SS-0069 T-11-CELL	T-11	6-1-90		2	924.68	614.7	1.5				✓	SEW	2'-3'
6-12-90	GUN-SS-0070 T-11-CELL	T-11	6-1-90		2	1647.1	637.3	2.6				✓	SEW	3'-4'
6-12-90	GUN-SS-0071 T-11-CELL	T-11	6-1-90		2	893.43	639.9	1.4				✓	SEW	4'-5'
6-12-90	GUN-SS-0072 T-12-CELL	T-12	6-4-90		2	11137	573.8	19.3				✓	SEW	0'-1'
6-12-90	GUN-SS-0073 T-12-CELL	T-12	6-4-90		2	11467	677.2	16.7				✓	SEW	1'-1.75'
6-14-90	GUN-SS-0074-T-12-CELL	T-12	6-4-90		2	987	671.1	1.5				✓	NEW	2.25'-2.75'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}} \Big/ \text{(Ct. Time) (Eff.) (Sample Mass)*}$$

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07278

ATTACHM

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
6-14-90	GUN-SS-0075 T-14-CELL	T-14	6-4-90		2	823	614	1.3				✓	SEW	0-1'
6-14-90	GUN-SS-0076 T-14-CELL	T-14	6-4-90		2	736	558	1.0				✓	SEW	1'-1.7'
6-14-90	GUN-SS-0077 T-16-CELL	T-16	6-1-90		2	873	567.8	1.5				✓	SEW	0'-1'
6-14-90	GUN-SS-0078 T-16-CELL	T-16	6-1-90		2	728.05	624.9	1.2				✓	SEW	1'-2'
6-15-90	GUN-SS-0079 T-16-CELL	T-16	6-1-90		2	707.12	595.5	1.2				✓	SEW	2'-3'
6-15-90	GUN-SS-0080 T-16-CELL	T-16	6-1-90		2	710.18	567.1	1.25				✓	SEW	3'-4'
6-15-90	GUN-SS-0081 T-16-CELL	T-16	6-1-90		2	348.49	585.9	0.6				✓	SEW	4'-5' ~~5-6~~ SEW
6-15-90	GUN-SS-0082 T-16-CELL	T-16	6-1-90		2	614.05	555.3	1.1				✓	SEW	5'-6'
6-15-90	GUN-SS-0083 T-16-CELL	T-16	6-1-90		2	871.68	653.7	1.3				✓	SEW	6'-7'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}} \Big/ \text{(Ct. Time) (Eff.) (Sample Mass)*}$$

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07878

ATTACHM

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
6-15-90	GUN-SS-0084 T-17-CELL	T-17	6-1-90		2	617.87	4[illegible].7	1.2				✓	SEW	2'-3'
6-15-90	GUN-SS-0085 T-17-CELL	T-17	6-1-90		2	7322.1	4924	14.9				✓	SEW	0'-1'
6-15-90	GUN-SS-0086 T-17-CELL	T-17	6-1-90		2	723.3	517.2	1.4				✓	SEW	1'-2'
6-15-90	GUN-SS-0087 T-17-CELL	T-17	6-1-90		2	470.24	565.6	1.0				✓	SEW	3'-4'
6-15-90	GUN-SS-0088 T-17-CELL	T-17	6-1-90		2	432.12	659.8	0.6				✓	SEW	4'-5'
6-15-90	GUN-SS-0089 T-18-CELL	T-18	6-1-90		2	547.99	668.2	0.8				✓	SEW	0-1'
6-15-90	GUN-SS-0090 T-18-CELL	T-18	6-1-90		2	674.99	658.9	1.0				✓	SEW	1.5'
6-15-90	GUN-SS-0091 T-19-CELL	T-19	6-1-90		2	1655.4	437.8	3.4				✓	SEW	1.5'
6-15-90	GUN-SS-0092	T-19	6-1-90		2	4435.3	7[illegible] 7[illegible]	6.1					SEW	0-1'

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226

* - NOT DETERMINED

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07878

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHME-

SITE NAME GUNNISON

SITE AREA

OCS SERIAL NO. GRJ-2 6871601

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
6-15-90	GUN-SS-0093	T-8	6-1-90		2	1585.4	72.53	2.1					SEW	7'-8'
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													
	GUN-SS-													

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = *.

Count Time = 500 sec, unless noted otherwise.

MDA = 1.1 pCi/gm Ra-226 "

* - NOT DETERMINED

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: [signature]
SITE H.P. MANAGER

07278

DIS.

VENDOR LABORATORY TH-230 MEASUREMENTS OF 1-FT DEPTH INCREMENT SOIL SAMPLES <#4 MESH SIEVE COBBLY SUBSOIL INVESTIGATION

JUNE 1990

BARRINGER LABORATORIES INC.

15000 W. 6th Ave.
Golden, Colorado 80401
Phone: (303) 277-1687
FAX: (303) 277-1689

TELECOPY TRANSMITTAL

TO: Mike Ferguson
Garth Silver

FROM: Dave Lasher

DATE: 7-16

WE ARE SENDING 9 PAGES.

Th-230 results

ANALYSIS REQUEST FORM

ANALYSIS: Th230

DATE RECEIVED: 6-19-90

SAMPLE TYPE: Soils CONTAINER: envelope

SAMPLE LOCATION: Shilo

ANALYST: [illegible]

DATE STARTED: 6-21-90

DATE COMPLETED: 7-5-90

CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT pCi/g	AVERAGE pCi/g	REL. DEV. FROM MEAN %	COMMENT
2621-1		200±10				
2		103±4				
3		116±4				
4		91±4				
5		16±2				
6		62±3				
7		19±2				
8		39±3				
9		15±2	17±2	16±2	6.3	
10		17±2				
11		30±2				
12		102±4				
13		88±4				
14		105±4				
15		210±10				
16		62±3				
17		7.8±1.2	7.4±1.1	7.6±1.2	2.6	
18		3.4±0.8				
19		6.5±1.1				
20		21±2				
21		4.6±0.9				
22		2.3±0.7				

Q.C. STANDARD RESULT: 83±5

Q.C. KNOWN VALUE: 93

Q.C. TARGET RANGE: 83-102

Q.C. DEVIATION MEAN, % 4

SPIKE RECOVERY, %

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

ANALYSIS REQUEST FORM

SIS: _____

& RECEIVED: _____

AMPLE TYPE: _____ CONTAINER: _____

SAMPLE LOCATION: _____

ANALYST: fo

DATE STARTED: 6-21-90

DATE COMPLETED: 7-5-90

CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT pCi/g	AVERAGE pCi/g	REL. DEV. FROM MEAN %	COMMENT
2631-23		0.9±0.5				
24		1.1±0.5				
25		1.4±0.5				
26		1.1±0.5				
27		1.4±0.5	1.5±0.6	1.5±0.6	3.4	
28		1.4±0.5				
29		0.7±0.4				
30		2.5±0.7				
31		1.2±0.5				
32		0.8±0.4				
33		0.6±0.4				
34		0.5±0.4				
35		0.8±0.4				
36		0.7±0.4	0.8±0.4	0.8±0.4	6.7	
37		1.3±0.5				
38		4.3±0.9				
39		1.4±0.5				
40		2.1±0.6				
41		93±4				
42		61±3 ~~3.7±1.2~~ fo	55±3	59±3	5.2	
43		3.4±1.2 ~~340±10~~ fo				
~~44~~		~~[illegible]~~ fo				

?

Q.C. STANDARD RESULT: 95±13

Q.C. KNOWN VALUE: 93

Q.C. TARGET RANGE: 83-107

Q.C. DEVIATION MEAN, % 2.1

SPIKE RECOVERY, % _____

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

ANALYSIS REQUEST FORM

ES: _____

RECEIVED: _____

MPLE TYPE: _____ CONTAINER: _____

SAMPLE LOCATION: _____

ANALYST: fo

DATE STARTED: 6-21-90

DATE COMPLETED: 7-5-90

CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT pCi/g	AVERAGE pCi/g	REL. DEV. FROM MEAN %	COMMENT
2621-45		82±4	84±4	83±4	1.2	
46		190±10				
47		60±3				
48		51±3				
49		54±3				
50		69±3				
51		55±3				
52		2.6±0.7				
53		1.0±0.5				
54		1.9±0.6				
55		0.9±0.5				
56		69±3	78±4	74±4	6.1	
57		92±4				
58		32±2				
59		11±1				
60		140±10				
61		84±4				
62		73±4				
63		99±4				
64		103±4				
65		21±2	22±2	22±2	2.3	
66		5.2±1.0				

Q.C. STANDARD RESULT: 100±13

Q.C. KNOWN VALUE: 97

Q.C. TARGET RANGE: 83-103

Q.C. DEVIATION MEAN, % 3.1

SPIKE RECOVERY, % _____

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

ANALYSIS REQUEST FORM

ANALYSIS: _____

DATE RECEIVED: _____

SAMPLE TYPE: _____ CONTAINER: _____

SAMPLE LOCATION: _____

ANALYST: pz

DATE STARTED: 6-21-90

DATE COMPLETED: 7-5-90

CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT pCi/g	AVERAGE pCi/g	REL. DEV. FROM MEAN %	COMMENT
2621-67		21±2				
68		3.0±0.8				
69		2.1±0.6				
70		68±3				
71		130±10				
72		14±2				
73		11±1				
74		1.7±0.6				
75		2.0±0.6	2.3±0.7	2.2±0.7	7.0	
76		0.7±0.4				
77		5.6±0.7				
78		1.0±0.5				
79		1.5±0.6				
80		0.7±0.4				
81		7.7±1.2				
82		77±4	83±4	80±4	3.8	
83		58±3				
84		1.5±0.6				
85		12±1				
86		2.3±0.7				
87		0.9±0.4				
88		1.8±0.6				

Q.C. STANDARD RESULT: 95±3

Q.C. KNOWN VALUE: 97

Q.C. TARGET RANGE: 87-107

Q.C. DEVIATION MEAN, % 2.1

SPIKE RECOVERY, % _____

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

ANALYSIS REQUEST FORM

BIS: _____

DATE RECEIVED: _____

SAMPLE TYPE: _____ CONTAINER: _____

SAMPLE LOCATION: _____

ANALYST: [illegible]

DATE STARTED: 6-21-90

DATE COMPLETED: 7-5-90

CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT pCi/g	AVERAGE pCi/g	REL. DEV. FROM MEAN %	COMMENTS
2621-89		1.3 ± 0.6				
90		1.0 ± 0.5				
91		39 ± 3	34 ± 2	37 ± 3	6.9	

Q.C. STANDARD RESULT: 92 ± 13

Q.C. KNOWN VALUE: 97

Q.C. TARGET RANGE: 87-107

Q.C. DEVIATION MEAN, % 5.[illegible]

SPIKE RECOVERY, % _____

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

Number	Sample Identification		Location
902621-1-1	GUN-SS-0001-T-3-CELL	200	
902621-1-2	GUN-SS-0002-T-3-CELL	103	
902621-1-3	GUN-SS-0003-T-3-CELL	116	10'-11.5'
902621-1-4	GUN-SS-0004-T-4-CELL	91	12.5 interface 14-15
902621-1-5	GUN-SS-0005-T-4-CELL	16	15-15.5'
902621-1-6	GUN-SS-0006-T-13-CELL	62	
902621-1-7	GUN-SS-0007-T-13-CELL	19	
902621-1-8	GUN-SS-0008-T-13-CELL	39	
902621-1-9	GUN-SS-0009-T-13-CELL	15	
902621-1-10	GUN-SS-0010-T-13-CELL	17	
902621-1-11	GUN-SS-0011-T-15-CELL	30	
902621-1-12	GUN-SS-0012-T-15-CELL	102	
902621-1-13	GUN-SS-0013-T-15-CELL	88	
902621-1-14	GUN-SS-0014-T-15-CELL	105	
902621-1-15	GUN-SS-0015-T-15-CELL	210	
902621-1-16	GUN-SS-0016-T-20-CELL	62	
902621-1-17	GUN-SS-0017-T-20-CELL	7.8	
902621-1-18	GUN-SS-0018-T-20-CELL	3.4	
902621-1-19	GUN-SS-0019-T-21-CELL	6.5	
902621-1-20	GUN-SS-0020-T-21-CELL	21	
902621-1-21	GUN-SS-0021-T-21-CELL	4.6	
902621-1-22	GUN-SS-0022-T-22-CELL	2.3	
902621-1-23	GUN-SS-0023-T-22-CELL	0.9	
902621-1-24	GUN-SS-0024-T-22-CELL	1.1	
902621-1-25	GUN-SS-0025-T-23-CELL	1.4	
902621-1-26	GUN-SS-0026-T-23-CELL		

Lab Number	Sample Identification	Location
902621-1-28	GUN-SS-0028-T-24-CELL	
902621-1-29	GUN-SS-0029-T-24-CELL	
902621-1-30	GUN-SS-0030-T-25-CELL	
902621-1-31	GUN-SS-0031-T-25-CELL	
902621-1-32	GUN-SS-0032-T-25-CELL	
902621-1-33	GUN-SS-0033-T-26-CELL	
902621-1-34	GUN-SS-0034-T-26-CELL	
902621-1-35	GUN-SS-0035-T-26-CELL	
902621-1-36	GUN-SS-0036-T-27-CELL	
902621-1-37	GUN-SS-0037-T-27-CELL	
902621-1-38	GUN-SS-0038-T-28-CELL	
902621-1-39	GUN-SS-0039-T-28-CELL	
902621-1-40	GUN-SS-0040-T-28-CELL	
902621-1-41	GUN-SS-0041-T-1-CELL	
902621-1-42	GUN-SS-0042-T-1-CELL	
902621-1-43	GUN-SS-0043-T-1-CELL	
902621-1-44	GUN-SS-0044-T-1-CELL	
902621-1-45	GUN-SS-0045-T-2-CELL	
902621-1-46	GUN-SS-0046-T-2-CELL	
902621-1-47	GUN-SS-0047-T-2-CELL	
902621-1-48	GUN-SS-0048-T-2-CELL	
902621-1-49	GUN-SS-0049-T-2-CELL	
902621-1-50	GUN-SS-0050-T-5-CELL	
902621-1-51	GUN-SS-0051-T-5-CELL	
902621-1-52	GUN-SS-0052-T-6-CELL	
902621-1-53	GUN-SS-0053-T-6-CELL	

Lab Number	Sample Identification	Location
902621-1-55	GUN-SS-0055-T-6-CELL	
902621-1-56	GUN-SS-0056-T-7-CELL	
902621-1-57	GUN-SS-0057-T-7-CELL	
902621-1-58	GUN-SS-0058-T-7-CELL	
902621-1-59	GUN-SS-0059-T-7-CELL	
902621-1-60	GUN-SS-0060-T-8-CELL	
902621-1-61	GUN-SS-0061-T-8-CELL	
902621-1-62	GUN-SS-0062-T-8-CELL	
902621-1-63	GUN-SS-0063-T-10-CELL	
902621-1-64	GUN-SS-0064-T-10-CELL	
902621-1-65	GUN-SS-0065-T-10-CELL	
902621-1-66	GUN-SS-0066-T-10-CELL	
902621-1-67	GUN-SS-0067-T-11-CELL	
902621-1-68	GUN-SS-0068-T-11-CELL	
902621-1-69	GUN-SS-0069-T-11-CELL	
902621-1-70	GUN-SS-0070-T-11-CELL	
902621-1-71	GUN-SS-0071-T-11-CELL	
902621-1-72	GUN-SS-0072-T-12-CELL	
902621-1-73	GUN-SS-0073-T-12-CELL	
902621-1-74	GUN-SS-0074-T-12-CELL	
902621-1-75	GUN-SS-0075-T-14-CELL	
902621-1-76	GUN-SS-0076-T-14-CELL	
902621-1-77	GUN-SS-0077-T-16-CELL	
902621-1-78	GUN-SS-0078-T-16-CELL	
902621-1-79	GUN-SS-0079-T-16-CELL	

ANALYSIS REQUEST FORM

[redacted] _____ ANALYST: _____

RECEIVED: _____ DATE STARTED: _____

SAMPLE TYPE: _____ CONTAINER: _____ DATE COMPLETED: _____

SAMPLE LOCATION: _____ CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT	AVERAGE	REL. DEV. FROM MEAN %	COMMENT
2621-45		2.5 ± 0.8				
46		6.6 ± 1.3				
47		4.0 ± 1.0				
48		6.4 ± 1.2				
49		5.4 ± 1.1				
0154 50		4.6 ± 1.0				
51		8.3 ± 1.4				
52		1.0 ± 0.5				
53		1.4 ± 0.6				
54		1.0 ± 0.5				
55		1.5 ± 0.6				
56		2.2 ± 0.7				
57		4.4 ± 1.0				
0155 58		4.1 ± 1.0				
59		2.5 ± 0.8				
60		3.2 ± 0.9				
61		2.3 ± 0.8				
62		2.1 ± 0.8				
63		2.3 ± 0.8				
64		3.4 ± 0.4	2.3 ± 0.8	2.9 ± 0.9	19%	
65		8.4 ± 1.4				
66		0.4 ± 0.4				

Q.C. STANDARD RESULT: 98 ± 6
Q.C. KNOWN VALUE: 99
Q.C. TARGET RANGE: 55 - 144

Q.C. DEVIATION MEAN, % 1.0
SPIKE RECOVERY, %

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

ANALYSIS REQUEST FORM

ANALYST: _____

DATE STARTED: _____

DATE COMPLETED: _____

CHAIN OF CUSTODY: YES

RECEIVED: _____

SAMPLE TYPE: _____ CONTAINER: _____

SAMPLE LOCATION: _____

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT	AVERAGE	REL. DEV. FROM MEAN %	COMMEN
2621-23		2.1 ± 0.7				
24		4.6 ± 1.0				
25		2.0 ± 0.7				
26		1.3 ± 0.6				
27		1.4 ± 0.6				
yes 28		1.3 ± 0.6				
29		1.5 ± 0.6				
30		3.4 ± 1.0				
no 31		1.2 ± 0.6				
32		1.3 ± 0.6				
no 33		0.9 ± 0.5				
34		1.3 ± 0.6				
35		1.5 ± 0.6				
no 36		1.0 ± 0.5				
no 37		1.3 ± 0.6				
38		3.6 ± 1.0				
39		3.3 ± 0.9				
40		2.9 ± 0.9				
41		1.7 ± 0.7				
42		3.1 ± 0.9				
43		1.3 ± 0.6				
44		3.8 ± 1.0				

Q.C. STANDARD RESULT: 113 ± 3

Q.C. KNOWN VALUE: 101

Q.C. TARGET RANGE: _____

Q.C. DEVIATION MEAN, % _____

SPIKE RECOVERY, % _____

Total Frac

ANALYSIS REQUEST FORM

ANALYSIS: Ra 226

DATE RECEIVED: 6-19-90

SAMPLE TYPE: Soils CONTAINER: envelope

SAMPLE LOCATION: Shelf

ANALYST: MDH

DATE STARTED: 6-25

DATE COMPLETED: 7-17

CHAIN OF CUSTODY: YES /

LOG NUMBER	FRACTION	RESULT pCi/g	RESULT	AVERAGE	REL. DEV. FROM MEAN %	COMMENT
2621-1		54 ± 4				
2		27 ± 3				
3		15 ± 2				
4		110 ± 10				
5		20 ± 2				
6		130 ± 10				
7		3.7 ± 0.9				
8		7.5 ± 1.3				
0151 9		9.6 ± 1.5				
10		5.5 ± 1.2	5.2 ± 1.1	5.4 ± 1.2	2.8 %	
11		2.8 ± 0.9				
12		4.1 ± 1.0				
13		2.4 ± 0.8				
14		2.7 ± 0.8				
15		3.8 ± 1.0				
16		120 ± 10				
17		8.7 ± 1.4				
18		4.5 ± 1.1				
19		7.8 ± 1.4				
20		19 ± 2				
21		1.9 ± 0.7				
22		3.8 ± 0.9				

Q.C. STANDARD RESULT: 109 ± 6

Q.C. KNOWN VALUE: ~~101~~ 99

Q.C. TARGET RANGE: 89-109

Q.C. DEVIATION MEAN, % 10%

SPIKE RECOVERY, %

D = Dissolved Fraction S = Suspended Fraction T = Total Fract

Lab Number	Sample Identification	Location
902621-1-82	GUN-SS-0082-T-16-CELL	
902621-1-83	GUN-SS-0083-T-16-CELL	
902621-1-84	GUN-SS-0084-T-17-CELL	
902621-1-85	GUN-SS-0085-T-17 CELL	
902621-1-86	GUN-SS-0086-T-17-CELL	
902621-1-87	GUN-SS-0087-T-17-CELL	
902621-1-88	GUN-SS-0088-T-17-CELL	
902621-1-89	GUN-SS-0089-T-18-CELL	
902621-1-90	GUN SS-0090-T-18-CELL	
902621-1-91	GUN-SS-0091-T-19-CELL	

Lab Number	Sample Identification	Location
902621-1-55	GUN-SS-0055-T-6-CELL	
902621-1-56	GUN-SS-0056-T-7-CELL	
902621-1-57	GUN-SS-0057-T-7-CELL	
902621-1-58	GUN-SS-0058-T-7-CELL	
902621-1-59	GUN-SS-0059-T-7-CELL	
902621-1-60	GUN-SS-0060-T-8-CELL	
902621-1-61	GUN-SS-0061-T-9-CELL	
902621-1-62	GUN-SS-0062-T-9-CELL	
902621-1-63	GUN-SS-0063-T-10-CELL	
902621-1-64	GUN-SS-0064-T-10-CELL	
902621-1-65	GUN-SS-0065-T-10-CELL	
902621-1-66	GUN-SS-0066-T-10-CELL	
902621-1-67	GUN-SS-0067-T-11-CELL	
902621-1-68	GUN-SS-0068-T-11-CELL	
902621-1-69	GUN-SS-0069-T-11-CELL	
902621-1-70	GUN-SS-0070-T-11-CELL	
902621-1-71	GUN-SS-0071-T-11-CELL	
902621-1-72	GUN-SS-0072-T-12-CELL	
902621-1-73	GUN-SS-0073-T-12-CELL	
902621-1-74	GUN-SS-0074-T-12-CELL	
902621-1-75	GUN-SS-0075-T-14-CELL	
902621-1-76	GUN-SS-0076-T-14-CELL	
902621-1-77	GUN-SS-0077-T-16-CELL	
902621-1-78	GUN-SS-0078-T-16-CELL	
902621-1-79	GUN-SS-0079-T-16-CELL	
02621-1-80	GUN-SS-0080-T-16-CELL	

Number	Sample Identification	Location
902621-1-28	GUN-SS-0028-T-24-CELL	
902621-1-29	GUN-SS-0029-T-24-CELL	
902621-1-30	GUN-SS-0030-T-25-CELL	
902621-1-31	GUN-SS-0031-T-25-CELL	
902621-1-32	GUN-SS-0032-T-25-CELL	
902621-1-33	GUN-SS-0033-T-26-CELL	
902621-1-34	GUN-SS-0034-T-26-CELL	
902621-1-35	GUN-SS-0035-T-26-CELL	
902621-1-36	GUN-SS-0036-T-27-CELL	
902621-1-37	GUN-SS-0037-T-27-CELL	
902621-1-38	GUN-SS-0038-T-28-CELL	
902621-1-39	GUN-SS-0039-T-28-CELL	
902621-1-40	GUN-SS-0040-T-28-CELL	
902621-1-41	GUN-SS-0041-T-1-CELL	
902621-1-42	GUN-SS-0042-T-1-CELL	
902621-1-43	GUN-SS-0043-T-1-CELL	
902621-1-44	GUN-SS-0044-T-1-CELL	
902621-1-45	GUN-SS-0045-T-2-CELL	
902621-1-46	GUN-SS-0046-T-2-CELL	
902621-1-47	GUN-SS-0047-T-2-CELL	
902621-1-48	GUN-SS-0048-T-2-CELL	
902621-1-49	GUN-SS-0049-T-2-CELL	
902621-1-50	GUN-SS-0050-T-5-CELL	
902621-1-51	GUN-SS-0051-T-5-CELL	
902621-1-52	GUN-SS-0052-T-6-CELL	
902621-1-53	GUN-SS-0053-T-6-CELL	

Lab Number	Sample Identification	Location
902621-1-1	GUN-SS-0001-T-3-CELL	
902621-1-2	GUN-SS-0002-T-3-CELL	
902621-1-3	GUN-SS-0003-T-3-CELL	
902621-1-4	GUN-SS-0004-T-4-CELL	
902621-1-5	GUN-SS-0005-T-4-CELL	
902621-1-6	GUN-SS-0006-T-13-CELL	
902621-1-7	GUN-SS-0007-T-13-CELL	
902621-1-8	GUN-SS-0008-T-13-CELL	
902621-1-9	GUN-SS-0009-T-13-CELL	
902621-1-10	GUN-SS-0010-T-13-CELL	
902621-1-11	GUN-SS-0011-T-15-CELL	
902621-1-12	GUN-SS-0012-T-15-CELL	
902621-1-13	GUN-SS-0013-T-15-CELL	
902621-1-14	GUN-SS-0014-T-15-CELL	
902621-1-15	GUN-SS-0015-T-15-CELL	
902621-1-16	GUN-SS-0016-T-20-CELL	
902621-1-17	GUN-SS-0017-T-20-CELL	
902621-1-18	GUN-SS-0018-T-20-CELL	
902621-1-19	GUN-SS-0019-T-21-CELL	
902621-1-20	GUN-SS-0020-T-21-CELL	
902621-1-21	GUN-SS-0021-T-21-CELL	
902621-1-22	GUN-SS-0022-T-22-CELL	
902621-1-23	GUN-SS-0023-T-22-CELL	
902621-1-24	GUN-SS-0024-T-22-CELL	
902621-1-25	GUN-SS-0025-T-23-CELL	
902621-1-26	GUN-SS-0026-T-23-CELL	
[illegible]	[illegible]	

Lab Number	Sample Identification	Location
902621-1-82	GUN-SS-0082-T-16-CELL	
902621-1-83	GUN-SS-0083-T-16-CELL	
902621-1-84	GUN-SS-0084-T-17-CELL	
902621-1-85	GUN-SS-0085-T-17-CELL	
902621-1-86	GUN-SS-0086-T-17-CELL	
902621-1-87	GUN-SS-0087-T-17-CELL	
902621-1-88	GUN-SS-0088-T-17-CELL	
902621-1-89	GUN-SS-0089-T-18-CELL	
902621-1-90	GUN-SS-0090-T-18-CELL	
902621-1-91	GUN-SS-0091-T-18-CELL	

APPENDIX D

TEST PIT LITHOLOGICAL LOGS AND RADIOLOGICAL DATA COBBLY SUBSOIL PIT INVESTIGATION NOVEMBER 1992

LITHOLOGICAL LOGS
COBBLY SUBSOIL INVESTIGATION
NOVEMBER 1992

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE EREVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE (216) 523-5600/TELEX: 985542

REPLY TO: MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

93-3050-046

January 18, 1993

Mr. Steve Hamp
Site Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Cobbles-To-Fines Test Pit Logs
Gunnison, Colorado

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Hamp:

Enclosed please find the subject logs for your information. CWMFESI results will be forwarded when they become available.

If you have any questions, please contact Bob Hindman at 246-2557.

Sincerely,

MK-FERGUSON COMPANY

C. R. Spencer
Construction Engineering Manager

CRS/RCH/mno

Attachment

cc: w/attachments:
J. McBee, TAC/UMTRA
W. Naugle, CDH

0695KZ

Cobbles-To-Fine Test Pit Locations

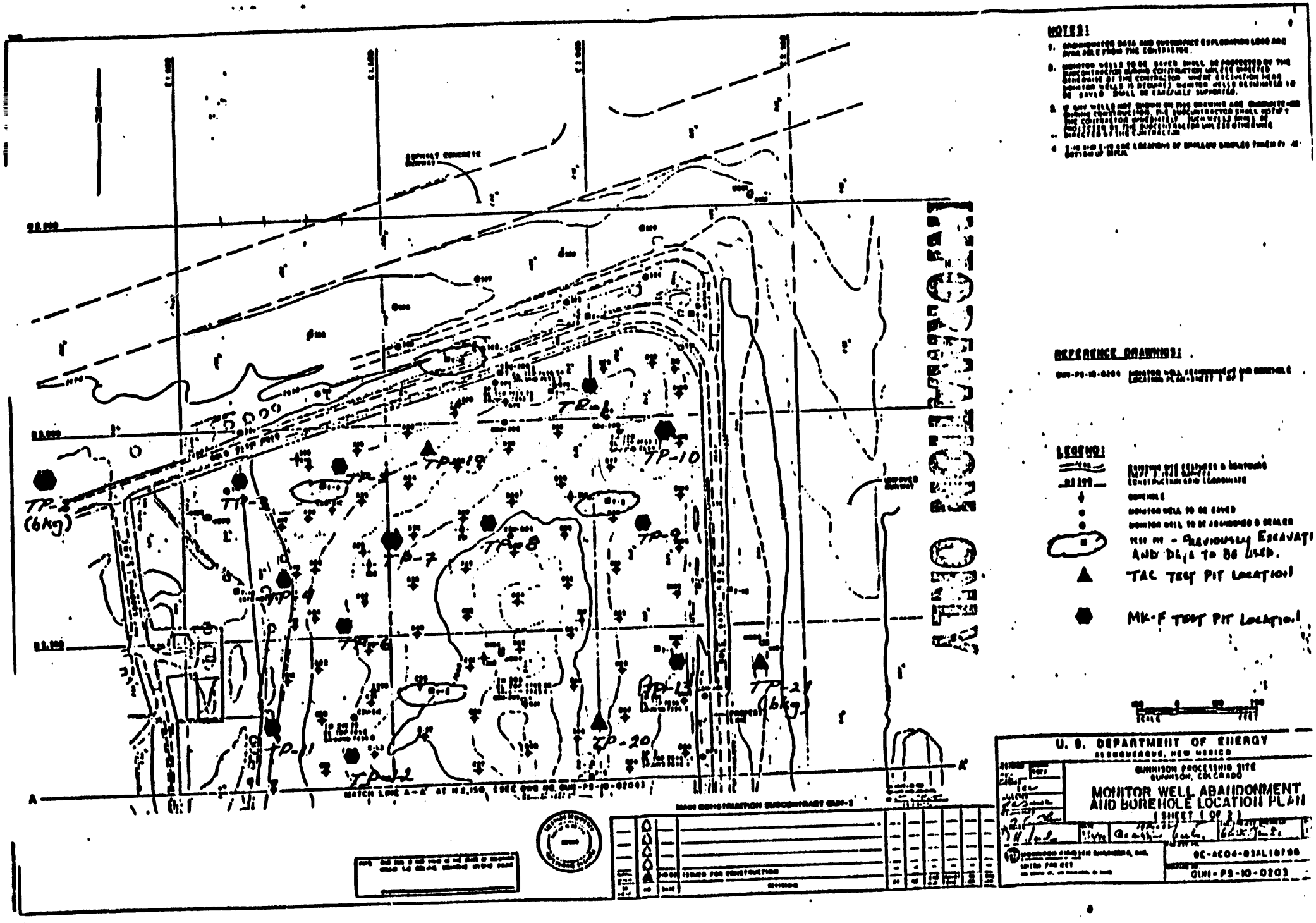
MK-F Test Pits

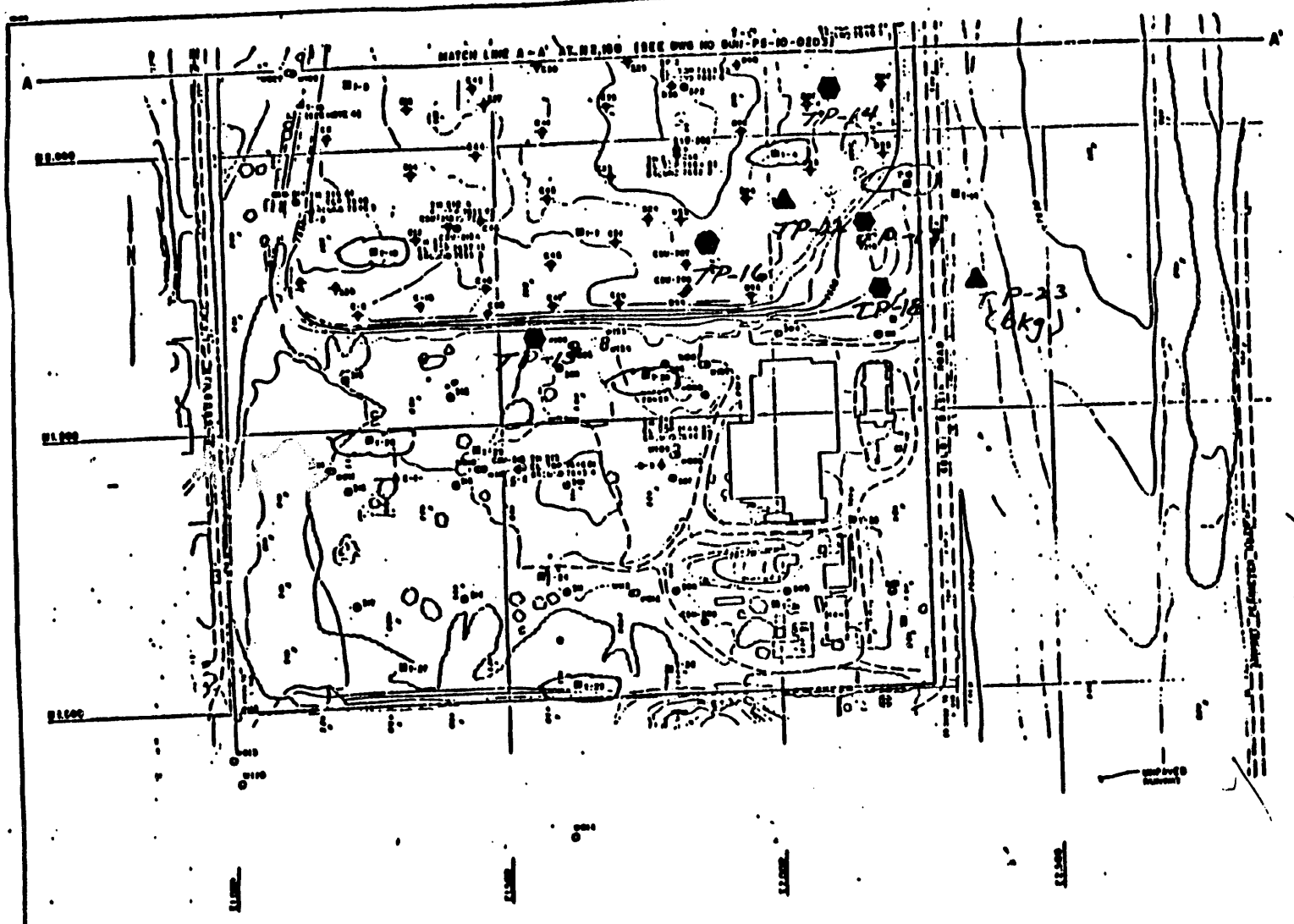
1	N 3075	E 2000
2	N 2900	E 670
3	N 2880	E 1145
4	N 2640	E 1245
5	N 2910	E 1380
6	N 2530	E 1390
7	N 2725	E 1510
8	N 2760	E 1740
9	N 2745	E 2115
10	N 2965	E 2170
11	N 2300	E 1205
12	N 2225	E 1400
13	N 2415	E 2190
14	N 2080	E 2115
15	~~N 1650~~	~~E 1565~~ N 2200 E 1205
16	N 1810	E 1880
17	N 1840	E 2165
18	N 1720	E 2195

TAC Test Pits

19	4	N 2940	E 1600
20	3	N 2280	E 2000
21	1	N 2410	E 2390
22	5	N 1880	E 2025
23	2	N 1730	E ~~2370~~ 2400

INFORMATION ONLY


NOTES:
REFERENCE DRAWINGS:
LEGEND:
TAC TEST PIT LOCATION
MK-F TEST PIT LOCATION
TP-8 (bkg)
TP-10
TP-11
TP-20
TP-21 (bkg)
MATCH LINE A-A' AT N2,150
MAIN CONSTRUCTION SUBCONTRACT GUN-2
ISSUED FOR CONSTRUCTION
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO
GUNNISON PROCESSING SITE
GUNNISON, COLORADO
MONITOR WELL ABANDONMENT AND BOREHOLE LOCATION PLAN
(SHEET 1 OF 2)
DE-AC04-83AL18708
GUN-PS-10-0203



NOTE:
FOR NOTES, REFERENCE DRAWINGS AND LEGEND SEE DWG NO. GUN-PS-10-0203.

INFORMATION ONLY

SCALE FEET

MAIN CONSTRUCTION SUBCONTRACT GUN-2

ISSUED FOR CONSTRUCTION

REVISIONS

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

GUNNISON PROCESSING SITE
GUNNISON, COLORADO

MONITOR WELL ABANDONMENT AND BOREHOLE LOCATION PLAN
(SHEET 2 OF 2)

MORRISON-KNUDSEN ENGINEERS, INC.
MHTRA PROJECT

DE-AC04-83AL18756

GUN-PS-10-0204

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 1

APPROX. SITE COORDINATES (ft)

N 3075 E 2000

GROUND ELEV. (FT. MSL) 7653.8

DATE EXCAVATED: 11/11/92 - 11/12/92

BACKHOE TYPE: CAT 235

CONTRACTOR: AMES

FIELD REP: G. HOMAN

REHAB. DATE:

GROUNDWATER LEVELS

DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION

SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
					DRY TAILINGS TO ≈ 3.0 FT.
5					SLIMES ≈ 3.0 FT TO 10.0 FT
10					GROUNDWATER ENCOUNTERED AT ≈ 10.5 FT 2 SAMPLES @ WATER LEVEL
15					
20					
25					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE

B - Undisturbed Block Sample

D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 1

LOCATION: N 3075 E 2000

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7653.8

*DEPTH OF TAILINGS: 10'

DEPTH OF GROUNDWATER: 10.5'

SAMPLE INTERVAL: 2 SAMPLES TAKEN @ WATER LEVEL

COMMENTS:
APPROX. 0.5' ALLUVIAL (TOPSOIL) COVER LAYER
DRY TAILINGS 0.5' TO 3' / SLIMES 3' TO 10'

*NOTE: RAN INTO SLIME LENS THAT FLUCTUATED ACROSS COBBLE LAYER FROM 7' TO 10' DEPTH. ENCOUNTERED GROUNDWATER @ 10.5' AND TOOK TWO (2) SAMPLES OF COBBLE MATERIAL

SIGNATURE: Greg Homm DATE: 12/7/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP: N

SITE ID: GUN LOCATION ID: 2
APPROX. SITE COORDINATES (ft)
N 2900 E 670
GROUND ELEV. (FT. MSL) 7647.6
DATE EXCAVATED: 11/10/07
BACKHOE TYPE: JD 410
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS

DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL)
					SILTY SAND, GRAVEL, COBBLE 5 SAMPLES @ 1.0 FT. INTERVAL
5					NO GROUNDWATER ENCOUNTERED
10					
15					
20					

INFORMATION ONLY

COMMENTS: BACKGROUND TEST PIT

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 2

LOCATION: N 2900 E 670

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7647.6

DEPTH OF TAILINGS/COBBLES INTERFACE: N/A (BACKGROUND TEST PIT)

DEPTH OF GROUNDWATER: NONE ENCOUNTERED

SAMPLE INTERVAL: 5 SAMPLES @ 1.0 FT INTERVAL

COMMENTS:
BACKGROUND TEST PIT

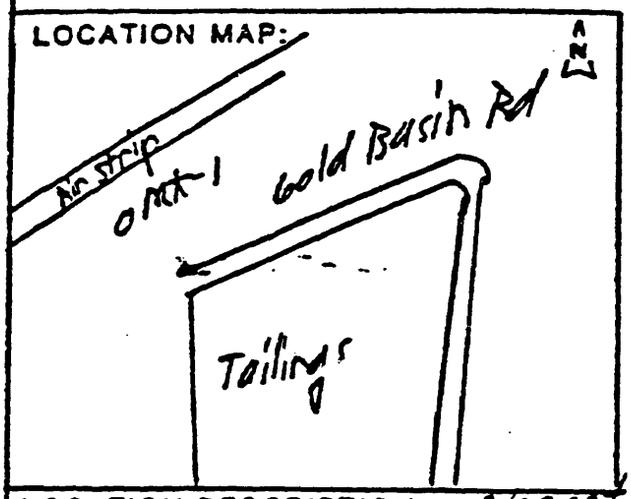
SIGNATURE: Greg Homan DATE: 12/7/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:



SITE ID: Gun 01 LOCATION ID: M+K-1
APPROX. SITE COORDINATES (ft)
N _____ E _____
GROUND ELEV. (FT. MSL) _____
DATE EXCAVATED: 11-10-92
BACKHOLE TYPE: John Deere 410
CONTRACTOR: RMES
FIELD REP: R. Papusch / R. Monks
REHAB. DATE: 11-10-92

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION Airport Property - South of East West runway.
SITE CONDITION Flat vegetated rocky surface

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
		B		GM/GP	GM/SM Topsoil 1-8", dark brown slmoist
5					Sandy to silty Gravel, considerable cobbles + boulders present, dark brown, slightly moist. TD 5'
10					
15					
20					
25					

INFORMATION ONLY

COMMENTS: M+K sampled on foot intervals from 1 to 5 feet.

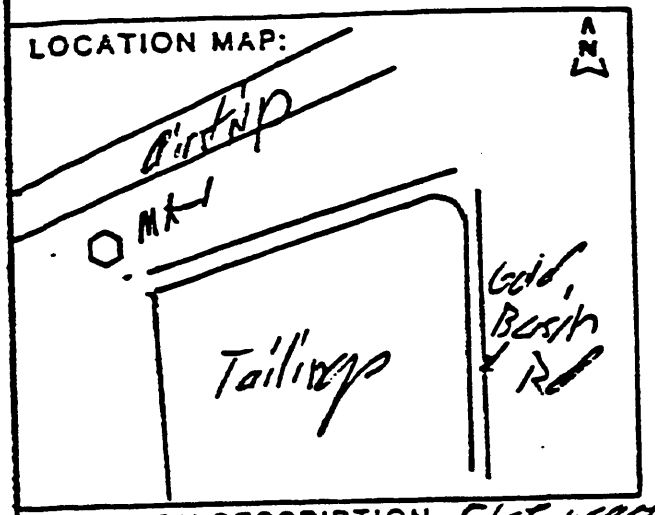
SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

Page 1 of 1

LOCATION MAP:



SITE ID: GUAC 1 LOCATION ID: MK-1

APPROX. SITE COORDINATES (ft)

N 2900 E 470

GROUND ELEV. (FT. MSL)

DATE EXCAVATED: 11-16-92

BACKHOLE TYPE:

CONTRACTOR:

FIELD REP: X Nicholas R Papusch

REHAB. DATE:

GROUNDWATER LEVELS

DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION Flat vegetated surface - Airport Property

SITE CONDITION Flat vegetated surface.

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
	↕	Bulk		~~GM~~	1-8" topsoil; roots
	↕				
	↕		-	GM/GP	Poorly sorted sandy silty gravel; dark brown, slightly moist. Cobbles and boulders present (40-50% cobbles & boulders)
	↕				
	↕				

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE

B - Undisturbed Block Sample

D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 3
APPROX. SITE COORDINATES (ft)
N 2880 E 1145
GROUND ELEV. (FT. MSL) 7647.2
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					NO TAILINGS - COBBLES ENCOUNTERED TO GROUNDWATER LEVEL @ 6.5 FT 5 SAMPLES @ 1.0 FT INTERVAL → 2 FT TO 7 FT
10					
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 3

LOCATION: N 2880 E 1145

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7647.2

DEPTH OF TAILINGS/COBBLES INTERFACE: No TAILINGS ENCOUNTERED

DEPTH OF GROUNDWATER: 6.5 FT

SAMPLE INTERVAL: 5 SAMPLES @ 1.0 FT INTERVAL → 2 FT TO 7 FT

COMMENTS:

SIGNATURE: Greg Hom DATE: 12/7/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP: N

SITE ID: GUN LOCATION ID: 4

APPROX. SITE COORDINATES (ft)

N 2640 E 1245

GROUND ELEV. (FT. MSL) 7646.7

DATE EXCAVATED: 11/11/92 - 11/12/92

BACKHOE TYPE: CAT 235

CONTRACTOR: AMES

FIELD REP: G. HOMAN

REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION

SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER
5					NO TAILINGS - COBBLES ENCOUNTERED TO GROUNDWATER LEVEL @ 8.0 FT 5 SAMPLES @ 1.0 FT INTERVAL
10					
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE

B - Undisturbed Block Sample

D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 4

LOCATION: N 2640 E 1245

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7646.7

DEPTH OF TAILINGS/COBBLES INTERFACE: NO TAILINGS ENCOUNTERED

DEPTH OF GROUNDWATER: 8.5 FT

SAMPLE INTERVAL: 5 SAMPLES @ ≈ 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [illegible] DATE: 12/7/92

INFORMATION ONLY

JE JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 5
APPROX. SITE COORDINATES (ft)
N 2910 E 1380
GROUND ELEV. (FT. MSL) 7651.4
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER
			-		TAILINGS - SAND, SILTY SAND TO 6.0 FT
5					
					COBBLES FROM 6.0 FT TO GROUNDWATER LEVEL @ 10.0 FT 4 SAMPLES @ 1.0 FT INTERVAL
10					
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 5

LOCATION: N 2910 E 1380

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7651.4

DEPTH OF TAILINGS/COBBLES INTERFACE: 6.0 FT

DEPTH OF GROUNDWATER: 10.0 FT

SAMPLE INTERVAL: 4 SAMPLES @ 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [illegible] DATE: 12/7/02

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

Page 1 of 1

LOCATION MAP:

SITE ID: GUN LOCATION ID: 6
APPROX. SITE COORDINATES (ft)
N 2530 E 1390
GROUND ELEV. (FT. MSL) 7655.5
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS

DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER
					≈ 0.5 FT TO 4.0 FT TAILINGS - SAND TO SILTY SAND
5					≈ 4.0 FT TO 9.0 FT SLIME LAYER
10					COBBLE LAYER 9.0 FT TO WATER LEVEL AT 15.0 FT. 5 SAMPLES @ ≈ 1.0 FT INTERVAL
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

3 of 4

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 6

LOCATION: N 2530 E 1390

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7655.5

DEPTH OF TAILINGS/COBBLES INTERFACE: 9 FT

DEPTH OF GROUNDWATER: ≈ 15 FT

SAMPLE INTERVAL: 5 SAMPLES @ APPROX. 1 FT INTERVAL TO 15 FT

COMMENTS:

SIGNATURE: [illegible] DATE: 12/9/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 7
APPROX. SITE COORDINATES (ft)
N 2725 E 1510
GROUND ELEV. (FT. MSL) 7657.1
DATE EXCAVATED: 11/11/02 - 11/12/02
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					≈ 0.5 FT TO ~~10.0 FT~~ 7.0 FT TAILINGS - SAND, SILTY SAND.
10					≈ 7.0 FT TO 10.0 FT SLIMES
15					COBBLE INTERFACE 10.0 FT TO 15.0 FT(+). NO WATER ENCOUNTERED. 5 SAMPLES @ 1.0 FT INTERVAL
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 7

LOCATION: N 2725 E 1510

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7657.1

DEPTH OF TAILINGS/COBBLES INTERFACE: 10 FT

DEPTH OF GROUNDWATER: NO WATER ENCOUNTERED

SAMPLE INTERVAL: 5 SAMPLES @ 1.0 FT INTERVAL TO 15.0 FT

COMMENTS:

SIGNATURE: [signature] DATE: 12/9/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 8
APPROX. SITE COORDINATES (ft)
N 2760 E 1740
GROUND ELEV. (FT. MSL) 7659.4
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
			-		≈ 0.5 FT TO 9.0 FT TAILINGS
5					
10					9.0 FT TO 15.0 FT (+) COBBLE INTERFACE. NO WATER ENCOUNTERED 4 SAMPLES @ APPROX. 1.5 FT INTERVAL
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 8

LOCATION: N 2760 E 1740

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7659.4

DEPTH OF TAILINGS/COBBLES INTERFACE: 9 FT

DEPTH OF GROUNDWATER: No GROUNDWATER ENCOUNTERED

SAMPLE INTERVAL: 4 SAMPLES @ APPROX 1.5 FT INTERVAL TO 15 FT

COMMENTS:

SIGNATURE: [signature] DATE: 12/9/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP: A N

SITE ID: GUN LOCATION ID: 9
APPROX. SITE COORDINATES (ft)
N 2745 E 2115
GROUND ELEV. (FT. MSL) 7656.0
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) ~~of~~ COVER LAYER
					≈ 0.5 FT TO 5.0 FT TAILINGS. SILTY, SILTY SAND.
5					≈ 5.0 FT TO 11.0 FT SLIMES
10					interface
					COBBLES AT 11.0 FT TO WATER LEVEL AT 13.0 FT.
15					4 SAMPLES @ APPROX. 1.0 FT INTERVAL LAST SAMPLE @ 14.0 FT.
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

FIGURE 14.4 1-3

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 9

LOCATION: N 2745 E 2115

TAC TEST PIT: YES____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES____ NO X

SURFACE ELEVATION: 7656.0

DEPTH OF TAILINGS/COBBLES INTERFACE: 11.0 FT

DEPTH OF GROUNDWATER: 13.0 FT

SAMPLE INTERVAL: 4 SAMPLES @ ≈ 1.0 FT INTERVAL. LAST SAMPLE TAKEN AT 14.0 FT.

COMMENTS:

SIGNATURE: [illegible] DATE: 12/9/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 10
APPROX. SITE COORDINATES (ft)
N 2965 E 2170
GROUND ELEV. (FT. MSL) 7653.9
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
					≈ 0.5 FT TO 3.5 FT TAILINGS SAND, SILTY SAND.
5					≈ 3.5 FT TO 8.0 FT SLIMES
10					COBBLES AT 8.0 FT TO WATER LEVEL AT 10.5 FT. 3 SAMPLES @ APPROX. 1.0 FT INTERVAL
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 10

LOCATION: N 2965 E 2170

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7653.9

DEPTH OF TAILINGS/COBBLES INTERFACE: 8 FT

DEPTH OF GROUNDWATER: 10.5 FT

SAMPLE INTERVAL: 3 SAMPLES @ APPROX. 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: Greg Horn DATE: 12/9/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 11
APPROX. SITE COORDINATES (ft)
N 2300 E 1205
GROUND ELEV. (FT. MSL) 7646.1
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					COBBLES 0.5 FT TO WATER LEVEL AT 8.0 FT. 5 SAMPLES TAKEN FROM 2.0 FT TO 8.0 FT AT ≈ 1.0 FT (+) INTERVAL
10					
15					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 11

LOCATION: N 2300 E 1205

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7646.1

DEPTH OF TAILINGS/COBBLES INTERFACE: ALL COBBLES, NO TAILINGS

DEPTH OF GROUNDWATER: 8 FT

SAMPLE INTERVAL: START SAMPLING @ 2 FT. 5 SAMPLES @ ≈ 1 FT INTERVAL.

COMMENTS:

SIGNATURE: [illegible] DATE: 12/10/92

INFORMATIONAL ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUW LOCATION ID: 12
APPROX. SITE COORDINATES (ft)
N 2225 E 1400
GROUND ELEV. (FT. MSL) 7656.3
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					≈ 0.5 FT TO 6.0 FT TAILINGS. SAND, SILTY SAND
10					≈ 6.0 FT TO 11.0 FT SLIMES
15					COBBLES 11.0 FT TO 16.0 FT(+) NO GROUNDWATER ENCOUNTERED 5 SAMPLES @ 1.0 FT INTERVAL
20					

DECLASSIFICATION CENTER

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 12

LOCATION: N 2225 E 1400

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7656.3

DEPTH OF TAILINGS/COBBLES INTERFACE: 11.0 FT

DEPTH OF GROUNDWATER: No GROUNDWATER ENCOUNTERED

SAMPLE INTERVAL: 5 SAMPLES AT 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 13
APPROX. SITE COORDINATES (ft)
N 2415 E 2190
GROUND ELEV. (FT. MSL) 7655-1
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					≈ 0.5 FT TO 10.0 FT TAILINGS. SAND, SILTY SAND
10					COBBLES 10.0 FT TO WATER LEVEL AT 13.5 FT
15					5 SAMPLES @ < 1.0 FT INTERVAL.
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JEG-AL-ENG-7 (6/87)

FIGURE 14.4.1-3

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 13

LOCATION: N 2415 E 2190

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7655.1

DEPTH OF TAILINGS/COBBLES INTERFACE: 10.0 FT

DEPTH OF GROUNDWATER: 13.5 FT

SAMPLE INTERVAL: 5 SAMPLES @ < 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 14
APPROX. SITE COORDINATES (ft)
N 2080 E 2115
GROUND ELEV. (FT. MSL) 7654.4
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
					≈ 0.5 FT TO 4.0 FT TAILINGS. SAND, SILTY SAND
5					≈ 4.0 FT TO 12.0 FT SLIMES
10					
					COBBLES 12.0 FT TO WATER LEVEL AT 16.0 FT
15					4 SAMPLES AT 1.0 FT INTERVAL
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 14

LOCATION: N 2080 E 2115

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7654.4

DEPTH OF TAILINGS/COBBLES INTERFACE: 12.0 FT

DEPTH OF GROUNDWATER: 16.0 FT

SAMPLE INTERVAL: 4 SAMPLES @ 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [illegible] DATE: 12/10/92

JE JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

Page 1 of 1

LOCATION MAP:

SITE ID: GUN LOCATION ID: 15
APPROX. SITE COORDINATES (ft)
N 2200 E 1205
GROUND ELEV. (FT. MSL) ≈ 7646.1
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					COBBLES 0.5 FT TO WATER LEVEL AT 8.0 FT 5 SAMPLES TAKEN FROM 2.0 FT TO 8.0 FT @ APPROX 1.0 FT INTERVAL
10					
15					
20					

INFORMATION ONLY

COMMENTS: TEST PIT RELOCATED FROM ORIGINAL LOCATION OF N1650, E1565. APPROVED BY WENDY NAUGLE (CDH).

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JEG-AL-ENG-7 (6/87)

FIGURE 14.4.1-3

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 15

LOCATION: N 2200 E 1205

TAC TEST PIT: YES ___ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ___ NO X

SURFACE ELEVATION: ≈ 7646.1

DEPTH OF TAILINGS/COBBLES INTERFACE: ALL COBBLES, NO TAILINGS

DEPTH OF GROUNDWATER: ≈ 8.0 FT

SAMPLE INTERVAL: 5 SAMPLES AT APPROX. 1.0 FT INTERVAL

COMMENTS:
ORIGINAL TEST PIT LOCATION WAS N1650, E1565. THE TEST PIT WAS RELOCATED DUE TO ORIGINAL LOCATION BEING ON VICINITY PROPERTY MATERIAL. THUS CAUSING GREATER EXCAVATION DEPTH AND ~~DIFFICU~~ DIFFICULTY DETERMINING COBBLES INTERFACE IF ORIGINAL LOCATION WOULD HAVE BEEN USED. APPROVED BY WENDY NAUGLE (CDH).

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: Gwd LOCATION ID: 16
APPROX. SITE COORDINATES (ft)
N 1810 E 1880
GROUND ELEV. (FT. MSL) 7659.0
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. Homan
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					≈ 0.5 FT TO 6.0 FT TAILINGS. SAND, SILTY SAND
10, 15					≈ 6.0 FT TO 15.5 FT SLIMES ↓
20					COBBLES 15.5 FT TO 20.5 FT (+) NO GROUNDWATER ENCOUNTERED 5 SAMPLES AT 1.0 FT INTERVAL
25					

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 16

LOCATION: N 1810 E 1880

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES X NO ____

SURFACE ELEVATION: 7659.0

DEPTH OF TAILINGS/COBBLES INTERFACE: 15.5 FT

DEPTH OF GROUNDWATER: No Groundwater encountered

SAMPLE INTERVAL: 5 samples @ 1.0 ft interval

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

UNCLASSIFIED

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 17
APPROX. SITE COORDINATES (ft)
N 1840 E 2165
GROUND ELEV. (FT. MSL) 7646.9
DATE EXCAVATED: 11/11/92 - 11/12/92
BACKHOE TYPE: CAT 235
CONTRACTOR: AMES
FIELD REP: G. HOMAN
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
5					≈ 0.5 FT TO 6.5 FT TAILINGS. SAND, SILTY SAND
10					COBBLES 6.5 FT TO WATER LEVEL AT 10.0 FT 3 SAMPLES AT APPROX. 1.0 FT INTERVAL
15					
20					

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

FIGURE 14.4.1-3

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 17

LOCATION: N 1840 E 2165

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7646.9

DEPTH OF TAILINGS/COBBLES INTERFACE: 6.5 FT

DEPTH OF GROUNDWATER: ≈ 10.0 FT

SAMPLE INTERVAL: 3 SAMPLES @ APPROX. 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [illegible] DATE: 12/10/92

RECEIVED

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN LOCATION ID: 18

APPROX. SITE COORDINATES (ft)

N 1720 E 2195

GROUND ELEV. (FT. MSL) 7646.0

DATE EXCAVATED: 11/11/02 - 11/12/02

BACKHOE TYPE: CAT 235

CONTRACTOR: AMES

FIELD REP: G. HOMAN

REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION

SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH PLASTICITY, CONDITION, ETC.
					≈ 0.5 FT ALLUVIAL (TOPSOIL) COVER LAYER
					≈ 0.5 FT TO 2.5 FT TAILINGS. SAND, SILTY SAND
5					≈ 2.5 FT TO 5.0 FT SLIMES
10					COBBLES 5.0 FT TO 10.0 FT (+) NO GROUNDWATER ENCOUNTERED 5 SAMPLES @ 1.0 FT INTERVAL
15					

COMMENTS:

SAMPLE TYPE

B - Undisturbed Block Sample

D - Disturbed Bulk Sample

JEG-AL-ENG-7 (6/87)

FIGURE 14.4.1-3

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 18

LOCATION: N 1720 E 2195

TAC TEST PIT: YES ____ NO X

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7646.0

DEPTH OF TAILINGS/COBBLES INTERFACE: 5.0 FT

DEPTH OF GROUNDWATER: NO GROUNDWATER ENCOUNTERED

SAMPLE INTERVAL: 5 SAMPLES @ 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

Page 1 of 1
MEF 19

LOCATION MAP: A N

SITE ID: GUN01 LOCATION ID: TAC-4
APPROX. SITE COORDINATES (ft)
N 2940 E 1600
GROUND ELEV. (FT. MSL) 7653.6
DATE EXCAVATED: 11-10-92
BACKHOLE TYPE: Caterpillar 235
CONTRACTOR: AMES
FIELD REP: R. Lapusan / K. Marks
REHAB. DATE: 11-11-92

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION On tailings pile, north portion.
SITE CONDITION Silty-Sandy-Cobbly surface, tailings cover

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
				SM/ML	Silty Sand / Sandy Silt, some gravel, dark brown, sl moist, vegetated, tailings cover, 6-8".
			-	SM/SW	
5					Sand to Silty Sand fine, fairly well graded, v loose, light brown, dry, tailings material.
7.0	↕	B	001		
	↕	B	002		
10	↕	B	003	CL	
	↕	B	004		Clay, some silt, med to hi pt, gray, moist, tailings slime.
	↕	B	005		
13.0	↕	B	006		
15				GP	Sandy Gravel, cobbly, poorly graded, moist to saturated with depth; lt brown, stained red from 8' to depth. TD 13'
					noticewater entering pit at 12'.

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

INFORMATION ONLY

JEG-AL-ENG-7 (6/87)

FIGURE 14.4.1-3

JACOBS ENGINEERING GROUP INC.

SOIL SAMPLE INVENTORY

SITE ID: GUN01

LOCATION (BORING) ID: JAC-4

DATE: 11/10/92

FIELD REP.: Kimmel / R. Paausch

SAMPLE I.D.	DEPTH INT.	SAMPLE I.D.	DEPTH INT.
001	6-7'		
002	8-9'		
003	9-10'		
004	10'-11'		
005	11'-12'		
006	12'-13'		

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 19

LOCATION: N 2940 E 1600

TAC TEST PIT: YES X NO ____

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7653.6

DEPTH OF TAILINGS/COBBLES INTERFACE: ≈ 7 FT ~~TO 8 FT~~ DOWN

DEPTH OF GROUNDWATER: 12 FT

SAMPLE INTERVAL: 6 SAMPLES @ 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

Page 1 of 1
MK-F-20

LOCATION MAP:

SITE ID: GUN01 LOCATION ID: TAC-3
APPROX. SITE COORDINATES (ft)
N 2280 E 2000
GROUND ELEV. (FT. MSL)
DATE EXCAVATED: 11-10-92
BACKHOLE TYPE: Catipillar 235
CONTRACTOR: AMES
FIELD REP: R. Papusch / K. Monks
REHAB. DATE: ~~11-11-92~~ 11-11-92 / RAP 11-10-92

GROUNDWATER LEVELS

DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION on tailings pile, central
SITE CONDITION silty-sandy cobbly surface, tailings cover.

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
			-	SM/SW	ML/SM sandy silt/silty sand, some gravel, dark brown, sl moist, vegetated, tailings cover, 6-8".
5					sand to silty sand, fine sand, fairly well graded, loose, light brown, dry, tailings material.
8.0					
10		B	001	CL	clay, some silty layers, grey-green, hi pt, damp; tailings slime material.
				subpile	
15		B	002	GP	cobbly gravel, very sandy, poorly graded, moist. TD 18'
		B	003 004		
18.0					
20					
25					

INFORMATION ONLY

COMMENTS: pH of sample ID 004 = 4.6

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

LOCATION MAP:

SITE ID: GUN01 LOCATION ID: TAC-3
APPROX. SITE COORDINATES (ft)
N 2280 E 2000
GROUND ELEV. (FT. MSL)
DATE EXCAVATED: 11/10/92
BACKHOLE TYPE: John Deere 410-D
CONTRACTOR:
FIELD REP: J Morris / R Papusch
REHAB. DATE:

GROUNDWATER LEVELS

DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION So. site Central
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
				SM/SW	Sand, loose, light brown tailings
				CL	Clay, fine, gray - tailings/slimes, moist @ 8' stiff clay
		Bulk	001		
			002 003 004	GP	Cobbles, gravels, Sandy, Brown; st Moist pH of 004 = 4.6

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JEG-AL-ENG-7 (6/87)

FIGURE 14.4.1-3

JACOBS ENGINEERING GROUP INC.

SOIL SAMPLE INVENTORY

SITE ID: GUN01

LOCATION (BORING) ID: TAC-3

DATE: 11/10/92

FIELD REP.: K Marks / P Paprocki

SAMPLE I.D.	DEPTH INT.	SAMPLE I.D.	DEPTH INT.
001	8-15'		
002	15-17'		
003	17-18'		
004	18'		

INFORMATION ONLY

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 20

LOCATION: N 2280 E 2000

TAC TEST PIT: YES X NO ____

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7657.4

DEPTH OF TAILINGS/COBBLES INTERFACE: 15.0 FT

DEPTH OF GROUNDWATER: ≈ 17 FT TO 18 FT

SAMPLE INTERVAL: BULK SAMPLE @ 8 FT TO 15 FT
3 SAMPLES @ 1 FT INTERVAL

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

Page 1 of 1
MK-F 21

LOCATION MAP:

SITE ID: GUN01 LOCATION ID: TAC-1
APPROX. SITE COORDINATES (ft)
N 2410 E 2390
GROUND ELEV. (FT. MSL)
DATE EXCAVATED: 11-10-92
BACKHOLE TYPE: John Deere -410D
CONTRACTOR: AMES
FIELD REP: R. Papuscal / K. Monks
REHAB. DATE: 11-10-92

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION Near Eastern Boarder of Gold Basin Rd., Airport Prop.
SITE CONDITION Flat Vegetated cobbly-silty surface.

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
				GP	SM/GM Silty Sand, some gravel, dark brown, sl. moist, vegetated top soil,
		B	001		Sandy Gravel, considerable cobble material, poorly graded, dark brown, slightly moist to saturated with depth. TD 7.5'
		B	002		
		B	003		
5					
		B	004		
7.5'					
10					
15					
20					
25					

Note:
(1) Material Damp at ≈ 3.5 ft
(2) Water Entering test pit at 6'.
(3) Sample not collected from 5'-6' because of test pit wall cave.

INFORMATION ONLY

COMMENTS:
Rad Reading
7 pCi/g at 2'
8 pCi/g at 3'
850 counts per to min at 3.5'.

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

Page 1 of 1

LOCATION MAP:

SITE ID: GUN01 LOCATION ID: TAC-1
APPROX. SITE COORDINATES (ft)
N 2410 E 2390
GROUND ELEV. (FT. MSL)
DATE EXCAVATED: 11/10/92
BACKHOLE TYPE:
CONTRACTOR:
FIELD REP: K Monks R Papusch
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION North Background Pit
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
		Bulk		GM/GP	6" Topsoil
			001		Cobble, Gravel, Sandy ~~Silt~~
			002		Dark Brown, Slightly Moist (50% cobbles)
			003		1st sample @ 2' 6-7 pCi/g
			004	▽	2nd sample @ 3' 8 pCi/g
					Damp at ≈ 3.5 ft 850 counts per min
					6' water table
					5-6; sample not collected due to cave-in

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.

SOIL SAMPLE INVENTORY

SITE ID: GUNO 1

LOCATION (BORING) ID: TAC-1

DATE: 11/10/89

FIELD REP.:

SAMPLE I.D.	DEPTH INT.	SAMPLE I.D.	DEPTH INT.
001	2-3		
002	3-4		
003	4-5		
004	6-7		

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 21

LOCATION: N 2410 E 2390

TAC TEST PIT: YES X NO ____

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7646.7

DEPTH OF TAILINGS/COBBLES INTERFACE: No TAILINGS, ALL COBBLES

DEPTH OF GROUNDWATER: 6 FT

SAMPLE INTERVAL: 4 SAMPLES @ APPROX 1.0 FT INTERVAL 2 FT TO 7 FT.

COMMENTS:

SIGNATURE: [signature] DATE: 12/10/92

INFORMATION ONLY

JE JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

Page __ of __ MK-F 22

LOCATION MAP:

SITE ID: MINO1 LOCATION ID: TAC-5
APPROX. SITE COORDINATES (ft)
N 1880 E 2025
GROUND ELEV. (FT. MSL) 7655.5
DATE EXCAVATED: 11/10/92
BACKHOLE TYPE: Cat 225
CONTRACTOR:
FIELD REP: K Monks/R Papusch
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION On-site South Pit
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
				GM	1 foot brown silty soil
				SM/SW	Sand fine-grained, light brown tailings, well sorted fine sand, Tailings
8 13			001		Silty Clay Slimes, gray, @5 ft
13					Tailings / Subsoil interface @ 13'
15			002 003 004 005 006 007		Gravels, Cobbles, sands, brown, moist (cobbles % 40%), slight iron staining Boulders @ 17' Water table at 14.6

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JE JACOBS ENGINEERING GROUP INC.

SOIL SAMPLE INVENTORY

SITE ID: GWD1

DATE: 11/16/92

LOCATION (BORING) ID: TAC - 5

FIELD REP.: K Banks / R Daynusch

SAMPLE I.D.	DEPTH INT.	SAMPLE I.D.	DEPTH INT.
001	6'-9'		
002	12-14'		
003	14-15'		
004	15-16'		
005	17'-18' ~~16-17'~~		
006	18-19'		
007	19-20'		

INFORMATION ONLY

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 22

LOCATION: N 1880 E 2025

TAC TEST PIT: YES X NO ____

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7655.5

DEPTH OF TAILINGS/COBBLES INTERFACE: 13 FT

DEPTH OF GROUNDWATER: 19.0 FT

SAMPLE INTERVAL: 7 SAMPLES @ APPROX. 1.0 FT INTERVAL

COMMENTS:

SIGNATURE: Greg Ha DATE: 12/10/92

INFORMATION ONLY

JACOBS ENGINEERING GROUP INC.

TEST PIT LOG

MK-F 23

LOCATION MAP:

SITE ID: GUN01 LOCATION ID: TAC-2

APPROX. SITE COORDINATES (ft)

N 1730 E 2400

GROUND ELEV. (FT. MSL) 7642.9

DATE EXCAVATED: 11-10-92

BACKHOLE TYPE: John Deere 410-D

CONTRACTOR: AMES

FIELD REP: R. Papusch / R. Marks

REHAB. DATE: 11-10-92

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION South Background Pit

SITE CONDITION Flat Sandy-silty cobbly surface

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
				GP	Sandy Gravel, some cobble, poorly graded, dark brown, moist to saturated with depth. Cobble size is smaller relative to TAC-1 test pit. TD 6'
	↕	B	001		
	↕	B	002		
	↕	B	003		
	↕	B	004		
6					

Note: soil is very damp at 4'.
Note: water entering testpit at 5'.
Note: Rad reading of 15 pCi/g at 2ft.

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE

B - Undisturbed Block Sample

D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

TEST PIT LOG

LOCATION MAP:

SITE ID: SUN01 LOCATION ID: TAC-2
APPROX. SITE COORDINATES (ft)
N 1730 E 2400
GROUND ELEV. (FT. MSL)
DATE EXCAVATED: 11/10/92
BACKHOLE TYPE: John Deere 410D
CONTRACTOR:
FIELD REP: Monka R. Papusch
REHAB. DATE:

GROUNDWATER LEVELS			
DATE	TIME	DEPTH (ft)	EST. FLOW (GAL/MIN)

LOCATION DESCRIPTION South Background Pit
SITE CONDITION

DEPTH (ft.)	SAMPLE INT	SAMPLE TYPE	SAMPLE ID	UNIFIED SOIL CLASS.	VISUAL CLASS.: DENSITY, COLOR, STRENGTH, PLASTICITY, CONDITION, ETC.
		Bulk	001		Cobble - Gravel, Sandy, Dark Brown
			002		~~Slightly~~ Moist (30-40% cobbles)
			003		Decrease in cobble size from TAC-1
			004		15 pCi/g @ 2 ft
					Soil becomes wet at 4'
					Water Table @ 5ft

INFORMATION ONLY

COMMENTS:

SAMPLE TYPE
B - Undisturbed Block Sample
D - Disturbed Bulk Sample

JACOBS ENGINEERING GROUP INC.

SOIL SAMPLE INVENTORY

SITE ID: GUN 7

LOCATION (BORING) ID: TAC-2

DATE: 11/10/92

FIELD REP.: R Papusch / K Monke

SAMPLE I.D.	DEPTH INT.	SAMPLE I.D.	DEPTH INT.
001	2-3		
002	3-4		
003	4-5		
004	5-6		

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

COBBLES-TO-FINE TEST PIT DATA

TEST PIT #: 23

LOCATION: N 1730 E 2400

TAC TEST PIT: YES X NO ____

CDH SAMPLES TO BE TAKEN BY MK-F/CWMFES: YES ____ NO X

SURFACE ELEVATION: 7642.9

DEPTH OF TAILINGS/COBBLES INTERFACE: No TAILINGS ALL COBBLE

DEPTH OF GROUNDWATER: 5.0 FT

SAMPLE INTERVAL: 4 SAMPLES @ 1.0 FT INTERVAL FROM 2.0 FT TO 6.0 FT

COMMENTS:
BACKGROUND TEST PIT

SIGNATURE: [illegible] DATE: 12/10/07

INFORMATION ONLY

SIEVE ANALYSIS AND SUMMARY OF RADIOLOGICAL MEASUREMENTS: COMPOSITE COBBLY SOIL SAMPLES
COBBLY SUBSOIL INVESTIGATION
NOVEMBER 1992

Doug Gonzales

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE: (216) 523-5600/TELEX: 985542

REPLY TO: MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

February 2, 1993

93-3050-097
845-5868

Carlson 246-2541
Turner 246-2539

Mr. Steve Hamp
DOE Site Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Cobbles to Fines - Gunnison, Colorado

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Hamp:

Enclosed please find the radiological information developed for the subject test pits.

If you have any questions or comments, please contact Bob Hindman at 246-2557.

Sincerely,

MK-FERGUSON COMPANY

Charles R Spencer

C. R. Spencer
Construction Engineering Manager

CRS/RCH/mno

Attachment

cc: w/attachment:
W. Naugle, CDH
J. McBee, TAC/UMTRA

0723KZ

CWM Federal Environmental Services, Inc.

DATE: Jan. 20, 1993

TO: Jim Turner

LOCATION: Albuquerque

FROM: Ron Jacobs RJ for RDJ

LOCATION: Gunnison

SUBJECT: Cobbles-to-fines

Enclosed is the requested cobbles-to-fines information from the Gunnison site test pits.

If you have any further inquiries, please contact me.

RDJ/KD/ts

pc John Innis

INFORMATION ONLY

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3050/Gun

Sample/Grid I.D. Test Pit #1

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	20.45	Wt. Sample & Bucket	59.83	Wet Wt. Sample/Pan	792.57
Wt. Bucket	1.77	Wt. Bucket	2.02	Dry Wt. Sample/Pan	656.88
Wt. Sample	18.68	Wt. Sample	57.81	Tare Wt. Pan	18.29
Adjusted Dry Wt. ($M_{<\#4}$)*	14.72	Adjusted Dry Wt. ($M_{>\#4}$)**	56.94	Wt. Water*	135.69
				Wt. Soil**	638.59
				Percent Water(*/**)	21.2

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>\#4}/M_{<\#4}$ = 3.87

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>\#4}$)	2.5	15	1.7	
On-Site Analysis Fines ($C_{<\#4}$)	11.1 *	N/A	0.9	
	**			
	***			
Vendor Analysis Fines ($C_{<\#4}$)	20	95	1.7	
Bulk Radionuclide Concentration (C_B)	6.09 #	31.43	1.7	
	##			
	###			

* Initial; ** Initial Corrected; *** 30-day (N/A for Test Pit or Running AVE.)

\# Using Vendor; \#\# Using Initial Corrected; \#\#\# Using 30-day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.80

* determined by comparing vendor analysis with initial on-site lab results

FOR INFORMATION ONLY

Reviewed By: ____ Date: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

ite: Gun/3050 Sheet ____ of ____

ample/Grid I.D. Test Pit #3 Date: 11/10/92

ines		Cobbles		Moisture Content Fines	
t. Sample & Bucket	18.72	Wt. Sample & Bucket	78.55	Wet Wt. Sample/Pan	616.52
t. Bucket	1.72	Wt. Bucket	1.72	Dry Wt. Sample/Pan	599.32
t. Sample	17.00	Wt. Sample	76.83	Tare Wt. Pan	18.22
djusted	16.49	Adjusted	75.68	Wt. Water*	17.2
y Wt.($M_{<34}$)*	~~16.50~~ WTS 11-20-92	Dry Wt.($M_{>34}$)**	~~75.68~~ WTS 11-20-92	Wt. Soil**	581.10
				Percent Water(*/**)	3.0 ~~2.0~~ WTS 11-20-92

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

ass Partition function (f) = $M_{>34}/M_{<34}$ = 4.59

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>34}$)	2.5	3.2	1.2	
On-Site Analysis Fines ($C_{<34}$)	1.2 *	N/A	0.5	
	**			
	***			
Vendor Analysis Fines ($C_{<34}$)	1.4	1.3	1.2	
Bulk Radionuclide Concentration (C_B)	2.30 #	5.26	1.2	
	##			
	###			

Initial; Using Vendor; ** Initial Corrected; ## Using Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.) ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.17

Reviewed By: ____ Date: ____

INFORMATION ONLY

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

ite: 3050/Gun

ample/Grid I.D. Test Pit #3

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
t. Sample & Bucket	32.43	Wt. Sample & Bucket	108.51	Wet Wt. Sample/Pan	539.80
t. Bucket	2.02	Wt. Bucket	3.75	Dry Wt. Sample/Pan	496.12
t. Sample	30.41	Wt. Sample	104.76	Tare Wt. Pan	18.20
djusted	27.64	Adjusted		Wt. Water*	43.68
ry Wt. ($M_{<2d}$)*	27.63 11-16-92	Dry Wt. ($M_{>2d}$)**	103.19	Wt. Soil**	477.92
				Percent Water(*/**)	9.1

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

iass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.73

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	1.3	29	2.3	
On-Site Analysis Fines ($C_{<2d}$)	1.8 *	N/A	1.0	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	3.6	150	6.9	
Bulk Radionuclide Concentration (C_b)	1.79 #	54.58	3.27	
	##			
	###			

INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)
Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.00

ieviewed By: ____ Date: ____

COBBLES TO FINES CALCULATION SHEET

Site: 3050 / Gun

Sample/Grid I.D. / Test Pit # 4

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	38.83	Wt. Sample & Bucket	110.66	Wet Wt. Sample/Pan	592.49
Wt. Bucket	1.77	Wt. Bucket	3.50	Dry Wt. Sample/Pan	549.30
Wt. Sample	37.06	Wt. Sample	107.16	Tare Wt. Pan	18.33
Adjusted	34.06	Adjusted		Wt. Water*	43.10
Dry Wt. ($M_{<84}$)*	~~34.05~~ 11-26-92	Dry Wt. ($M_{>84}$)**	105.55	Wt. Soil**	531.06
				Percent Water(*/**)	8.1

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>84}/M_{<84}$ = 3.10

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>84}$)	1.2	3.7	0.3	
On-Site Analysis Fines ($C_{<84}$)	0.9 *	N/A	0.7	
	**			
	***			
Vendor Analysis Fines ($C_{<84}$)	2.2	8.7	0.8	
Bulk Radionuclide Concentration (C_B)	1.44 #	4.92	0.42	
	##			
	###			

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; \#\# Using Initial Corrected; \#\#\# Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.44

Reviewed By: ____ Date: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

e: 3050/Gnu

Sheet ____ of ____

ample/Grid I.D. Test Pit #5

Date: 11/13/92

nes		Cobbles		Moisture Content Fines	
t. Sample & Bucket	42.90	Wt. Sample & Bucket	78.17	Wet Wt. Sample/Pan	608.87
t. Bucket	1.74	Wt. Bucket	2.13	Dry Wt. Sample/Pan	530.47
t. Sample	41.16	Wt. Sample	76.04	Tare Wt. Pan	18.35
djusted y Wt.($M_{<\#4}$)*	34.86	Adjusted Dry Wt.($M_{>\#4}$)**	74.90	Wt. Water*	72.40
				Wt. Soil**	512.14
				Percent Water(*/**)	15.3

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

ass Partition function (f) = $M_{>\#4}/M_{<\#4}$ = 2.15

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>\#4}$)	1.9	29	2.5	
On-Site Analysis Fines ($C_{<\#4}$)	1.8 *	N/A	0.9	
	**			
	***			
Vendor Analysis Fines ($C_{<\#4}$)	3.5	180	2.0	
Bulk Radionuclide Concentration (C_B)	2.41 #	76.94	2.34	
	##			
	###			

INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)
Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.94

eviewed By: _____ Date: _____

COBBLES TO FINES CALCULATION SHEET

Site: 3050/Gun

Sample/Grid I.D. Test Pit #6

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	44.66	Wt. Sample & Bucket	141.21	Wet Wt. Sample/Pan	589.96
Wt. Bucket	1.75	Wt. Bucket	3.50	Dry Wt. Sample/Pan	522.18
Wt. Sample	42.85	Wt. Sample	137.71	Tare Wt. Pan	18.19
Adjusted	37.15	Adjusted		Wt. Water*	67.28
Dry Wt.($M_{<2d}$)*	[illegible]	Dry Wt.($M_{>2d}$)**	135.64	Wt. Soil**	504.49
				Percent Water(*/**)	13.3

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.65

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	1.8	1.6	0.6	
On-Site Analysis Fines ($C_{<2d}$)	1.0 *	N/A	0.8	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	2.9	8.4	1.2	
Bulk Radionuclide Concentration (C_b)	2.04 #	3.06	0.73	
	##			
	###			

INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

Ra Correction Factor: 2.90

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3050/Gun

Sample/Grid I.D. Test Pit #7

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	44.52	Wt. Sample & Bucket	113.43	Wet Wt. Sample/Pan	539.17
Wt. Bucket	1.74	Wt. Bucket	4.04	Dry Wt. Sample/Pan	513.28
Wt. Sample	42.78	Wt. Sample	109.39	Tare Wt. Pan	18.22
Adjusted Dry Wt. ($M_{<84}$)*	40.56 ~~40.54~~ WTS 11-20-92	Adjusted Dry Wt. ($M_{>84}$)**	107.75	Wt. Water*	25.89
				Wt. Soil**	495.06
				Percent Water(*/**)	5.2

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>84}/M_{<84}$ = 2.66

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>84}$)	1.9	7.5	0.7	
On-Site Analysis Fines ($C_{<84}$)	1.5 *	N/A	1.5	
	**			
	***			
Vendor Analysis Fines ($C_{<84}$)	4.0	130	2.8	
Bulk Radionuclide Concentration (C_B)	2.47 #	40.97	1.27	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.67

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
A BECHTEL COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

te: 3050/Gun

ample/Grid I.D. Test Pit #8

Sheet ____ of ____

Date: 11/13/92

ines		Cobbles		Moisture Content Fines	
t. Sample & Bucket	33.81	Wt. Sample & Bucket	85.15	Wet Wt. Sample/Pan	622.77
t. Bucket	1.78	Wt. Bucket	1.74	Dry Wt. Sample/Pan	594.74
t. Sample	32.03	Wt. Sample	83.41	Tare Wt. Pan	18.49
djusted	30.46	Adjusted		Wt. Water*	28.03
ry Wt. ($M_{<\#4}$)*	~~30.47~~ WTS 11-30-92	Dry Wt. ($M_{>\#4}$)**	82.16	Wt. Soil**	576.25
				Percent Water(*/**)	4.9

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

lass Partition function (f) = $M_{>\#4}/M_{<\#4}$ = 2.70

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>\#4}$)	2.0	0.8	0.5	
On-Site Analysis Fines ($C_{<\#4}$)	1.2 *	N/A	1.4	
	**			
	***			
Vendor Analysis Fines ($C_{<\#4}$)	1.7	6.3	1.1	
Bulk Radionuclide Concentration (C_B)	1.92 #	2.29	0.66	
	##			
	###			

INFORMATION ONLY

* Initial: ** Initial Corrected: *** 20 day (N/A for Test Pit or Running AVE.)

Using Vendor: ## Using Initial Corrected: ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.42

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

te: 3050/Gun

ample/Grid I.D. Test Pit #9

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
/t. Sample & Bucket	26.41	Wt. Sample & Bucket	97.67	Wet Wt. Sample/Pan	498.05
/t. Bucket	2.01	Wt. Bucket	3.90	Dry Wt. Sample/Pan	437.61
/t. Sample	24.40	Wt. Sample	93.77	Tare Wt. Pan	18.39
djusted	20.89	Adjusted		Wt. Water*	60.44
ry Wt.($M_{<84}$)*	~~20.00~~ Dry wts 11-20-92	Dry Wt.($M_{>84}$)**	92.36 ✓	Wt. Soil**	419.22
				Percent Water(*/**)	14.4 ✓

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>84}/M_{<84}$ = 4.42

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>84}$)	3.0	47	2.9	
On-Site Analysis Fines ($C_{<84}$)	2.8 *	N/A	0.9	
	**			
	***			
Vendor Analysis Fines ($C_{<84}$)	6.9	350	6.5	
Bulk Radionuclide Concentration (C_B)	3.72 #	102.90	3.56	
	##			
	###			

INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)
Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.46

Reviewed By: _____ Date: _____

COBBLES TO FINES CALCULATION SHEET

Site: 3050 / Gum

Sample/Grid I.D. Test Pit #10

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	29.53	Wt. Sample & Bucket	78.39	Wet Wt. Sample/Pan	672.84
Wt. Bucket	1.72	Wt. Bucket	2.13	Dry Wt. Sample/Pan	563.54
Wt. Sample	27.81	Wt. Sample	76.26	Tare Wt. Pan	18.24
Adjusted	22.25	Adjusted	75.12	Wt. Water*	109.30
Dry Wt. ($M_{<2d}$)*	22.25 WTS 11-20-92	Dry Wt. ($M_{>2d}$)**	75.12 WTS 11-20-92	Wt. Soil**	545.30
				Percent Water(*/**)	20.0

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.38

Radiological Analysis	^{228}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	3.1	21	1.2	
On-Site Analysis Fines ($C_{<2d}$)	1.6 *	N/A	0.6	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	3.5	76	2.3	
Bulk Radionuclide Concentration (C_B)	3.19 #	33.56	1.45	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

Ra Correction Factor: 2.19

Reviewed By: _____ Date: _____

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COBBLES TO FINES CALCULATION SHEET

e: 3050/Gun

Sheet ____ of ____

imple/Grid I.D. Test Pit 11

Date: 11/12/92

nes		Cobbles		Moisture Content Fines	
t. Sample & Bucket	37.34	Wt. Sample & Bucket	108.25	Wet Wt. Sample/Pan	579.17
t. Bucket	1.77	Wt. Bucket	3.89	Dry Wt. Sample/Pan	519.95
t. Sample	35.57	Wt. Sample	104.36	Tare Wt. Pan	18.12
ijusted y Wt.($M_{<\#4}$)*	31.37	Adjusted Dry Wt.($M_{>\#4}$)**	102.79	Wt. Water*	59.22
				Wt. Soil**	501.83
				Percent Water(*/**)	11.8

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

ass Partition function (f) = $M_{>\#4}/M_{<\#4}$ = 3.28

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>\#4}$)	2.0	12	0.9	
On-Site Analysis Fines ($C_{<\#4}$)	1.0 *	N/A	1.2	
	**			
	***			
Vendor Analysis Fines ($C_{<\#4}$)	2.2	36	1.5	
Bulk Radionuclide Concentration (C_b)	2.05 #	17.61	1.04	
	##			
	###			

FOR INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)
Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.20

eviewed By: ____ Date: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3050/Gun

Sample/Grid I.D. Test Pit #12

Sheet ____ of ____

Date: 11/13/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	43.71 ~~1.61~~ 11/13/92	Wt. Sample & Bucket	96.78	Wet Wt. Sample/Pan	556.25
Wt. Bucket	1.61	Wt. Bucket	4.26	Dry Wt. Sample/Pan	509.17
Wt. Sample	42.10	Wt. Sample	92.52	Tare Wt. Pan	18.32
Adjusted Dry Wt. ($M_{<84}$)*	38.06 ~~27.20~~ 11-20-92	Adjusted Dry Wt. ($M_{>84}$)**	91.13	Wt. Water*	47.08 ~~[illegible]~~
				Wt. Soil**	490.85
				Percent Water(*/**)	9.6 ~~[illegible]~~

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>84}/M_{<84}$ = 2.39

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>84}$)	1.3	3.1	0.6	
On-Site Analysis Fines ($C_{<84}$)	1.1 *	N/A	0.5	
	**			
	***			
Vendor Analysis Fines ($C_{<84}$)	1.7	6.8	1.1	
Bulk Radionuclide Concentration (C_B)	1.42 #	~~2.15~~ 4.19	0.75	
	##			
	###			

INFORMATION ONLY

Initial: ** Initial Corrected: *** 20 day (N/A for Test Pit or Running AVE.)

* Using Vendor: ## Using Initial Corrected: ### Using 20day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.55

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3050/Gun

Sample/Grid I.D. Test Pit #13

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	45.71	Wt. Sample & Bucket	136.58	Wet Wt. Sample/Pan	546.32
Wt. Bucket	1.77	Wt. Bucket	4.20	Dry Wt. Sample/Pan	496.96
Wt. Sample	43.94	Wt. Sample	132.38	Tare Wt. Pan	18.31
Adjusted Dry Wt. ($M_{<2d}$)*	39.41	Adjusted Dry Wt. ($M_{>2d}$)**	130.39	Wt. Water*	49.36
				Wt. Soil**	478.65
				Percent Water(*/**)	10.3

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.31

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	2.5	41	3.6	
On-Site Analysis Fines ($C_{<2d}$)	2.0 *	N/A	0.6	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	4.2	160	20	
Bulk Radionuclide Concentration (C_b)	2.89 #	68.61	7.41	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.10

Reviewed By: ____ Date: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

ite: 3050/Enn.

ample/Grid I.D. Test Pit #14

Sheet ____ of ____

Date: 11/13/92

Fines		Cobbles		Moisture Content Fines	
/t. Sample & Bucket	55.09	Wt. Sample & Bucket	44.85	Wet Wt. Sample/Pan	573.81
/t. Bucket	1.74	Wt. Bucket	1.75	Dry Wt. Sample/Pan	501.93
/t. Sample	53.35	Wt. Sample	43.10	Tare Wt. Pan	18.49
djusted	45.40	Adjusted		Wt. Water*	71.88
ry Wt.($M_{<34}$)*	~~45.42~~ WTS 11-20-92	Dry Wt.($M_{>34}$)**	42.45	Wt. Soil**	483.44
				Percent Water(*/**)	14.9

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

lass Partition function (f) = $M_{>34}/M_{<34}$ = 0.94

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>34}$)	1.5	13	1.2	
On-Site Analysis Fines ($C_{<34}$)	2.4 *	N/A	0.7	
	**			
	***			
Vendor Analysis Fines ($C_{<34}$)	3.9	160	3.2	
Bulk Radionuclide Concentration (C_s)	2.74 #	88.77	2.23	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)
# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.63

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 30501 Gun

Sample/Grid I.D. Test Pit #15

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	38.83	Wt. Sample & Bucket	124.14	Wet Wt. Sample/Pan	451.30
Wt. Bucket	2.02	Wt. Bucket	4.26	Dry Wt. Sample/Pan	424.96
Wt. Sample	36.81	Wt. Sample	119.88	Tare Wt. Pan	18.09
Adjusted	34.42	Adjusted		Wt. Water*	26.34
Dry Wt.($M_{<2d}$)*	34.42 WTS 11-20-92	Dry Wt.($M_{>2d}$)**	118.08	Wt. Soil**	406.87
				Percent Water(*/**)	6.5

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.43

Radiological Analysis	^{228}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	2.8	1.6	0.9	
On-Site Analysis Fines ($C_{<2d}$)	2.2 *	N/A	0.3	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	1.7	3.8	0.9	
Bulk Radionuclide Concentration (C_b)	2.55 #	2.10	0.90	
	##			
	###			

INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{228}Ra Correction Factor: 0.77

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3050/Gun

Sample/Grid I.D. Test Pit #16

Sheet ____ of ____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	41.21	Wt. Sample & Bucket	140.24	Wet Wt. Sample/Pan	479.68
Wt. Bucket	2.03	Wt. Bucket	4.06	Dry Wt. Sample/Pan	454.37
Wt. Sample	44.18	Wt. Sample	136.18	Tare Wt. Pan	14.32
Adjusted Dry Wt. ($M_{<2d}$)*	41.62 ✓	Adjusted Dry Wt. ($M_{>2d}$)**	134.14 ✓	Wt. Water*	25.31
				Wt. Soil**	436.05
				Percent Water(*/**)	5.8 ✓

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.22

Radiological Analysis	^{228}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	1.6	10	0.7	
On-Site Analysis Fines ($C_{<2d}$)	1.5 *	N/A	0.8	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	2.6	47	3.5	
Bulk Radionuclide Concentration (C_s)	1.84 #	18.77	1.36	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{228}Ra Correction Factor: 1.73

Reviewed By: ____ Date: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3050 / Gun

Sample/Grid I.D. Test Pit #17

Sheet _____ of _____

Date: 11/12/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	28.43	Wt. Sample & Bucket	84.00	Wet Wt. Sample/Pan	566.02
Wt. Bucket	1.75	Wt. Bucket	2.03	Dry Wt. Sample/Pan	483.20
Wt. Sample	26.68	Wt. Sample	81.97	Tare Wt. Pan	18.3
Adjusted Dry Wt. ($M_{<2d}$)*	21.93 ✓	Adjusted Dry Wt. ($M_{>2d}$)**	80.74 ✓	Wt. Water*	82.82
				Wt. Soil**	464.90
				Percent Water(*/**)	17.8 ✓

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>2d}/M_{<2d}$ = 3.68

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>2d}$)	2.8	7.1	1.6	
On-Site Analysis Fines ($C_{<2d}$)	2.3 *	N/A	0.5	
	**			
	***			
Vendor Analysis Fines ($C_{<2d}$)	3.1	74	1.8	
Bulk Radionuclide Concentration (C_b)	2.86 #	21.39	1.64	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.35

Reviewed By: _____ Date: _____

MK-FERGUSON COMPANY
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CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: 3080 Gun

Sample/Grid I.D. Test Pit #18

Sheet ____ of ____

Date: 11/13/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	44.01	Wt. Sample & Bucket	136.92	Wet Wt. Sample/Pan	543.05
Wt. Bucket	1.61	Wt. Bucket	3.36	Dry Wt. Sample/Pan	508.32
Wt. Sample	42.40	Wt. Sample	133.56	Tare Wt. Pan	18.35
Adjusted Dry Wt. ($M_{<\#4}$)*	39.39	Adjusted Dry Wt. ($M_{>\#4}$)**	131.56	Wt. Water*	34.73
				Wt. Soil**	489.97
				Percent Water(*/**)	7.1

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>\#4}/M_{<\#4}$ = 3.34

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>\#4}$)	2.1	41	2.0	
On-Site Analysis Fines ($C_{<\#4}$)	3.1 *	N/A	0.8	
	**			
	***			
Vendor Analysis Fines ($C_{<\#4}$)	6.7	240	7.3	
Bulk Radionuclide Concentration (C_B)	3.16 #	86.85	3.22	
	##			
	###			

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; \#\# Using Initial Corrected; \#\#\# Using 20 day (N/A for Test Pits or Running AVE.)

INFORMATION ONLY

^{226}Ra Correction Factor: 2.16

Reviewed By: ____ Date: ____

MK-FERGUSON COMPANY
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CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

ite: GUN 13050

Sample/Grid I.D. TEST PIT #19

Sheet _____ of _____

Date: 11/11/92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	38.93	Wt. Sample & Bucket	138.70	Wet Wt. Sample/Pan	527.86
Wt. Bucket	7.13	Wt. Bucket	3.52	Dry Wt. Sample/Pan	473.85
Wt. Sample	36.80	Wt. Sample	134.68	Tare Wt. Pan	18.24
djusted	32.83	Adjusted		Wt. Water*	49.01 ~~54.01~~ WTS 11-20-92
Dry Wt.($M_{<34}$)*	~~32.44~~ WTS 11-20-92	Dry Wt.($M_{>34}$)**	132.66	Wt. Soil**	455.61
				Percent Water(*/**)	10.8 ~~11.0~~ WTS 11-20-9

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>34}/M_{<34}$ = 4.04

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>34}$)	2.2	22	2.4	
On-Site Analysis Fines ($C_{<34}$)	3.3 *	N/A	1.1	
	**			
	***			
Vendor Analysis Fines ($C_{<34}$)	3.4	140	7.3	
Bulk Radionuclide Concentration (C_B)	2.44 #	45.41	3.37	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.03

Reviewed By: _____ Date: _____

A MORRISON KNUDSEN COMPANY
Owen Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

ite: GUN/3050 Sheet ____ of ____

ample/Grid I.D. TEST PIT #20 Date: 11/10/97

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	34.20	Wt. Sample & Bucket	94.41	Wet Wt. Sample/Pan	546.98
Wt. Bucket	2.14	Wt. Bucket	3.48	Dry Wt. Sample/Pan	496.72
Wt. Sample	32.06	Wt. Sample	90.93	Tare Wt. Pan	18.39
Adjusted Dry Wt. ($M_{<34}$)*	28.69	Adjusted Dry Wt. ($M_{>34}$)**	89.57	Wt. Water*	50.23
				Wt. Soil**	478.33
				Percent Water(*/**)	10.5

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>34}/M_{<34}$ = 1.04

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>34}$)	2.7	42	2.3	
On-Site Analysis Fines ($C_{<34}$)	3.6 *	N/A	1.0	
	**			
	***			
Vendor Analysis Fines ($C_{<34}$)	7.5	270	16	
Bulk Radionuclide Concentration (C_s)	5.05 #	153.76	9.02	
	##			
	###			

INFORMATION ONLY

Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)
* Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.08

Reviewed By: ____ Date: ____

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

COBBLES TO FINES CALCULATION SHEET

Site: GUN/2050 Sheet ____ of ____

Sample/Grid I.D. TEST PIT #21 Date: 11-10-97

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	39.96	Wt. Sample & Bucket	138.55	Wet Wt. Sample/Pan	610.95
Wt. Bucket	1.72	Wt. Bucket	3.85	Dry Wt. Sample/Pan	552.64
Wt. Sample	38.24	Wt. Sample	134.70	Tare Wt. Pan	18.21
Adjusted	33.77	Adjusted	132.68	Wt. Water*	67.31
Dry Wt. ($M_{<34}$)*	~~33.78~~ WTS 11-20-97	Dry Wt. ($M_{>34}$)**	~~132.71~~ WTS 11-20-97	Wt. Soil**	534.33
				Percent Water(*/**)	11.7

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = 132.71 Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>34}/M_{<34}$ = 3.93

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>34}$)	1.6	1.9	1.5	
On-Site Analysis Fines ($C_{<34}$)	1.7 *	N/A	0.7	
	**			
	***			
Vendor Analysis Fines ($C_{<34}$)	2.5	16?	1.2	
Bulk Radionuclide Concentration (C_B)	1.78 #	4.76	1.44	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 1.47

Reviewed By: _____ Date: _____

A MORRISON KNUDSEN COMPANY

COBBLES TO FINES CALCULATION SHEET

Site: Gun/350

Sample/Grid I.D. Test Pit #22

Sheet _____ of _____

Date: _____

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	47.85	Wt. Sample & Bucket	190.37	Wet Wt. Sample/Pan	426.46
Wt. Bucket	1.17	Wt. Bucket	5.31	Dry Wt. Sample/Pan	402.17
Wt. Sample	46.08	Wt. Sample	185.06	Tare Wt. Pan	18.31
Adjusted Dry Wt. ($M_{<34}$)*	43.18 ~~43.16~~ WTS 11-20-92	Adjusted Dry Wt. ($M_{>34}$)**	182.28	Wt. Water*	24.29
				Wt. Soil**	383.86
				Percent Water(*/**)	6.3

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>34}/M_{<34}$ = 4.22

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>34}$)	4.0	69	2.2	
On-Site Analysis Fines ($C_{<34}$)	7.4 *	N/A	1.9	
	**			
	***			
Vendor Analysis Fines ($C_{<34}$)	15	660	14	
Bulk Radionuclide Concentration (C_s)	6.11 #	182.22	4.46	
	##			
	###			

INFORMATION ONLY

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; \#\# Using Initial Corrected; \#\#\# Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 2.03

Reviewed By: _____ Date: _____

A MORRISON KNUDSEN COMPANY

COBBLES TO FINES CALCULATION SHEET

Site: GUN 3050

Sample/Grid I.D. TEST PIT #23

Sheet ____ of ____

Date: 11-10-92

Fines		Cobbles		Moisture Content Fines	
Wt. Sample & Bucket	46.75	Wt. Sample & Bucket	117.69	Wet Wt. Sample/Pan	693.23
Wt. Bucket	1.78	Wt. Bucket	3.85	Dry Wt. Sample/Pan	610.87
Wt. Sample	44.47	Wt. Sample	113.84	Tare Wt. Pan	18.32
Adjusted Dry Wt. ($M_{<84}$)*	38.29 ✓	Adjusted Dry Wt. ($M_{>84}$)**	112.13 ~~112.16~~ WTS 11-20-92	Wt. Water*	82.36
				Wt. Soil**	592.55
				Percent Water(*/**)	13.9 ✓

Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

* Adjusted Dry Wt. of the Cobbles = 112.16 Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>84}/M_{<84}$ = 2.93

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>84}$)	1.7	3.1	1.7	
On-Site Analysis Fines ($C_{<84}$)	1.3 *	N/A	0.7	
	**			
	***			
Vendor Analysis Fines ($C_{<84}$)	1.1	3.9	1.2	
Bulk Radionuclide Concentration (C_B)	1.55 #	3.30	1.57	
	##			
	###			

INFORMATION ONLY

Initial; Using Vendor; ** Initial Corrected; ## Using Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.) ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: 0.85

Reviewed By: _____ Date: _____

COBBLES TO FINES CALCULATION SHEET

Site: _____ Sheet _____ of _____

Sample/Grid I.D. _____ Date: _____

Fines	Cobbles	Moisture Content Fines
Wt. Sample & Bucket _____	Wt. Sample & Bucket _____	Wet Wt. Sample/Pan _____
Wt. Bucket _____	Wt. Bucket _____	Dry Wt. Sample/Pan _____
Wt. Sample _____	Wt. Sample _____	Tare Wt. Pan _____
Adjusted Dry Wt. ($M_{<84}$)* _____	Adjusted Dry Wt. ($M_{>84}$)** _____	Wt. Water* _____
		Wt. Soil** _____
		Percent Water(*/**) _____

* Adjusted Dry Wt. of the Fines = Wt. Sample x (1 - % water)

** Adjusted Dry Wt. of the Cobbles = Wt. Sample x (1 - .015)

Mass Partition function (f) = $M_{>84}/M_{<84}$ = _____

Radiological Analysis	^{226}Ra (pCi/g)	^{230}Th (pCi/g)	^{232}Th (pCi/g)	COMMENTS
Cobbles ($C_{>84}$)				
On-Site Analysis Fines ($C_{<84}$)	*	N/A		
	**			
	***			
Vendor Analysis Fines ($C_{<84}$)				
Bulk Radionuclide Concentration (C_B)	#	INFORMATION ONLY		
	##			
	###			

* Initial; ** Initial Corrected; *** 20 day (N/A for Test Pit or Running AVE.)

\# Using Vendor; ## Using Initial Corrected; ### Using 20 day (N/A for Test Pits or Running AVE.)

^{226}Ra Correction Factor: _____

Reviewed By: _____ Date: _____

VENDOR LABORATORY RADIOLOGICAL MEASUREMENTS OF 1-FT DEPTH INCREMENT SOIL SAMPLES <#4 MESH SIEVE COBBLY SUBSOIL INVESTIGATION NOVEMBER 1992

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Test Pit fines
1' interval

Attn:
Project: Gunnison

Received: 20-Nov-92
PO# 3050-511-10004 #058

Job: 925566E

Status: Final

BARRINGER LABORATORIES
ANALYTICAL REPORT PACKAGE

CASE NARRATIVE.....i

ANALYTICAL RESULTS.....R-1

QUALITY CONTROL REPORT.....Q-1

INFORMATION ONLY

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

23-Dec-92

Ron Jacobs
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Gunnison, CO 81230

Page: i
Copy: 3 of 3

Attn:
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Received: 20-Nov-92
PO# 3050-511-10004 #058

Job: 925566E

Status: final

CASE NARRATIVE

A total of 22 Soil samples were received on 20-Nov-92. All were properly preserved and in good condition. As stated in the chain of custody, the samples were run for the following analyses: Ra-226, Th-230, Th-232 and U. Our procedures are summarized on the Quality Control Data Sheet. There were no deviations to these procedures. All samples were extracted and analyzed within the proper holding times.

Quality control standards were run using standard EPA guidelines. A summary of that data is provided. The acceptance criteria for spikes and duplicates is fifteen percent. It is based on the relative percent deviation of the mean, taking the counting error into account for radiochemical analyses. All QC checks, including duplicates, spikes, and blanks, passed.

It is possible that some Th-232 results may be biased high due to carry over from Th-230 peak on the spectrum. Since Th-232 and Th-228 are generally in equilibrium, the Th-228 results have been included in this report. This analysis delayed the report by one day.

Signed: .....
Steven L. Sincoff, Ph.D.
Director of Operations

INFORMATION ONLY

BARRINGER LABORATORIES INC.
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23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: R-1
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Attn:
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Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

Sample Type: Soil Fines

Sample Id	Ra-226 Total pCi/g	Error 2σ	Th-230 Total pCi/g	Error 2σ	Th-232 Total pCi/g	Error 2σ		U Total µg/g	
GUN-TP-0052	32	±3	75	±4	3.2	±1.0	#1 0-1	4.0	
GUN-TP-0053	12	±2	47	±3	4.5	±1.2	1-2'	3.0	
GUN-TP-0066	1.8	±0.7	12	±2	2.0	±0.8	#6 0-1'	180	54 pCi/g
GUN-TP-0067	2.9	±1.0	13	±2	1.0	±0.6	1-2'	130	43 pCi/g
GUN-TP-0068	2.0	±0.8	1.0	±0.5	0.7	±0.5	2-3'	64	21 pCi/g
GUN-TP-0069	1.2	±0.6	1.9	±0.6	1.1	±0.6	3-4'	20	6.6 pCi/g
GUN-TP-0070	2.1	±0.8	3.9	±0.9	1.2	±0.6	4-5'	51	17 pCi/g
GUN-TP-0080	1.8	±0.7	1.3	±0.6	0.7	±0.5	#11 0-1'	4.0	
GUN-TP-0081	1.4	±0.6	1.3	±0.6	0.7	±0.5	1-2'	2.0	
GUN-TP-0082	1.9	±0.8	1.3	±0.6	1.0	±0.6	2-3'	2.0	
GUN-TP-0083	1.6	±0.7	25	±2	2.5	±0.8	3-4'	8.0	
GUN-TP-0084	4.2	±1.1	43	±3	4.3	±1.0	4-5'	11	
GUN-TP-0038	5.0	±1.2	190	±10	3.8	±1.0	#13 0-1'	35	
GUN-TP-0039	3.5	±1.0	160	±10	15	±2	1-2'	32	
GUN-TP-0040	4.2	±1.1	220	±10	2.7	±0.8	2-3'	23	
GUN-TP-0041	4.3	±1.1	160	±10	9.2	±1.5	3-4'	10	
GUN-TP-0042	4.6	±1.1	190	±10	10	±2	4-5'	12	
GUN-TP-0043	7.0	±1.4	130	±10	10	±2	#16 0-1'	32	
GUN-TP-0044	2.3	±0.8	62	±3	2.7	±0.8	1-2'	58	
GUN-TP-0045	2.0	±0.8	47	±3	1.0	±0.6	2-3'	56	
GUN-TP-0046	2.6	±0.9	40	±3	1.4	±0.7	3-4'	105	
GUN-TP-0047	2.3	±0.9	38	±3	1.3	±0.7	4-5'	150	

Sample Id	Th-228 Total pCi/g	Error 2σ
GUN-TP-0052	2.0	±0.8
GUN-TP-0053	1.3	±0.7
GUN-TP-0066	2.2	±0.9

INFORMATION ONLY

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23-Dec-92

Ron Jacobs
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1571 CR 38
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Page: R-2
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Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

Sample Type: Soil

Sample Id	Th-228 Total pCi/g	Error 2σ
GUN-TP-0067	0.8	±0.5
GUN-TP-0068	1.4	±0.6
GUN-TP-0069	0.9	±0.6
GUN-TP-0070	1.0	±0.6
GUN-TP-0080	0.8	±0.5
GUN-TP-0081	1.3	±0.6
GUN-TP-0082	0.6	±0.5
GUN-TP-0083	0.7	±0.5
GUN-TP-0084	0.5	±0.5
GUN-TP-0038	0.6	±0.5
GUN-TP-0039	1.2	±0.6
GUN-TP-0040	0.4	±0.4
GUN-TP-0041	1.1	±0.6
GUN-TP-0042	1.0	±0.6
GUN-TP-0043	1.0	±0.6
GUN-TP-0044	1.5	±0.7
GUN-TP-0045	1.3	±0.6
GUN-TP-0046	1.1	±0.6
GUN-TP-0047	1.0	±0.6

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23-Dec-92

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Page: R-3
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium
Th-228	: Thorium-228

Units:

pCi/g	: picoCuries per gram
2σ	: Counting error at the 95% confidence level, 2σ
µg/g	: micrograms per gram

INFORMATION ONLY

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

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NOV 20 1992

LABORATORY SERVICES AUTHORIZATION FORM

Page 1 of 2

Jacobs DR
Requisitioner

11 / 19 / 92
Date

12 / 19 / 92
Need Date

Urgent
Priority ✓ Standard

Morrison, CO
Location

3050-511-10004
P.O. Number

058
Request No.

ATTENTION LABORATORY:
All reports and invoices must Reference PO and Request Nos.

of Sample: ____ Water ✓ Soil ____ Air Particulate ____ Vegetation

of Analysis: ✓ Ra-226 ✓ Th-230 ✓ Nat U. ____ Gross Alpha
____ Gross Beta ____ Solubility
✓ Other (Specify under special instructions)

al Instructions/Comments: also analyze for Th-232. Please return
ased portion.

I.D. NO	DATE COLLECTED	VOLUME	DESCRIPTION	
-TP-0052	11-12-92	443.2 g	#1 0-1	120/100
-TP-0053	11-12-92	630.8 g	#1 1-2	120/100
-TP-0066	11-12-92	446.0 g	#6 0-1	120/100
-TP-0067	11-12-92	505.5 g	#6 1-2	150/80
-TP-0068	11-12-92	515.0 g	#6 2-3	130/100
-TP-0069	11-12-92	606.9 g	#6 3-4	ø
-TP-0070	11-12-92	466.5 g	#6 4-5	ø
-TP-0080	11-12-92	546.0 g	#11 0-1	120/90
-TP-0081	11-12-92	516.0 g	#11 1-2	ø

CHAIN-OF-CUSTODY

nquished by (Site Representative Signature): Joan Casgrove	Date/Time 11/19/92 @ 1500
er: UPS 671 933-059	Date/Time 11/19/92 @ 1500
ived at Lab by (Lab Representative Signature):* [signature]	Date/Time 11-20-92 / 0930

ringer Chain-of-Custody as per contract will be attached

FCWMFES USE ONLY:

[signature] 19 nov. 92
-R Site Manager

Ronald D Jacobs 11/19/92
Health Physics Site Manager

chnical Review: ____ Date: ____

o: Approved Vendor
For Radioanalytical Services

Copy to: HPP Manager

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F2-RP-006-4

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Page 2 of 2

LABORATORY SERVICES AUTHORIZATION FORM
(CONTINUATION PAGE)

3050-511-10004/058
P.O. Number/Request Number

I.D. NO	DATE COLLECTED	VOLUME	DESCRIPTION
IN-TP-0082	11-12-92	521.4 g	#11 2-3 ø
IN-TP-0083	11-12-92	544.5 g	#11 3-4 ø
IN-TP-0084	11-12-92	678.1 g	#11 4-5 ø
IN-TP-0038	11-12-92	491.5 g	#13 0-1 130'/80
IN-TP-0039	11-12-92	462.3 g	#13 1-2 120'/90
IN-TP-0040	11-12-92	529.1 g	#13 2-3 150'/60
IN-TP-0041	11-12-92	517.7 g	#13 3-4 ø
IN-TP-0042	11-12-92	653.0 g	#13 4-5 ø
IN-TP-0043	11-12-92	454.5 g	#16 0-1 ø
IN-TP-0044	11-12-92	517.0 g	#16 1-2 ø
IN-TP-0045	11-12-92	470.5 g	#16 2-3 150'/80
IN-TP-0046	11-12-92	453.3 g	#16 3-4 160'/60
IN-TP-0047	11-12-92	473.2 g	#16 4-5 150'/80

INFORMATION ONLY

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: Q-1
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Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

QUALITY CONTROL REPORT

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ	Th-230 Total pCi/g	Error 2σ	Th-232 Total pCi/g	Error 2σ
Duplicate	3.6	±1.0	43	±3	4.3	±1.0
Duplicate	4.4	±1.2	48	±3	3.2	±0.9
Duplicate % diff.	10	---	5.5	---	15	---
Std (found value)	99	±7	88	±6	16	±3
Std (true value)	99	---	97	---	18	---
Std % rec.	100	---	91	---	89	---
Blank	0.2	±0.2	0.0	±0.1	0.0	±0.2
Spike % rec.	100	---	87	---	104	---

Sample Id	U Total µc/g	Th-228 Total pCi/g	Error 2σ
Duplicate	35	0.5	±0.5
Duplicate	35	1.0	±0.6
Duplicate % diff.	0.0	33	---
Std (found value)	47.5	16	±3
Std (true value)	49.0	19	---
Std % rec.	97	84	---
Blank	0.0	0.0	±0.2
Spike % rec.	106	94	---

INFORMATION ONLY

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

23-Dec-92

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Gunnison, CO 81230

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Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

QUALITY CONTROL REPORT

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium
Th-228	: Thorium-228

Units:

pCi/g	: picoCuries per gram
2σ	: Counting error at the 95% confidence level, 2σ
µg/g	: micrograms per gram

INFORMATION ONLY

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

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Page: Q-3
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Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

QUALITY CONTROL REPORT

QUALITY CONTROL DATA SHEET

Received by: jdr Via: UPS

Sample Container Type: 500ml mtl can
Sample Type: Soil
Preservative When Received: none
Additional Lab Preparation: 100 mesh

Parameter	Method	LLD	Preser-vative	Analyst	Date(s) of Analysis
Ra-226	SM-705	0.3 pCi/g	none	Pingilley	12/10-12/15
Th-230	USAEC	0.4 pCi/g	none	Ortiz	12/ 8-12/17
Th-232	USAEC	0.4 pCi/g	none	Ortiz	12/ 8-12/17
U	ASTM D2907	0.3 µg/g	none	Knox	12/ 9-12/15
Th-232	USAEC	0.4 pCi/g	none	Ortiz	12/ 8-12/21

INFORMATION ONLY

BARRINGER LABORATORIES INC.
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23-Dec-92

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Page: Q-1
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #058

Job: 925566E

Status: Final

QUALITY CONTROL REPORT

Signed: .....
Radiochemical Laboratory Manager

Signed: .....
Quality Assurance Department

INFORMATION ONLY

analysis for < #4 sieve 14 test pits
1 foot lifts

9-Apr-93

Helene Langlois
MK-FERGUSON (Gunnison)
P.O. Box 9136
Albuquerque, NM 87119

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Attn:
Project: Gunnison

Received: 12-Mar-93 13:55
PO #: 3050-511-10004/063

Job: 936539E

Status: Final

Sample Type: Soil

TP		Sample Id	Th-230 Total pCi/g	± 2σ	U Total µg/g (ppm)	Ra-226
	0-1	GUN-TP-0014	170	±10	52	4.1
	1-2	GUN-TP-0015	220	±10	51	4.9
19	2-3	GUN-TP-0016	160	±10	56	3.4
	3-4	GUN-TP-0017	28	±2	37	2.3
	4-5	GUN-TP-0018	95	±4	48	3.6
	0-1	GUN-TP-0048	35	±2	29	2.3
17	1-2	GUN-TP-0049	48	±3	420	2.3
	2-3	GUN-TP-0050	59	±3	22	3.4
	0-1	GUN-TP-0054	4.8	±1.0	3.8	0.8
3	1-2	GUN-TP-0055	100	±10	16	2.6
	2-3	GUN-TP-0056	100	±10	9.2	2.2
	3-4	GUN-TP-0057	150	±10	14	2.5
	4-5	GUN-TP-0058	500	±10	17	4.2
	0-1	GUN-TP-0059	3.8	±0.9	31	1.3
4	1-2	GUN-TP-0060	5.0	±0.8	29	1.9
	2-3	GUN-TP-0061	2.3	±0.6	6.8	1.4
	3-4	GUN-TP-0062	2.6	±0.6	3.3	1.2
	4-5	GUN-TP-0063	2.4	±0.6	14	0.8
	0-1	GUN-TP-0064	122	±4	52	3.7
5	1-2	GUN-TP-0065	97	±4	32	2.9
	2-3	GUN-TP-0087	123	±4	27	3.3
	3-4	GUN-TP-0088	83	±3	14	2.9
	0-1	GUN-TP-0035	53	±3	20	3.6
10	1-2	GUN-TP-0036	75	±4	9.5	2.3
	2-3	GUN-TP-0037	80	±4	7.8	2.7
	0-1	GUN-TP-0076	1.8	±0.7	57	1.3
8	1-2	GUN-TP-0077	3.0	±0.8	63	1.1
	2-3	GUN-TP-0078	1.6	±0.6	0.4	0.4
	3-4	GUN-TP-0079	1.5	±0.5	32	0.6
7	0-1	GUN-TP-0071	102	±4	100	3.9
	1-2	GUN-TP-0072	86	±4	49	3.1

9-Apr-93

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Project: Gunnison

Received: 12-Mar-93 13:55
PO #: 3050-511-10004/063

Job: 936539E

Status: Final

Sample Type: Soil

		Sample Id	Th-230 Total pCi/g	± 2σ	U Total µg/g	Ra-226
7	2-3	GUN-TP-0073	23	±2	52	2.1
	3-4	GUN-TP-0074	26	±2	38	1.5
	4-5	GUN-TP-0075	54	±3	59	1.9
2	0-1	GUN-TP-0085	1.6	±0.6	110	1.1
	1-2	GUN-TP-0089	2.8	±0.8	100	0.7
	2-3	GUN-TP-0086	7.3	±1.2	110	1.0
	3-4	GUN-TP-0090	3.3	±0.8	51	0.9
	4-5	GUN-TP-0091	6.1	±1.1	32	1.1
14	0-1	GUN-TP-0092	3.5	±0.8	37	1.0
	1-2	GUN-TP-0093	54	±3	33	1.3
	2-3	GUN-TP-0094	130	±10	26	3.5
	3-4	GUN-TP-0095	104	±4	33	2.3

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9-Apr-93

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PO #: 3050-511-10004/064

Job: 9365408

Status: Final

Sample Type: Soil

		Sample Id	Ra-226 Total pCi/g	± 2σ	Th-230 Total pCi/g	± 2σ	Th-232 Total pCi/g	± 2σ	U
9	0-1	GUN-TP-0031	3.4	1.0	180	±10	4.0	±1.0	26
	1-2	GUN-TP-0032	5.8	1.3	380	±10	19	±2	20
	2-3	GUN-TP-0033	4.5	1.1	130	±10	6.3	±1.3	32
	3-4	GUN-TP-0034	2.5	0.9	120	±10	2.0	±0.7	21
8	0-1	GUN-TP-0022	7.5	1.5	490	±10	6.0	±1.2	14
	1-2	GUN-TP-0024	3.5	1.0	180	±10	4.0	±1.0	23
	2-3	GUN-TP-0023	5.4	1.3	390	±10	4.0	±1.0	27
	3-4	GUN-TP-0025	3.2	0.9	230	±10	4.7	±1.1	18
	4-5	GUN-TP-0051	1.9	0.8	260	±10	7.8	±1.4	35
20	0-1	GUN-TP-0019	6.2	1.3	210	±10	3.6	±1.0	33
	1-2	GUN-TP-0020	5.2	1.2	200	±10	2.7	±0.8	32
	2-3	GUN-TP-0021	5.5	1.2	200	±10	5.1	±1.1	30
22	0-1	GUN-TP-0026	8.7	1.6	850	±10	7.5	±1.4	26
	1-2	GUN-TP-0027	11	2	930	±20	20	±3	29
	2-3	GUN-TP-0028	9.9	1.6	730	±20	30	±4	37
	3-4	GUN-TP-0029	5.8	1.2	790	±20	9.1	±2.1	32
	4-5	GUN-TP-0030	11	2	1030	±20	28	±4	65

	Sample Id	U Total µg/g
9	GUN-TP-0031	26
	GUN-TP-0032	20
	GUN-TP-0033	32
	GUN-TP-0034	21
18	GUN-TP-0022	14
	GUN-TP-0024	23
	GUN-TP-0023	27
	GUN-TP-0025	18
	GUN-TP-0051	35
20	GUN-TP-0019	33
	GUN-TP-0020	32

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Received: 12-Mar-93 09:45
PO #: 3050-511-10004/064

Job: 936540E

Status: Final

Sample Type: Soil

	Sample Id	U Total µg/g
	GUN-TP-0021	30
22	GUN-TP-0026	26
	GUN-TP-0027	29
	GUN-TP-0028	37
	GUN-TP-0029	32
	GUN-TP-0030	65

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9-Apr-93

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1571 CR 38
Gunnison, CO 81230

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Attn:
Project: Gunnison

Received: 12-Mar-93 09:45
PO #: 3050-511-10004/064

Job: 936540E

Status: Final

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	± 2s	Th-230 Total pCi/g	± 2s	Th-232 Total pCi/g	± 2s		
GUN-TP-0031	3.4	1.0	180	±10	4.0	±1.0	0-1	TP#9
GUN-TP-0032	5.8	1.3	380	±10	19	±2	1-2	
GUN-TP-0033	4.5	1.1	130	±10	6.3	±1.3	2-3	
GUN-TP-0034	2.5	0.9	120	±10	2.0	±0.7	3-4	
GUN-TP-0022	7.5	1.5	490	±10	6.0	±1.2	0-1	TP#18
GUN-TP-0024	3.5	1.0	180	±10	4.0	±1.0	1-2	
GUN-TP-0023	5.4	1.3	390	±10	4.0	±1.0	2-3	
GUN-TP-0025	3.2	0.9	230	±10	4.7	±1.1	3-4	
GUN-TP-0051	1.9	0.8	260	±10	7.8	±1.4	4-5	
GUN-TP-0019	6.2	1.3	210	±10	3.6	±1.0	0-1	TP#20
GUN-TP-0020	5.2	1.2	200	±10	2.7	±0.8	1-2	
GUN-TP-0021	5.5	1.2	200	±10	5.1	±1.1	2-3	
GUN-TP-0026	8.7	1.6	850	±10	7.5	±1.4	0-1	TP#22
GUN-TP-0027	11	2	930	±20	20	±3	1-2	
GUN-TP-0028	9.9	1.6	730	±20	30	±4	2-3	
GUN-TP-0029	5.8	1.2	790	±20	9.1	±2.1	3-4	
GUN-TP-0030	11	2	1030	±20	29	±4	4-5	

Sample Id	U Total µg/g		
GUN-TP-0031	26	0-1	TP#9
GUN-TP-0032	20	1-2	
GUN-TP-0033	32	2-3	
GUN-TP-0034	21	3-4	
GUN-TP-0022	14	0-1	TP#18
GUN-TP-0024	23	1-2	
GUN-TP-0023	27	2-3	
GUN-TP-0025	18	3-4	
GUN-TP-0051	35	4-5	
GUN-TP-0019	33	0-1	TP#20
GUN-TP-0020	32	1-2	

9-Apr-93

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PO #: 3050-511-10004/064

Job: 936540E

Status: Final

Sample Type: Soil

Sample Id	U Total µg/g	
GUN-TP-0021	30	2-3
GUN-TP-0026	26	0-1
GUN-TP-0027	29	1-2
GUN-TP-0028	37	2-3
GUN-TP-0029	32	3-4
GUN-TP-0030	65	4-5

TP #20

TP #22

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Attn:
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PO #: 3050-511-10004/064

Job: 936540E
Abbreviations:

Status: Final

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium

Units:

pCi/g	: picoCuries per gram
µg/g	: micrograms per gram

INFORMATION ONLY

FAXED ANALYTICAL REPORT

FROM: Barringer Laboratories, Inc.
JOB : 936539
DATE: 9-Apr-93
TIME: 17:52

TO : Ron Jacobs
MK-FERGUSON
1571 CR 38
Gunnison, CO 81230

This is an electronically transferred fax of analytical results (preliminary or final, as designated on the report). The data contained in this report has been reviewed and approved by the laboratory managers and QA/QC personnel. The final report with all appropriate signatures and QA/QC will follow by mail. We do not assume any responsibilty for the fax transmission. It is the client's responsibility to notify us of any changes in address and/or phone number.

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9-Apr-93

Ron Jacobs
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1571 CR 38
Gunnison, CO 81230

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Attn:
Project: Gunnison

Received: 12-Mar-93 13:55
PO #: 3050-511-10004/063

Job: 936539E

Status: Final

Sample Type: Soil

Sample Id	Th-230 Total pCi/g	± 2σ	U Total µg/g		
GUN-TP-0014	170	±10	52	0-1	TP #19
GUN-TP-0015	220	±10	51	1-2	
GUN-TP-0016	160	±10	56	2-3	
GUN-TP-0017	28	±2	37	3-4	
GUN-TP-0018	95	±4	48	4-5	
GUN-TP-0048	35	±2	29	0-1	TP #17
GUN-TP-0049	48	±3	420	1-2	
GUN-TP-0050	59	±3	22	2-3	
GUN-TP-0054	4.8	±1.0	3.8	0-1	TP #3
GUN-TP-0055	100	±10	16	1-2	
GUN-TP-0056	100	±10	9.2	2-3	
GUN-TP-0057	150	±10	14	3-4	
GUN-TP-0058	500	±10	17	4-5	
GUN-TP-0059	3.8	±0.9	31	0-1	TP #4
GUN-TP-0060	5.0	±0.8	29	1-2	
GUN-TP-0061	2.3	±0.6	6.8	2-3	
GUN-TP-0062	2.6	±0.6	3.3	3-4	
GUN-TP-0063	2.4	±0.6	14	4-5	
GUN-TP-0064	122	±4	52	0-1	TP #5
GUN-TP-0065	97	±4	32	1-2	
GUN-TP-0087	123	±4	27	2-3	
GUN-TP-0088	83	±3	14	3-4	
GUN-TP-0035	53	±3	20	0-1	TP #10
GUN-TP-0036	75	±4	9.5	1-2	
GUN-TP-0037	80	±4	7.8	2-3	
GUN-TP-0076	1.8	±0.7	57	0-1	TP #8
GUN-TP-0077	3.0	±0.8	63	1-2	
GUN-TP-0078	1.6	±0.6	0.4	2-3	
GUN-TP-0079	1.5	±0.5	32	3-4	
GUN-TP-0071	102	±4	100	0-1	TP #7
GUN-TP-0072	86	±4	49	1-2	

9-Apr-93

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Attn:
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Received: 12-Mar-93 13:55
PO #: 3050-511-10004/063

Job: 936539E

Status: Final

Sample Type: Soil

Sample Id	Th-230 Total pCi/g	± 2σ	U Total µg/g		
GUN-TP-0073	23	±2	52	2-3	TP #7
GUN-TP-0074	25	±2	38	3-4	
GUN-TP-0075	54	±3	59	4-5	
GUN-TP-0085	1.6	±0.6	110	0-1	
GUN-TP-0089	2.8	±0.8	100	1-2	
GUN-TP-0086	7.3	±1.2	110	2-3	TP #12
GUN-TP-0090	3.3	±0.8	51	3-4	
GUN-TP-0091	6.1	±1.1	32	4-5	
GUN-TP-0092	3.5	±0.8	37	0-1	
GUN-TP-0093	54	±3	33	1-2	
GUN-TP-0094	130	±10	26	2-3	TP #14
GUN-TP-0095	104	±4	33	3-4	

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1 71 CR 38
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9-Apr-93

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PO #: 3050-511-10004/063

Job: 9365339E
Abbreviations:

Status: Final

Parameters:

Th-230	: Thorium-230
U	: Uranium

Units:

pCi/g	: picoCuries per gram
µg/g	: micrograms per gram

VENDOR LABORATORY RADIOLOGICAL MEASUREMENTS: COMPOSITE SOIL SAMPLES >#4 MESH SIEVE COBBLY SUBSOIL INVESTIGATION NOVEMBER 1992

BARRINGER LABORATORIES INC.
16000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

22-Dec-92

Test Pit Cobbles

Attn:
Project: Gunnison

Received: 20-Nov-9:
PO# 3050-511-10004 #057

Job: 925571E

Status: Fina:

BARRINGER LABORATORIES
ANALYTICAL REPORT PACKAGE

CASE NARRATIVE.....i

ANALYTICAL RESULTS.....R-1

QUALITY CONTROL REPORT.....Q-1

INFORMATION ONLY

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BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

22-Dec-92

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Gunnison, CO 81230

Page: i
Copy: 3 of 3

Attn:
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PO# 3050-511-10004 #057

Job: 925571E

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CASE NARRATIVE

A total of 23 Soil samples were received on 20-Nov-92. All were properly preserved and in good condition. As stated in the chain of custody, the samples were run for the following analyses: Ra-226, Th-230, Th-232 and U. Our procedures are summarized on the Quality Control Data Sheet. There were no deviations to these procedures. All samples were extracted and analyzed within the proper holding times.

Quality control standards were run using standard EPA guidelines. A summary of that data is provided. The acceptance criteria for spikes and duplicates is fifteen percent. It is based on the relative percent deviation of the mean, taking the counting error into account for radiochemical analyses. All QC checks, including duplicates, spikes, and blanks, passed.

Signed: .....
Steven L. Sincoff, Ph.D.
Director of Operations

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22-Dec-92

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Page: R-1
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Cobbles

Attn:
Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ	Th-230 Total pCi/g	Error 2σ	
GUN-SS-01-CTF (1 Bucket)	2.5	±0.8	15	±2	
GUN-SS-02-CTF (2 Buckets)	2.5	±0.8	3.2	±0.8	BKG
GUN-SS-03-CTF (2 Buckets)	1.3	±0.6	29	±2	
GUN-SS-04-CTF (2 Buckets)	1.2	±0.7	3.7	±0.9	
GUN-SS-05-CTF (2 Buckets)	1.9	±0.8	29	±2 ?	
GUN-SS-06-CTF (2 Buckets)	1.8	±0.8	1.6	±0.6	
GUN-SS-07-CTF (2 Buckets)	1.9	±0.7	7.5	±1.2	
GUN-SS-08-CTF (2 Buckets)	2.0	±0.8	0.8	±0.5	
GUN-SS-09-CTF (2 Buckets)	3.0	±0.9	47	±3	
GUN-SS-10-CTF (1 Bucket)	3.1	±0.9	21	±2	
GUN-SS-11-CTF (2 Buckets)	2.0	±0.8	12	±2	
GUN-SS-12-CTF (2 Buckets)	1.3	±0.6	3.1	±0.8	
GUN-SS-13-CTF (2 Buckets)	2.5	±0.9	41	±3	
GUN-SS-14-CTF (1 Bucket)	1.5	±0.4	13	±2	
GUN-SS-15-CTF (2 Buckets)	2.8	±0.9	1.6	±0.6	
GUN-SS-16-CTF (2 Buckets)	1.6	±0.7	10	±1 ?	
GUN-SS-17-CTF (2 Buckets)	2.8	±0.9	7.1	±1.2	
GUN-SS-18-CTF (2 Buckets)	2.1	±0.8	41	±3	
GUN-SS-19-CTF (2 Buckets)	2.2	±0.8	22	±2	
GUN-SS-20-CTF (2 Buckets)	2.7	±0.9	42	±3	
GUN-SS-21-CTF (2 Buckets)	1.6	±0.7	1.9	±0.6	> BKG
GUN-SS-22-CTF (3 Buckets)	4.0	±1.1	69	±4	
GUN-SS-23-CTF (2 Buckets)	1.7	±0.7	3.1	±0.8	

Sample Id	Th-232 Total pCi/g	Error 2σ	U Total µg/g	
GUN-SS-01-CTF (1 Bucket)	1.7	±0.7	2.2	
GUN-SS-02-CTF (2 Buckets)	1.2	±0.6	1.9	BKG

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Meeting The Analytical Challenges Of A Changing World

BARRINGER LABORATORIES INC.
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22-Dec-92

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Gunnison, CO 81230

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Attn:
Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

Sample Type: Soil

Sample Id	Th-232 Total pCi/g	Error 2σ	U Total µg/g (ppm)	
GUN-SS-03-CTF (2 Buckets)	2.3	±0.8	2.6	
GUN-SS-04-CTF (2 Buckets)	0.3	±0.4	4.1	
GUN-SS-05-CTF (2 Buckets)	2.5	±0.8	8.6	
GUN-SS-06-CTF (2 Buckets)	0.6	±0.5	14	
GUN-SS-07-CTF (2 Buckets)	0.7	±0.5	20	
GUN-SS-08-CTF (2 Buckets)	0.5	±0.5	20	
GUN-SS-09-CTF (2 Buckets)	2.9	±0.9	7.0	
GUN-SS-10-CTF (1 Bucket)	1.2	±0.6	5.1	
GUN-SS-11-CTF (2 Buckets)	0.9	±0.6	1.9	
GUN-SS-12-CTF (2 Buckets)	0.6	±0.5	23	
GUN-SS-13-CTF (2 Buckets)	3.6	±1.0	6.3	
GUN-SS-14-CTF (1 Bucket)	1.2	±0.6	20	
GUN-SS-15-CTF (2 Buckets)	0.9	±0.6	1.6	
GUN-SS-16-CTF (2 Buckets)	0.7	±0.5	32	
GUN-SS-17-CTF (2 Buckets)	1.6	±0.7	13	
GUN-SS-18-CTF (2 Buckets)	2.0	±0.7	6.0	
GUN-SS-19-CTF (2 Buckets)	2.4	±0.8	13	
GUN-SS-20-CTF (2 Buckets)	2.3	±0.8	11	
GUN-SS-21-CTF (2 Buckets)	1.5	±0.7	2.2	BKG
GUN-SS-22-CTF (3 Buckets)	2.2	±0.8	11	BKG
GUN-SS-23-CTF (2 Buckets)	1.7	±0.7	1.3	BKG

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22-Dec-92

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Gunnison, CO 81230

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Attn:
Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

QUALITY CONTROL REPORT

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ	Th-230 Total pCi/g	Error 2σ
Duplicate	1.4	±1.9	41	±3
Duplicate	0.4	±1.6	53	±3
Duplicate % diff.	6.0	---	13	---
Std (found value)	102	±7	101	±6
Std (true value)	99	---	97	---
Std % rec.	103	---	104	---
Blank	0.0	±0.1	0.0	±0.2
Spike % rec.	108	---	101	---

Sample Id	Th-232 Total pCi/g	Error 2σ	U Total µg/g
Duplicate	3.6	±1.0	6.0
Duplicate	3.2	±0.9	6.2
Duplicate % diff.	6.2	---	1.6
Std (found value)	17	±3	44.4
Std (true value)	18	---	49.0
Std % rec.	94	---	91
Blank	0.0	±0.2	0.0
Spike % rec.	90	---	103

INFORMATION ONLY

BARRINGER LABORATORIES INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

22-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: Q-2
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

QUALITY CONTROL REPORT

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium

Units:

pCi/g	: picoCuries per gram
2σ	: Counting error at the 95% confidence level, 2σ
µg/g	: micrograms per gram

INFORMATION ONLY

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22-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

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Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

QUALITY CONTROL REPORT

QUALITY CONTROL DATA SHEET

Received by: jdr Via: DSL Inc

Sample Container Type: 5 gal bucket
Sample Type: Soil
Preservative When Received: none
Additional Lab Preparation: none

Parameter	Method	LLD	Preservative	Analyst	Date(s) of Analysis
Ra-226	SM-705	0.3 pCi/g	none	Preston	12/17-12/22
Th-230	USAEC	0.4 pCi/g	none	Ortiz	12/10-12/17
Th-232	USAEC	0.4 pCi/g	none	Ortiz	12/10-12/17
U	ASTM D2907	0.3 µg/g	none	Knox	12/14-12/16

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22-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Attn:
Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium

Units:

pCi/g	: picoCuries per gram
2σ	: Counting error at the 95% confidence level, 2σ
$\mu g/g$	: micrograms per gram

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22-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: Q-4
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 11:30
PO #: 3050-511-10004 #057

Job: 925571E

Status: Final

QUALITY CONTROL REPORT

Signed: .....
Radiochemical Laboratory Manager

Signed: .....
Quality Assurance Department

INFORMATION ONLY

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

5541

LABORATORY SERVICES AUTHORIZATION FORM

Page 1 of 2

DECHERT — Requisitioner
11/18/92 — Date

12/18/92 — Need Date
Urgent
Priority ✓ Standard

UNNISON — Location
3050-511-10004 — P.O. Number
057 — Request No.

ATTENTION LABORATORY: All reports and invoices must Reference PO and Request Nos.

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NOV 20 1992

of Sample: Water ✓ Soil ✓ Air Particulate Vegetation

of Analysis: ✓ Ra-226 ✓ Th-230 ✓ Nat U. Gross Alpha
Gross Beta Solubility
✓ Other (Specify under special instructions)

ial Instructions/Comments: PLEASE CRUSH AND COMPOSITE ALL BUCKETS FROM INDIVIDUAL TEST PIT. RETURN UNUSED PORTIONS
EASE ANALYZE FOR Th-232 ALSO.

I.D. NO	DATE COLLECTED	VOLUME	DESCRIPTION
1-SS-01-CTF (1 BUCKET)	11-10-92	1-5 GAL. BUCKET	COBBLES (TEST PIT)
N-SS-02-CTF (2 BUCKETS)	11-10-92	2-5 GAL. BUCKETS	TEST PIT #2 COBBLES
1-SS-03-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #3 COBBLES
-SS-04-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #4 COBBLES
1-SS-05-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #5 COBBLES
1-SS-06-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #6 COBBLES
N-SS-07-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #7 COBBLES
1-SS-08-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #8 COBBLES
1-SS-09-CTF (2 BUCKETS)	11-12-92	2-5 GAL. BUCKETS	TEST PIT #9 COBBLES

CHAIN-OF-CUSTODY IF SEAL ON LID IS BROKEN PLEASE ASK (NOTIFY)

inquished by (Site Representative Signature): Karen E. Dechert	Date/Time 11-18-92 1400
er: [signature]	Date/Time 11-18-92 345 pm
ived at Lab by (Lab Representative Signature):* [signature]	Date/Time 11-20-92 11:30

rringer Chain-of-Custody as per contract will be attached

F/CWMFES USE ONLY:

[signature] 18 NOV. 92
F Site Manager

Ronald D. Jacobs 11/18/92
Health Physics Site Manager

echnical Review: Date:

to: Approved Vendor
For Radioanalytical Services

Copy to: PBP Manager

INFORMATION ONLY

F2-RP-006-4

MK-FERGUSON COMPANY
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CWM Federal Environmental Services, Inc.

LABORATORY SERVICES AUTHORIZATION FORM
(CONTINUATION PAGE)

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NOV 20 1992

P.O. Number/Request Number

I.D. NO	DATE COLLECTED	VOLUME	DESCRIPTION
1-SS-10-CTF (1 BUCKET)	11-12-92	1-5GAL. BUCKET	TEST PIT #10 COBBLES
N-SS-11-CTF (2 BUCKETS)	11-12-92	2-5GAL. BUCKETS	TEST PIT #11 COBBLES
N-SS-12-CTF (2 BUCKETS)	11-12-92	2-5GAL. BUCKETS	TEST PIT #12 COBBLES
1-SS-13-CTF (2 BUCKETS)	11-12-92	2-5GAL. BUCKETS	TEST PIT #13 COBBLES
N-SS-14-CTF (1 BUCKETS)	11-12-92	1-5GAL. BUCKETS	TEST PIT #14 COBBLES
1-SS-15-CTF (2 BUCKETS)	11-12-92	2-5GAL. BUCKETS	TEST PIT #15 COBBLES
1-SS-16-CTF (2 BUCKETS)	11-12-92	2-5GAL. BUCKETS	TEST PIT #16 COBBLES
N-SS-17-CTF (2 BUCKETS)	11-12-92	2-5GAL. BUCKETS	TEST PIT #17 COBBLES
V-SS-18-CTF (2 BUCKETS)	11-11-92	2-5GAL. BUCKETS	TEST PIT # 18 COBBLES
1-SS-19-CTF (2 BUCKETS)	11-10-92	2-5GAL. BUCKETS	TEST PIT #19 COBBLES
N-SS-20-CTF (2 BUCKETS)	11-10-92	2-5GAL. BUCKETS	TEST PIT #20 COBBLES
1-SS-21-CTF (2 BUCKETS)	11-10-92	2-5GAL. BUCKETS	TEST PIT #21 COBBLES
N-SS-22-CTF (3 BUCKETS)	11-11-92	3-5GAL BUCKETS	TEST PIT #22 COBBLES
N-SS-23-CTF (2 BUCKETS)	11-10-92	2-5GAL. BUCKETS	TEST PIT #23 COBBLES

VENDOR LABORATORY RADIOLOGICAL MEASUREMENTS: COMPOSITE SOIL SAMPLES <#4 MESH SIEVE COBBLY SOIL INVESTIGATION NOVEMBER 1992

BARRINGER LABORATORIES INC.
1500J W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Testpit fines composite

Attn:
Project: Gunnison

Received: 20-Nov-92
PO# 3050-511-10004 #059

Job: 92556TE

Status: Final

BARRINGER LABORATORIES
ANALYTICAL REPORT PACKAGE

CASE NARRATIVE.....i

ANALYTICAL RESULTS.....R-1

QUALITY CONTROL REPORT.....Q-1

INFORMATION ONLY

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23-Dec-92

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Page: i
Copy: 3 of 3

Attn:
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Received: 20-Nov-92
PO# 3050-511-10004 #059

Job: 925567E

Status: Final

CASE NARRATIVE

A total of 23 Soil samples were received on 20-Nov-92. All were properly preserved and in good condition. As stated in the chain of custody, the samples were run for the following analyses: Ra-226, Th-230, Th-232 and U. Our procedures are summarized on the Quality Control Data Sheet. There were no deviations to these procedures. All samples were extracted and analyzed within the proper holding times.

Quality control standards were run using standard EPA guidelines. A summary of that data is provided. The acceptance criteria for spikes and duplicates is fifteen percent. It is based on the relative percent deviation of the mean, taking the counting error into account for radiochemical analyses. All QC checks, including duplicates, spikes, and blanks, passed.

It is possible that some Th-232 results may be biased high due to carry over from Th-230 peak on the spectrum. Since Th-232 and Th-228 are generally in equilibrium, the Th-228 results have been included in the report. This analysis delayed the report by one day.

Signed: .....
Steven L. Sincoff, Ph.D.
Director of Operations

INFORMATION ONLY

BARRINGER LABORATORIES INC.
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23-Dec-92

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1571 CR 38
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Page: R-1
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Attn:
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Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ	Th-230 Total pCi/g	Error 2σ	Th-232 Total pCi/g	Error 2σ	
GUN-SS-0524-01-CTF	20	±2	95	±4	1.7	±0.8	
GUN-SS-0525-02-CTF	1.4	±0.7	1.3	±0.6	1.2	±0.7	BKG
GUN-SS-0526-03-CTF	3.6	±1.0	150	±10	6.9	±1.4	
GUN-SS-0527-04-CTF	2.2	±0.8	8.7	±1.4	0.8	±0.6	
GUN-SS-0528-05-CTF	3.5	±1.0	180	±10	2.0	±0.8	
GUN-SS-0529-06-CTF	2.9	±1.0	8.4	±1.4	1.2	±0.7	
GUN-SS-0530-07-CTF	4.0	±1.0	130	±10	2.8	±0.9	
GUN-SS-0531-08-CTF	1.7	±0.7	6.3	±1.2	1.1	±0.6	
GUN-SS-0532-09-CTF	6.9	±1.3	350	±10	6.5	±1.4	
GUN-SS-0533-10-CTF	3.5	±1.0	76	±4	2.3	±0.8	
GUN-SS-0534-11-CTF	2.2	±0.8	36	±3	1.5	±0.7	
GUN-SS-0535-12-CTF	1.7	±0.7	6.8	±1.2	1.1	±0.6	
GUN-SS-0536-13-CTF	4.2	±1.1	160	±10	20	±2	
GUN-SS-0537-14-CTF	3.9	±1.1	160	±10	3.2	±1.0	
GUN-SS-0538-15-CTF	1.7	±0.7	3.8	±0.9	0.9	±0.6	
GUN-SS-0539-16-CTF	2.6	±0.8	47	±3	3.5	±1.0	
GUN-SS-0540-17-CTF	3.1	±1.1	74	±3	1.8	±0.7	
GUN-SS-0541-18-CTF	6.7	±1.3	240	±10	7.3	±1.3	
GUN-SS-0542-19-CTF	3.4	±1.1	140	±10	7.3	±1.3	
GUN-SS-0543-20-CTF	7.5	±1.4	270	±10	16	±2	
GUN-SS-0544-21-CTF	2.5	±0.9	16	±2	1.2	±0.6	
GUN-SS-0545-22-CTF	15	±2	660	±10	14	±2	> BKG
GUN-SS-0546-23-CTF	1.1	±0.6	3.9	±0.9	1.2	±0.6	

Sample Id	U Total µg/g	Th-228 Total pCi/g	Error 2σ	
GUN-SS-0524-01-CTF	6.7	0.8	±0.6	
GUN-SS-0525-02-CTF	1.9	0.7	±0.6	BKG

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23-Dec-92

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MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: R-2
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

Sample Type: Soil

Sample Id	U Total µc/g	Th-228 Total pCi/g	Error 2σ
GUN-SS-0526-03-CTF	15	1.2	±0.7
GUN-SS-0527-04-CTF	10	1.2	±0.7
GUN-SS-0528-05-CTF	26	1.8	±0.8
GUN-SS-0529-06-CTF	36	1.5	±0.7
GUN-SS-0530-07-CTF	2.9	1.7	±0.8
GUN-SS-0531-08-CTF	51	1.6	±0.8
GUN-SS-0532-09-CTF	33	1.2	±0.7
GUN-SS-0533-10-CTF	18	0.5	±0.5
GUN-SS-0534-11-CTF	6.7	1.3	±0.7
GUN-SS-0535-12-CTF	52	0.8	±0.6
GUN-SS-0536-13-CTF	20	0.2	±0.4
GUN-SS-0537-14-CTF	29	1.8	±0.8
GUN-SS-0538-15-CTF	2.4	1.1	±0.6
GUN-SS-0539-16-CTF	86	1.0	±0.6
GUN-SS-0540-17-CTF	30	1.2	±0.6
GUN-SS-0541-18-CTF	32	1.3	±0.6
GUN-SS-0542-19-CTF	65	1.1	±0.6
GUN-SS-0543-20-CTF	41.0	1.4	±0.7
GUN-SS-0544-21-CTF	2.0	0.8	±0.6
GUN-SS-0545-22-CTF	36.0	1.8	±0.7
GUN-SS-0546-23-CTF	2.0	1.0	±0.6

> BKG

INFORMATION ONLY

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23-Dec-92

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Gunnison, CO 81230

Page: R-3
Copy: 3 of 3

Attn:
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PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium
Th-228	: Thorium-228

Units:

pCi/g	: picoCuries per gram
2σ	: Counting error at the 95% confidence level, 2σ
µg/g	: micrograms per gram

INFORMATION ONLY

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23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

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Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

QUALITY CONTROL REPORT

Sample Type: Soil

Sample Id	Ra-226 Total pCi/g	Error 2σ	Th-230 Total pCi/g	Error 2σ	Th-232 Total pCi/g	Error 2σ
Duplicate	9.3	±1.5	3.8	±0.9	0.9	±0.6
Duplicate	9.4	±1.5	3.7	±0.9	0.3	±0.5
Duplicate % diff.	0.5	---	1.3	---	50	---
Std (found value)	104	±7	103	±6	18	±3
Std (true value)	99	---	97	---	18	---
Std % rec.	105	---	106	---	100	---
Blank	0.1	±0.2	0.0	±0.2	0.0	±0.2
Spike % rec.	101	---	88	---	120	---

Sample Id	U Total µg/g	Th-228 Total pCi/g	Error 2σ
Duplicate	32	1.7	±0.8
Duplicate	32	1.0	±0.6
Duplicate % diff.	0.0	26	---
Std (found value)	47.6	20	±3
Std (true value)	49.0	19	---
Std % rec.	97	105	---
Blank	0.0	0.0	±0.2
Spike % rec.	95	91	---

BARRINGER LABORATORIES INC.
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23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

QUALITY CONTROL REPORT

Abbreviations:

Parameters:

Ra-226	: Radium-226
Th-230	: Thorium-230
Th-232	: Thorium-232
U	: Uranium
Th-228	: Thorium-228

Units:

pCi/g	: picoCuries per gram
2σ	: Counting error at the 95% confidence level, 2σ
µg/g	: micrograms per gram

INFORMATION ONLY

BARRINGER LABORATORIES INC.
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23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: Q-3
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

QUALITY CONTROL REPORT

QUALITY CONTROL DATA SHEET

Received by: jdr Via: UPS

Sample Container Type: 500ml mtl can
Sample Type: Soil
Preservative When Received: none
Additional Lab Preparation: 100 mesh

Parameter	Method	LLD	Preservative	Analyst	Date(s) of Analysis
Ra-226	SM-705	0.3 pCi/g	none	Pingilley	12/15-12/17
Th-230	USAEC	0.4 pCi/g	none	Ortiz	12/ 9-12/17
Th-232	USAEC	0.4 pCi/g	none	Ortiz	12/ 9-12/17
U	ASTM D2907	0.3 µg/g	none	Knox	12/ 3-12/ 8
Th-228	USAEC	0.4 pCi/g	none	Ortiz	12/ 9-12/21

INFORMATION ONLY

BARRINGER LABORATORIES INC.
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23-Dec-92

Ron Jacobs
MK-Ferguson
1571 CR 38
Gunnison, CO 81230

Page: Q-4
Copy: 3 of 3

Attn:
Project: Gunnison

Received: 20-Nov-92 09:30
PO #: 3050-511-10004 #059

Job: 925567E

Status: Final

QUALITY CONTROL REPORT

Signed: .....
Radiochemical Laboratory Manager

Signed: .....
Quality Assurance Department

INFORMATION ONLY

MK-FERGUSON COMPANY
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CWM Federal Environmental Services, Inc.

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NOV 20 1992

LABORATORY SERVICES AUTHORIZATION FORM

D/C

n Clacobs — Requisitioner
11 / 19 / 92 — Date

12/19/92 — Need Date
Urgent
Priority ✓ Standard

rrison CO — Location
3050-511-10004 — P.O. Number
050 — Request No.

ATTENTION LABORATORY: All reports and invoices must Reference PO and Request Nos.

e of Sample: ____ Water ✓ Soil ____ Air Particulate ____ Vegetation

e of Analysis: ✓ Ra-226 ✓ Th-230 ✓ Nat U. ____ Gross Alpha
____ Gross Beta ____ Solubility
✓ Other (Specify under special instructions)

cial Instructions/Comments: Also analyze for Th-232. Please return unused portion.

I.D. NO	DATE COLLECTED	VOLUME	DESCRIPTION
N-SS-0524-01-CTF	11-12-92	747.6 g	Test pit #1 composite 180/60
N-SS-0525-02-CTF	11-10-92	566.4 g	Test pit #2 composite 130/90
N-SS-0526-03-CTF	11-12-92	554.7 g	Test pit #3 composite 0
N-SS-0527-04-CTF	11-12-92	567.8 g	Test pit #4 composite 130/70
N-SS-0528-05-CTF	11-13-92	503.6 g	Test pit #5 composite 9
N-SS-0529-06-CTF	11-12-92	557.7 g	Test pit #6 composite 8
N-SS-0530-07-CTF	11-12-92	558.4 g	Test pit #7 composite 9
N-SS-0531-08-CTF	11-13-92	541.0 g	Test pit #8 composite 130/110
N-SS-0532-09-CTF	11-12-92	510.0 g	Test pit #9 composite 130/110

CHAIN-OF-CUSTODY

inquished by (Site Representative Signature): Cloan. Cosgrove	Date/Time 11/19/92 @ 1500
rier: UPS 671 933 059	Date/Time 11/19/92 @ 1500
ssived at Lab by (Lab Representative Signature):* [signature]	Date/Time 11-20-92 / 0932

arringer Chain-of-Custody as per contract will be attached

K-F/CWMFES USE ONLY:

[signature] 19 NOV. 92
K-F Site Manager

Ronald D Jacobs 11/19/92
Health Physics Site Manager

echnical Review: ____ Date: ____

to: Approved Vendor For Radioanalytical Services

Copy to: HPP Manager

INFORMATION ONLY

FZ-RP-006-4

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LABORATORY SERVICES AUTHORIZATION FORM
(CONTINUATION PAGE)

3050-511-10004/059
P.O. Number/Request Number

I.D. NO	DATE COLLECTED	VOLUME	DESCRIPTION
N-SS-0533-10-CTF	11-12-92	660.4 g	Test pit #10 composite Ø
N-SS-0534-11-CTF	11-12-92	575.6 g	Test pit #11 composite Ø
N-SS-0535-12-CTF	11-13-92	515.2 g	Test pit #12 composite Ø
N-SS-0536-13-CTF	11-12-92	588.5 g	Test pit #13 composite Ø
N-SS-0537-14-CTF	11-13-92	617.6 g	Test pit #14 composite 120/120
N-SS-0538-15-CTF	11-12-92	544.0 g	Test pit #15 composite Ø
N-SS-0539-16-CTF	11-12-92	568.6 g	Test pit #16 composite 180/120
N-SS-0540-17-CTF	11-12-92	519.9 g	Test pit #17 composite Ø
N-SS-0541-18-CTF	11-13-92	520.8 g	Test pit #18 composite 140/35
N-SS-0542-19-CTF	11-11-92	489.5 g	Test pit #19 composite 120/8[illegible]
N-SS-0543-20-CTF	11-11-92	555.1 g	Test pit #20 composite 120/9[illegible]
N-SS-0544-21-CTF	11-10-92	553.4 g	Test pit #21 composite 120/10[illegible]
N-SS-0545-22-CTF	11-11-92	407.5 g	Test pit #22 composite 160/16[illegible]
N-SS-0546-23-CTF	11-11-92	658.0 g	Test pit #23 composite Ø

INCORPORATED

ON-SITE LABORATORY RADIOLOGICAL MEASUREMENTS COBBLY SUBSOIL INVESTIGATION NOVEMBER 1992

INFORMATION ONLY

NL-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHMENT 2

SITE NAME GUNNISON

SITE AREA N/A

OCS SERIAL NO. OCS #'S BETWEEN 501-599 OCS #984368 (GUN-6)

COUNT DATE INITIAL	COUNT DATE 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	* OCS # INITIAL	* OCS # 20 DAY	FUNCTION NO. INITIAL	FUNCTION NO. 20 DAY	MASS WET	MASS DRY	RA-226 INITIAL	RA-226 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL	TECH 20 DAY	REMARKS
11-10-92	12-28-92	GUN-TP 0001	#2 0-1'	11-10-92	12-3-92	501	501	397.94	642.39	467.9	456.1	0.9	1.4				✓ ~~Ad~~	kd	QC	F3= 208.19
11-10-92	12-28-92	GUN-TP 0002	#2 1-2'	11-10-92	12-3-92	502	502	685.14	594.21	495.4	484.8	1.4	1.2				✓	kd	QC	F3= 602.16
11-10-92	12-28-92	GUN-TP 0003	#2 2-3'	11-10-92	12-3-92	503	503	405.67	132.87	484.1	473.7	0.8	0.3				✓	kd	QC	F3= 548.44
11-10-92	12-28-92	GUN-TP 0004	#2 3-4'	11-10-92	12-3-92	504	504	665.94	519.80	570.4	554.7	1.2	0.9				✓	kd	QC	F3= 297.73
11-10-92	12-28-92	GUN-TP 0005	#2 4-5'	11-10-92	12-3-92	505	505	448.07	462.74	464.1	443.9	1.0	1.0				✓	kd	QC	F3= 530.53
11-10-92	12-28-92	GUN-TP 0006	#21 0-1'	11-10-92	12-3-92	506	506	289.94	547.54	542.5	529.6	0.5	1.0				✓ ~~Ad~~	kd	QC	F3= 342.50
11-10-92	12-28-92	GUN-TP 0007	#21 1-2'	11-10-92	12-3-92	507	507	657.94	410.47	536.0	497.8	1.2	0.8				✓	kd	QC	850 CPTM F3= 432.04
11-10-92	12-28-92	GUN-TP 0008	#21 2-3'	11-10-92	12-3-92	508	508	564.60	616.87	716.5	630.7	0.8	1.0				✓	kd	QC	650 CPTM F3= 432.04 WET
11-10-92	12-28-92	GUN-TP 0009	#21 3-4'	11-10-92	12-3-92	509	509	745.41	890.74	754.5	629	1.0	1.4				✓	kd	QC	F3= 351.45 WET

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = _____.
Count Time = _____, unless noted otherwise.
MDA = _____ pCi/gm Ra-226

MDA Calculation

$$\frac{4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}}{(\text{Ct. time})\ (\text{Eff.})\ (\text{Sample Mass})^*}$$

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

07878

015-17

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHMENT

ITE NAME GUNNISON

ITE AREA N/A

INFORMATION ONLY

OCS SERIAL NO. OCS #'s BETWEEN 501-
599 OCS # 984368 (4W

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
11-10-92	GUN-TP 0010	#23 0-1'			510	437.40	560.0	0.8				✓	kd	
12-28-92			11-10-92	12-3-92	510	399.54	506.4	0.8				~~kd~~	QC	F3=485.76
11-10-92	GUN-TP 0011	#23 1-2'			511	245.14	552.8	0.4					kd	
12-28-92			11-10-92	12-3-92	511	621.14	516.5	1.2				✓	QC	F3=602.16
11-10-92	GUN-TP 0012	#23 2-3'			512	381.14	633.2	0.6					kd	
12-28-92			11-10-92	12-3-92	512	254.20	547	0.5				✓	QC	F3=557.39
11-10-92	GUN-TP 0013	#23 3-4'			513	123.54	795.5	0.2					kd	
12-28-92			11-10-92	12-3-92	513	509.41	683	0.8				✓	QC	F3=763.33 WET
11-11-92	GUN-TP 0014	#19 0-1'			501	1374.47	498.6	2.8				✓	kd	
12-28-92			11-10-92	12-3-92	514	1721.68	472.1	4.1				~~kd~~	QC	F3=333.54
11-11-92	GUN-TP 0015	#19 1-2'			502	1938.21	504.1	3.8					kd	
12-28-92			11-10-92	12-3-92	515	2353.41	479.3	4.9				✓	QC	F3=405.17
11-11-92	GUN-TP 0016	#19 2-3'			503	1407.81	519.1	2.7					kd	
12-28-92			11-10-92	12-3-92	516	1695.01	491.7	3.4				✓	QC	F3=333.54
11-11-92	GUN-TP 0017	#19 3-4'			504	730.79	494.1	1.5					kd	
12-29-92			11-10-92	12-3-92	501	1037.67	446.9	2.3				✓	QC	F3=261.91
11-11-92	GUN-TP 0018	#19 4-5'			506	920.07	503.4	1.8					kd	
12-29-92			11-10-92	12-3-92	502	1468.61	405.1	3.6				✓	QC	F3=217.14

OTE: All soil sample results are in pCi/gm

ite Correction factor = _____.
ount time = _____, unless noted otherwise.
DA = pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{\sqrt{10{,}000 \text{ sec. background cts.}}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

97878

015-17

ATTACHMENT

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

INFORMATION ONLY

SITE NAME GUNNISON

SITE AREA N/A

OCS SERIAL NO. OCS #'s BETWEEN 501-5[illegible] OCS SN 984368 (GUN-[illegible])

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
11-11-92	GUN-TP 0019	#20 0-1'	11-10-92	12-3-92	506	3159.01	598.8	5.3				✓	kd	
12-29-92					503	4483.81	513.8	8.0					QC	F3= 548.44
11-11-92	GUN-TP 0020	#20 1-2'	11-10-92	12-3-92	507	2191.54	553.7	4.0					kd	
12-29-92					504	3370.75	502	6.7				✓	QC	F3= 405.17
11-11-92	GUN-TP 0021	#20 2-3'	11-10-92	12-3-92	508	1618.47	466.3	3.5					kd	
12-29-92					505	2738.74	429	6.4				✓	QC	F3= 154.46
11-12-92	GUN-TP 0022	#18 0-1'	11/11/92	12-3-92	501	2278.21	481.7	4.7				✓	kd	
12-29-92					506	2820.34	442	6.4					QC	F3= 852.88
11-12-92	GUN-TP 0023	#18 2-3'	11-11-92	12-3-92	502	1644.61	515.0	3.2					kd	
12-29-92					507	2527.28	490	5.2				✓	QC	F3= 655.89
11-12-92	GUN-TP 0024	#18 1-2'	11-11-92	12-3-92	503	1179.54	483.5	2.4					kd	
12-29-92					508	1411.87	460	3.1				✓	QC	F3= 494.71
11-12-92	GUN-TP 0025	#18 3-4'	11-11-92	12-3-92	504	1439.27	555.1	2.6					kd	
12-29-92					509	2311.28	529.3	4.4				✓	QC	F3= 745.43
11-12-92	GUN-TP 0026	#22 0-1'	11-11-92	12-3-92	505	332594	538.8	6.2				✓	kd	
12-29-92					510	5873.68	518.3	11.3				✓	QC	F3= 1198.13
11-12-92	GUN-TP 0027	#22 1-2'	11-11-92	12-3-92	506	3613.15	573.0	6.3					kd	
12-29-92					511	6411.82	553	11.6				✓	QC	F3= 1139.40

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = _____.
Count Time = _____, unless noted otherwise.
MDA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

07878

015-17

ATTACHMENT 2

HK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

NAME GUNNISON

AREA N/A

OCS SERIAL NO. OCS #'s BETWEEN 501-59 OCS SN 984368 (GUN-5)

INFORMATION ONLY

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
-12-92	GUN-TP 0028	#22 2-3'	11-11-92	12-3-92	507	3229.41	576.6	5.6					kd	
-29-92					512	5915.55	557.7	10.6				✓	QC	F3 = 1067.77
11-12-92	GUN-TP 0029	#22 3-4'	11-11-92	12-3-92	508	2670.48	587.6	4.5					kd	
-29-92					513	6115.82	558.4	11.0				✓	QC	F3 = 960.32
1-12-92	GUN-TP 0030	#22 4-5'	11-11-92	12-3-92	509	2927.54	486.1	6.0					kd	
3-29-92					514	5652.62	442.5	12.8				✓	QC	F3 = 808.10
1-12-92	GUN-TP 0031	#9 0-1'	11-12-92	12-3-92	510	1464.87	541.2	2.7				✓	kd	
12-29-92					515	2114.48	503.5	4.2					QC	F3 = 629.02
1-12-92	GUN-TP 0032	#9 1-2'	11-12-92	12-3-92	511	1834.21	475.9	3.9					kd	
2-29-92					516	2715.28	436	6.2				✓	QC	F3 = 360.40
11-12-92	GUN-TP 0033	#9 2-3'	11-12-92	12-3-92	512	1483.81	566.5	2.6					kd	
2-29-92					517	1962.74	480.7	4.1				✓	QC	F3 = 64.92
11-12-92	GUN-TP 0034	#9 3-4'	11-12-92	12-3-92	513	1480.87	630.9	2.3					kd	
12-29-92					518	2241.14	545.3	4.1				✓	QC	F3 = 360.40
11-12-92	GUN-TP 0035	#10 0-1'	11-12-92	12-3-92	514	1152.34	459.2	2.5				✓	kd	
2-29-92					519	1439.01	403.5	3.6					QC	F3 = 1007.37
11-12-92	GUN-TP 0036	#10 1-2'	11-12-92	12-3-92	515	680.07	476.7	1.4					kd	
2-29-92					520	949.41	404.3	2.3				✓	QC	F3 = 217.14

E: All soil sample results are in pCi/gm

e Correction Factor = _____.
nit Time = _____, unless noted otherwise.
\ = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec, background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

015-17

HK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHMENT

TE NAME GUNNISON

TE AREA N/A

OCS #'s BETWEEN 501-

OCS SERIAL NO. OCS SN 984368 (GUN-

INFORMATION ONLY

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-12-92	GUN-TP 0037	#10 2-3'	11-12-92	12-3-92	516	1348.61	676.6	2.0					kd	
12-29-92					521	1552.87	577.1	2.7				✓	QC	F3=252.96
11-12-92	GUN-TP 0038	#13 0-1'	11-12-92		517	1089.41	491.5	2.2				✓	kd	F3= 396.22
11-12-92	GUN-TP 0039	#13 1-2'	11-12-92		518	1291.27	462.3	2.8				✓	kd	F3=208.19
11-12-92	GUN-TP 0040	#13 2-3'	11-12-92		519	1305.14	529.1	2.5				✓	kd	F3= 378.31
11-12-92	GUN-TP 0041	#13 3-4'	11-12-92		520	452.07	517.7	0.9				✓	kd	F3= 575.80
11-12-92	GUN-TP 0042	#13 4-5'	11-12-92		521	938.47	653.0	1.4				✓	kd	F3= 378.31
11-13-92	GUN-TP 0043	#16 0-1'	12 ul 11-13-92		501	1582.47	454.5	3.5				✓	kd	F3= 423.08
11-13-92	GUN-TP 0044	#16 1-2'	11-12-92		502	945.41	517.0	1.8				✓	kd	F3=351.45
11-13-92	GUN-TP 0045	#16 2-3'	11-12-92		503	530.21	479.5	1.1				✓	kd	F3=763.33

OTE: All soil sample results are in pCi/gm

ite Correction Factor = _____.
ount Time = _____, unless noted otherwise.
DA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

17878

015-17

ATTACHMENT 2

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

INFORMATION ONLY

E NAME GUNNISON

E AREA N/A

* OCS #'s BETWEEN 501-599 (GUNS)

OCS SERIAL NO. OCS SN984368

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-13-92	GUN-TP 0046	#16 3-4'	11-12-92		504	538.74	453.3	1.2				✓	kd	F3 = 575.30
11-13-92	GUN-TP 0047	#16 4-5'	11-12-92		505	529.41	473.2	1.1				✓	kd	F3 = 396.22
11-13-92	GUN-TP 0048	#17 0-1'	11-12-92	12-4-92	506	722.47	438.9	1.6				✓	kd	
12-29-92					582	934.74	405.7	2.3					QC	F3 = 423.08
11-13-92	GUN-TP 0049	#17 1-2'	11-12-92	12-4-92	507	1014.47	525.2	1.9				✓	kd	
12-29-92					523	1034.21	447	2.3					QC	F3 = 333.54
11-13-92	GUN-TP 0050	#17 2-3'	11-12-92	12-4-92	508	890.21	527.5	1.7				✓	kd	
12-29-92					524	1477.14	432.7	3.4					QC	F3 = 315.63
11-13-92	GUN-TP 0051	#18 45'	11-12-92	12-4-92	509	729.14	470.0	1.6				✓	kd	
12-29-92					585	1495.54	411.3	3.6					QC	F3 = 646.93
11-13-92	GUN-TP 0052	#1 0-1'	11-12-92		510	7068.89	443.2	15.9				✓	kd	F3 = 449.94
11-13-92	GUN-TP 0053	#1 1-2'	11-12-92		511	4727.28	630.8	7.5				✓	kd	F3 = 163.42
11-13-92	GUN-TP 0054	#3 0-1'	11-12-92	12-3-92	512	309.40	429.9	0.7				✓	kd	
12-29-92					526	311.14	409.5	0.8					QC	F3 = 172.37

NOTE: All soil sample results are in pCi/gm

te Correction Factor = _____.

unit Time = _____, unless noted otherwise.

DA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{\sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}}{(\text{Ct. Time})\ (\text{Eff.})\ (\text{Sample Mass})^{*}}}$$

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHMENT 2

NAME GUNNISON

AREA N/A

INFORMATION ONLY

OCS #'s BETWEEN 501-

OCS SERIAL NO. 599 OCS SN984368 (GUN

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
1-13-92	GUN-TP 0055	#3 1-2'			513	524.60	461.0	1.1					kd	
2-29-92			11-12-92	12-4-92	527	1150.21	437.4	2.6				✓	QC	F3 = 432.04
1-13-92	GUN-TP 0056	#3 2-3'			515	921.94	513.9	1.8					kd	
2-29-92			11-12-92	12-3-92	528	1059.01	487.3	2.2				✓	QC	F3 = 476.81
1-13-92	GUN-TP 0057	#3 3-4'			518	703.54	524.3	1.3					kd	
2-29-92			11-12-92	12-3-92	529	1191.81	473	2.5				✓	QC	F3 = 539.48
1-13-92	GUN-TP 0058	#3 4-5'			519	1310.47	767.9	1.7					kd	# WET
2-29-92			11-12-92	12-3-92	530	2651.28	637.5	4.2				✓	QC	F3 = 736.47
11-13-92	GUN-TP 0059	#4 0-1'			520	377.40	539.0	0.7				✓	kd	
2-29-92			11-12-92	12-3-92	531	699.54	520	1.3					QC	F3 = 261.91
11-13-92	GUN-TP 0060	#4 1-2'			521	274.47	485.8	0.6					kd	
2-29-92			11-12-92	12-4-92	532	817.67	472.4	1.7				✓	QC	F3 = 333.54
11-13-92	GUN-TP 0061	#4 2-3'	11-12-92		522	574.47	530.3	1.1					kd	
12-29-92				12-4-92	533	705.94	502	1.4				✓	QC	F3 = 333.54
11-16-92	GUN-TP 0062	#4 3-4'			501	345.40	465.5	0.7					kd	
2-29-92			11-12-92	12-4-92	534	511.27	426.9	1.2				✓	QC	F3 = 351.45
11-16-92	GUN-TP 0063	#4 4-5'			502	677.41	519.4	1.3					kd	
2-29-92			11-12-92	12-4-92	535	362.74	448.8	0.8				✓	QC	F3 = 261.91

E: All soil sample results are in pCi/gm

e Correction Factor = _____.
nt Time = _____, unless noted otherwise.
A = _____ pCi/gm Ra-226

MDA Calculation

$$\frac{4.65\sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}}{(\text{Ct. Time})(\text{Eff.})(\text{Sample Mass})^{*}}$$

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

015-17

ATTACHMENT 2

NAME GUNNISON

AREA N/L

INK-FERGUSON/CHEM NUCLEAR
CLOSED CRYSTAL SYSTEM RECORD

INFORMATION ONLY

OCS SERIAL NO. *OCS #'S BETWEEN 501-599 OCS SN984368 (GUN-6)

RUN DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	*OCS # INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	RA-226 INITIAL / 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm / >15cm	TECH INITIAL / 20 DAY	REMARKS
1-16-92	GUN-TP 0064	#5 0-1'			503	938.47	427.5	2.2				✓	kl	
-29-92			11-12-92	12-4-92	536	1368.61	373.2	3.7					QC	F3 = 378.31
1-16-92	GUN-TP 0065	#5 1-2'			504	1227.01	544.8	2.3					kl	
-30-92			11-12-92	12-4-92	501	1437.94	504.5	2.9				✓	QC	F3 = 637.98
1-16-92	GUN-TP 0066	#6 0-1'			505	366.20	446.9	0.8				✓	kl	
			11-12-92											F3 = 494.71
1-16-92	GUN-TP 0067	#6 1-2'			506	983.54	505.5	1.9					kl	
			11-12-92									✓		F3 = 539.48
1-16-92	GUN-TP 0068	#6 2-3'			507	628.87	515.0	1.2					kl	
			11-12-92									✓		F3 = 449.94
-16-92	GUN-TP 0069	#6 3-4'			508	781.41	606.9	1.3					kl	
			11-12-92									✓		F3 = 530.53
1-16-92	GUN-TP 0070	#6 4-5'			509	697.41	466.5	1.5					kl	
			11-12-92									✓		F3 = 261.91
1-16-92	GUN-TP 0071	#7 0-1'			510	1302.21	509.4	2.6				✓	kl	
-30-92			11-12-92	12-4-92	502	1875.54	484.8	3.9					QC	F3 = 673.79
1-16-92	GUN-TP 0072	#7 1-2'			511	1137.14	536.9	2.1					kl	
-30-92			11-12-92	12-4-92	503	1568.07	510.8	3.1				✓	QC	F3 = 512.62

: All soil sample results are in pCi/gm

Correction factor = _____.
t Time = _____, unless noted otherwise.
= _____ pCi/gm Ra-226

MDA Calculation

$$\frac{4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}}{(\text{Ct. Time})\ (\text{Eff.})\ (\text{Sample Mass})^{*}}$$

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

ATTACHMENT

MK-FERGUSON/CHEM NUCLEAR
DISPOSED CRYSTAL SYSTEM RECORD

INFORMATION ONLY

TE NAME GUNNISON

TE AREA N/A

#OCS #'s BETWEEN 50

OCS SERIAL NO. 699 OCS SN 984368 (GU

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-16-92	GUN-TP 0073	#7 2-3'			512	950.47	577.7	1.6					kd	
12-30-92			11-12-92	12-4-92	504	1193.01	551.2	2.1				✓	QC	F3= 786.47
11-16-92	GUN-TP 0074	#7 3-4'			513	837.14	560.7	1.5					kd	
12-30-92			11-12-92	12-4-92	505	796.87	526.1	1.5				✓	QC	F3= 512.62
11-16-92	GUN-TP 0075	#7 4-5'			514	713.41	499.5	1.4					kd	
12-30-92			11-12-92	12-4-92	506	916.61	472.2	1.9				✓	QC	F3= ~~503.67~~ 664.84
11-16-92	GUN-TP 0076	#8 0-1'			515	421.67	400.1	1.1				✓	kd	
12-30-92			11-12-92	12-4-92	507	505.94	379.7	1.3					QC	F3= 503.67
11-16-92	GUN-TP 0077	#8 1-2'			516	620.61	409.2	1.5					kd	
12-30-92			11-12-92	12-4-92	508	446.47	388.3	1.1				✓	QC	F3= 387.27
11-16-92	GUN-TP 0078	#8 2-3'			517	477.40	426.3	1.1					kd	
12-30-92			11-12-92	12-4-92	509	178.73	408.8	0.4				✓	QC	F3= 261.91
11-16-92	GUN-TP 0079	#8 3-4'			518	517.41	446.0	1.2					kd	
12-30-92			11-12-92	12-4-92	510	245.40	425.3	0.6				✓	QC	F3= 261.91
11-16-92	GUN-TP 0080	#11 0-1'			519	61.67	546.0	0.1				✓	kd	
			11-12-92											F3= 503.67
11-16-92	GUN-TP 0081	#11 1-2'			520	355.00	516.0	0.7					kd	
			11-12-92									✓		F3= 503.67

OTE: All soil sample results are in pCi/gm

ite Correction Factor = _____.
ount Time = _____, unless noted otherwise.
DA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{\sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}}{(\text{Ct. Time})\ (\text{Eff.})\ (\text{Sample Mass})^{*}}}$$

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

015-17

ATTACHMENT 2

MK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

INFORMATION ONLY

NAME GUNNISON

AREA N/A

OCS #'S BETWEEN 501-

OCS SERIAL NO. 599 OCS SN 984368 (GUN-5

...NT DATE INITIAL ...D DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	*OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
-16-92	GUN-TP 0082	#11 2-3'	11-12-92		521	337.14	521.4	0.6				✓	kd	F3=512.62
-16-92	GUN-TP 0083	#11 3-4'	11-12-92		522	300.07	544.5	0.6				✓	kd	F3=888.69
-16-92	GUN-TP 0084	#11 4-5'	11-12-92		523	720.07	678.1	1.1				✓	kd	F3=440.99
16-92	GUN-TP 0085	#12 0-1'	11-12-92	12-4-92	524	119.80	500.5	0.2				✓	kd	
30-92					511	466.74	442	1.1					QC	F3=244.00
-16-92	GUN-TP 0086	#12 2-3'	11-12-92	12-4-92	525	450.74	506.5	0.9				✓	kd	
30-[illegible]					512	479.80	465	1.0					QC	F3=261.91
[illegible]	GUN-TP 0087	#5 2-3'	11-12-92	12-4-92	526	321.40	357.1	0.9				✓	kd	
30-92					513	1049.41	313.7	3.3					QC	F3=530.53
-16-92 12-30-92	GUN-TP 0088	#5 3-4'	11-12-92	12-4-92	527	573.67	531.1	1.1				✓	kd	
					514	1311.01	468.6	2.9					QC	F3=414.13
-16-92	GUN-TP 0089	#12 1-2'	11-12-92	12-4-92	528	441.94	468.3	0.9				✓	kd	
-30-92					515	316.60	424.4	0.7					QC	F3=252.96
-16-92	GUN-TP 0090	#12 3-4'	11-12-92	12-4-92	529	458.20	519.4	0.9				✓	kd	
-30-92					516	445.40	487.1	0.9					QC	F3=405.17

: All soil sample results are in pCi/gm

Correction factor = _____.
...t Time = _____, unless noted otherwise.
= _____ pCi/gm Ra-226

MDA Caluclation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

015-17

ATTACHMENT 2

NK-FERGUSON/CHEM NUCLEAR
OPTIMIZED CRYSTAL SYSTEM RECORD

INFORMATION ONLY

E NAME GUNNISON

E AREA N/A

*OCS #'s BETWEEN 501-

OCS SERIAL NO. 599 OCS SN984368 (GUN

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-16-92	GUN-TP 0091	#12 4-5'			580	407.80	560.2	0.7					kl	
12-30-92			11-12-92	12-4-92	517	547.50	516.2	1.1				✓	QC	F3=333.54 F.O. 11/16/92
11-17-92	GUN-TP 0092	#14 0-1'			501	688.34	365.8	1.9				✓	kl	
12-30-92			11-12-92	12-4-92	518	334.74	325.3	1.0					QC	F3=279.82
11-17-92	GUN-TP 0093	#14 1-2'			502	914.47	502.3	1.8					kl	
12-30-92			11-12-92	12-4-92	519	603.54	455.5	1.3				✓	QC	F3=333.54
11-17-92	GUN-TP 0094	#14 2-3'			503	1491.01	439.4	3.4					kl	
12-30-92			11-12-92	12-4-92	520	1332.07	383.6	3.5				✓	QC	F3=682.75
11-17-92	GUN-TP 0095	#14 3-4'			504	1322.74	561.0	2.4					kl	
12-30-92			11-12-92	12-4-92	521	1016.07	477.2	2.3				✓	QC	F3=396.22
11-17-92	GUN-TP 0096	#15 0-1'			505	756.34	448.3	1.7				✓	kl	
12-30-92			11-12-92	12-4-92	522	224.07	428.8	0.5					QC	F3=593.21
11-17-92	GUN-TP 0097	#15 1-2'			506	472.34	457.0	1.0					kl	
12-30-92			11-12-92	12-4-92	523	244.34	439	0.6				✓	QC	F3=324.59
11-17-92	GUN-TP 0098	#15 2-3'			507	327.27	409.8	0.8					kl	
1-5-93			11-12-92	12-4-92	501	731.01	390.7	1.9				✓	QC	F3=387.27
11-17-92	GUN-TP 0099	#15 3-4'			508	475.54	530.0	0.9					kl	
1-5-93			11-12-92	12-4-92	509	510.47	504.2	1.0				✓	QC	F3=449.94

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = _____.
Count Time = _____, unless noted otherwise.
MDA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{\sqrt{\frac{10{,}100 \text{ sec. background cts.}}{20}}}{(\text{Ct. time})\ (\text{Eff.})\ (\text{Sample Mass})^{*}}}$$

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

7878

ATTACHMENT

IK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

NAME GUNNISON

AREA N/A

INFORMATION ONLY

*OCS #'s between 501-599 OCS SN 984368 (GUN-5)

OCS SERIAL NO.

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	*OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
1-17-92	GUN-TP 0100	#15 4.5'			509	912.61	578.9	1.6					kl	
1-5-93			11-12-92	12-4-92	503	473.67	522	0.9				✓	JC	F3=297.72

E: All soil sample results are in pCi/gm

e Correction factor = _____.
ait time = _____, unless noted otherwise.
\ = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{\sqrt{10{,}000 \text{ sec. background cts.}}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

015-17

ATTACHMENT

NK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

I NAME GUANISON

E AREA N/A

*OCS #'s between 50
OCS SERIAL NO. 599 OCS SII 984368
(GUN-5)

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	*OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-17-92	GUN-SS 0524 01-CTF	T.P. #1	11-12-92		510	827.29	747.6	11.1					kd	WET COMPOSITE F3=655.89
11-17-92	GUN-SS 0525 02-CTF	T.P. #2	10 wd 11-12-92		511	659.27	566.4	1.2					kd	COMPOSITE F3=297.73
11-17-92	GUN-SS 0526 03-CTF	T.P #3	11-12-92		512	1007.81	554.7	1.8					kd	COMPOSITE F3=557.39
11-17-92	GUN-SS 0527 04-CTF	T.P. #4	11-12-92		513	538.21	567.8	0.9					kd	COMPOSITE F3=405.17
11-17-92	GUN-SS 0528 05-CTF	T.P. #5	13 wd 11-12-92		514	926.47	503.6	1.8					kd	COMPOSITE F3=467.85
11-17-92	GUN-SS 0529 06-CTF	T.P. #6	11-12-92		515	544.61	557.7	1.0					kd	COMPOSITE F3=432.01
11-17-92	GUN-SS 0530 07-CTF	T.P. #7	11-12-92		516	831.54	558.4	1.5					kd	COMPOSITE F3=852.88
11-17-92	GUN-SS 0531 08-CTF	T.P. #8	13 wd 11-12-92		517	661.14	541.0	1.2					kd	COMPOSITE F3=781.24
11-17-92	GUN-SS 0532 09-CTF	T.P. #9	11-12-92		518	1420.07	510.0	2.8					kd	COMPOSITE F3=440.99

TE: All soil sample results are in pCi/gm

ite Correction Factor = _____.
unt Time = _____, unless noted otherwise.
DA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

INFORMATION ONLY

015

2078

ATTACHMENT

HK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME GUNNISON

SITE AREA N/A

*OCS #'s between 501

OCS SERIAL NO. 599 OCS SN 984368 (GUN-5)

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	*OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	VENDOR LAB RESULT Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-17-92	GUN-SS 0533 10-CTF	T.P. #10	11-12-92		519	1089.41	660.4	1.6					kd	COMPOSITE E3=396.22
11-17-92	GUN-SS 0534 11-CTF	T.P. # 11	11-12-92		520	584.07	575.6	1.0					kd	COMPOSITE E3=709.61
11-17-92	GUN-SS 0535 12-CTF	T.P. #12	11-13-92		521	579.81	515.3	1.1					kd	COMPOSITE E3=244.00
11-17-92	GUN-SS 0536 13-CTF	T.P. #13	11-12-92		522	1149.94	588.5	2.0					kd	COMPOSITE E3=342.50
11-18-92	GUN-SS 0537 14-CTF	T.P. #14	11-13-92		501	1511.01	617.6	2.4					kd	COMPOSITE E3=458.90
11-18-92	GUN-SS 0538 15-CTF	T.P. #15	11-12-92		502	1223.01	544.0	2.2					kd	COMPOSITE E3=145.61
11-18-92	GUN-SS 0539 16-CTF	T.P. #16	11-12-92		503	813.41	528.6	1.5					kd	COMPOSITE E3=440.99
11-18-92	GUN-SS 0540 17-CTF	T.P. #17	11-12-92		504	1173.14	519.9	2.3					kd	COMPOSITE E3=244.00
11-18-92	GUN-SS 0541 18-CTF	T.P. #18	11-13-92		505	1662.21	529.8	3.1					kd	COMPOSITE E3=449.94

REVIEWED BY: SITE H.P. MANAGER

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = _____.

Count Time = _____, unless noted otherwise.

MDA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{\sqrt{10{,}000 \text{ sec. background cts.}}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

INFORMATION ONLY

7870

HK-FERGUSON/CHEM NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

ATTACHME

E NAME GUNNISON

E AREA N/A

*OCS #'s between 50

OCS SERIAL NO. 599 OCS SN 984368 (GUN-5)

COUNT DATE INITIAL 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	*OCS # INITIAL 20 DAY	FUNCTION NO. INITIAL 20 DAY	MASS WET DRY	RA-226 INITIAL 20 DAY	QC SAMPLE	VENDOR LAB RESULT Ra-226	Th-230	DEPTH <15cm >15cm	TECH INITIAL 20 DAY	REMARKS
11-18-92	GUN-SS 0542 19-CTF	T.P. #19	11-11-92		506	1639.27	489.5	3.3					kd	COMPOSITE F3=521.68
11-18-92	GUN-SS 0543 20-CTF	T.P. #20	11-11-92		507	1972.08	555.1	3.6					kd	COMPOSITE F3=575.30
11-18-92	GUN-SS 0544 21-CTF	T.P. #21	11-10-92		508	940.61	553.4	1.7					kd	COMPOSITE F3=387.27
11-18-92	GUN-SS 0545 22-CTF	T.P. #22	11-11-92		509	3003.51	407.5	7.4					kd	COMPOSITE F3=763.33
11-18-92	GUN-SS 0546 23-CTF	T.P. #23	11-10-92		510	824.34	658.0	1.3					kd	COMPOSITE F3=458.90

IE: All soil sample results are in pCi/gm

ite Correction Factor = _____,
unt Time = _____, unless noted otherwise.
DA = _____ pCi/gm Ra-226

MDA Calculation

$$4.65 \sqrt{\frac{10{,}000 \text{ sec. background cts.}}{20}}$$

(Ct. Time) (Eff.) (Sample Mass)*

*typically 500 gms

REVIEWED BY: _____
SITE H.P. MANAGER

INFORMATION ONLY

2070

015-

MORRISON KNUDSEN COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

STATISTICAL DATA SHEET

Site: Gunnison

Date: 1-5-93 Sheet 1 of 3

Test Pit No.	f	$C_{>84}$ Vendor			$C_{<84}$ On-Site		$C_{<84}$ Vendor			> <
		^{226}Ra	^{230}Th	^{232}Th	$^{226}Ra_1$	^{232}Th	$^{226}Ra_2$	^{230}Th	^{232}Th	$^{226}Ra_2/^{226}Ra_1$
1	3.87	2.5	15	1.7	11.1	0.9	20	95	1.7	1.80
2 BKG	4.59	2.5	3.2	1.2	1.2	0.5	1.4	1.3	1.2	1.17
3	3.73	1.3	29	2.3	1.8	1.0	3.6	150	6.9	2.00
4	3.10	1.2	3.7	0.3	0.9	0.7	2.2	8.7	0.8	2.44
5	2.15	1.9	29	2.5	1.8	0.9	3.5	180	2.0	1.94
6	3.65	1.8	1.6	0.6	1.0	0.8	2.9	8.4	1.2	2.90
7	2.66	1.9	7.5	0.7	1.5	1.5	4.0	130	2.8	2.67
8	2.70	2.0	0.8	0.5	1.2	1.4	1.7	6.3	1.1	1.42
9	4.42	3.0	47	2.9	2.8	0.9	6.9	350	6.5	2.46
10	3.38	3.1	21	1.2	1.6	0.6	3.5	76	2.3	2.19
11	3.28	2.0	12	0.9	1.0	1.2	2.2	36	1.5	2.20
12	2.39	1.3	3.1	0.6	1.1	0.5	1.7	6.8	1.1	1.55
13	3.31	2.5	41	3.6	2.0	0.6	4.2	160	20	2.10
14	0.94	1.5	13	1.2	2.4	0.7	3.9	160	3.2	1.63
15	3.43	2.8	1.6	0.9	2.2	0.3	1.7	3.8	0.9	0.77
16	3.22	1.6	10	0.7	1.5	0.8	2.6	47	3.5	1.73

Statistical Mass Partition Function (f_L) = 2.87 minus BKG 21.11 minus BKG 1.62

Statistical Cobble Radionuclide Concentration ($C_{>0}$) ^{226}Ra 2.26 minus BKG ^{230}Th 19.56 ^{232}Th 1.60

^{226}Ra Correction Factor (C;F:) =

Reviewed By: Ronald D. Jacobs Date: 1/7/93

INFORMATION ONLY

MacFERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

STATISTICAL DATA SHEET

Site: Gunnison

Date: 1-5-93 Sheet 2 of 3

Test Pit No.	f	$C_{>84}$ Vendor			$C_{<84}$ On-Site		$C_{<84}$ Vendor			$^{226}Ra_2/^{226}Ra_1$
		^{226}Ra	^{230}Th	^{232}Th	$^{226}Ra_1$	^{232}Th	$^{226}Ra_2$	^{230}Th	^{232}Th	
17	3.68	2.8	2.1	1.6	2.3	0.5	3.1	74	1.8	1.35
18	3.34	2.1	41	2.0	3.1	0.8	6.7	240	2.3	2.16
19	4.04	2.2	22	2.4	3.3	1.1	3.4	140	2.3	1.03
20	1.04	2.7	42	2.3	3.6	1.0	7.5	270	16	2.08
21 BKG	3.93	1.6	1.9	1.5	1.7	0.7	2.5	16	1.2	1.47
22	4.22	4.0	69	2.2	7.4	1.9	15	660	14	2.03
23 BKG	2.93	1.7	3.1	1.7	1.3	0.7	1.1	3.9	1.2	0.85
T2	3.55	1.2	19	0.5			4.6	180	1.2	
T4	4.00	3.2	6.2	1.1			4.2	78	0.9	
T6	3.35	1.3	1.3	1.0			1.4	1.1	1.1	
T8	2.70	1.5	19	1.5	N	A	4.0	180	1.5	N A
T10	4.88	1.5	10	1.4			3.0	120	1.9	
T15	3.00	1.2	0.7	1.1			2.5	3.7	1.4	
T17	1.50	2.0	1.2	1.2			14	15	0.8	
T20	4.00	1.0	0.5	0.7			1.6	1.1	0.9	
T23	0.18	1.3	0.9	0.9			0.8	1.3	1.2	

Statistical Mass Partition Function (f_L) = *

Statistical Cobble Radionuclide Concentration ($C_{>u}$) = ^{226}Ra * ^{230}Th * ^{232}Th *

^{226}Ra Correction Factor (C.F.) = *

Reviewed By: Donald D Roots Date: 1/7/93

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

CWM Federal Environmental Services, Inc.

STATISTICAL DATA SHEET

Site: Gunnison

Date: 1-5-93 Sheet 3 of 3

Test Pit No.	f	$C_{>\#4}$ Vendor			$C_{<\#4}$ On-Site		$C_{<\#4}$ Vendor			$^{226}Ra_2/^{226}Ra_1$
		^{226}Ra	^{230}Th	^{232}Th	$^{226}Ra_1$	^{232}Th	$^{226}Ra_2$	^{230}Th	^{232}Th	
T26	3.55	3.2	1.5	0.6	N	A	1.3	1.0	1.1	N A
					N	A				

INFORMATION ONLY

Statistical Mass Partition Function (f_L) = *

Statistical Cobble Radionuclide Concentration ($C_{>U}$) = ^{226}Ra * ^{230}Th * ^{232}Th *

^{226}Ra Correction Factor ($C_{>F_\lambda}$) = *

Reviewed By: Ronald D Jacobs

Date: 1-6-93

DATE
FILMED
3/24/94

END