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FAX TRANSMISSION COVER SHEET

Date: *February 23, 1995*

To: *Jack Grobe*

Fax: *708-515-1259*

Re: *Draft USEPA Technical Summary Report - Selected Pages*

Sender: *Carol D. Berger*

YOU SHOULD RECEIVE 12 PAGE(S), INCLUDING THIS COVER SHEET. IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL (301) 762-0502.

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DRAFT

TECHNICAL SUMMARY REPORT SUPPORTING THE DEVELOPMENT OF STANDARDS FOR THE CLEANUP OF RADIOACTIVELY CONTAMINATED SITES

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Washington, D.C. 20460

April, 1994

CONTENTS

6. IMPLEMENTATION CONSIDERATIONS

One way to implement the rule might be through the issuance of "look-up tables" which provide generic radionuclide cleanup concentrations for soil that correspond to a given radiation dose or risk to the RMI. Tables 9 and 10 present examples of such tables, for selected radionuclides, for a cleanup goal of 1E-4 for both the residential and commercial land-use scenarios. Since the soil cleanup levels (in pCi/g) are proportional to the risk-based cleanup goals, the cleanup levels associated with other risk-based cleanup goals can be derived directly from these tables. For example, if the cleanup goal is reduced by a factor of 10 to 10^{-5}, the cleanup level is decreased by a factor of 10. Although these tables are preliminary, they are provided to demonstrate the concept of a look-up table. EPA is currently assessing the models and default parameters that are used to prepare such tables.

An important consideration in the development of soil cleanup levels is the feasibility of implementing the cleanup criteria in actual practice in the field. If the cleanup levels are set below the lower limits of detection for laboratory and field measurements techniques, or if the background radiation or radioactivity levels are highly variable and comparable to the cleanup levels, it will be difficult to implement and enforce the regulations based on those cleanup criteria. In order to provide insight into the potential significance of this issue, Tables 9 and 10 contain estimates of the lower limits of detection and the variability of background radioactivity in soil. The lifetime risk level associated with the MDC for laboratory and field measurements is also included in the tables. The lifetime risk level was calculated by multiplying the risk per pCi/g based on the model calculations using RESRAD 5.01. However, risk factors based on alternative models can also be used.

The results reveal that at a target risk level of 10^{-4}:

- All radionuclides can be detected using common commercial laboratory analysis methods for the residential exposure scenario, except for C-14, Cl-36, and I-129.
- All radionuclides can be detected using common commercial laboratory analysis methods for the commercial/industrial exposure scenario, except for I-129.
- No radionuclides can be detected using field measurements for the residential exposure scenario.
- No radionuclides can be detected using field measurements for the commercial/industrial exposure scenario, except for Cm-243, Cd-109, and Mn-54.

Ra-226, Ra-228, and the natural decay series headed by Th-232 and U-238 may be detected at a target risk level of 10^{-4} when all of the decay products are present in equilibrium.

At a target risk level of 10^{-5}:

- 18 percent of the radionuclides (11 of 61) cannot be detected using common commercial laboratory analysis methods for the residential exposure scenario.
- 8 percent of the radionuclides (5 of 61) cannot be detected using common commercial laboratory analysis methods for the commercial/industrial exposure scenario.

At a target risk level of 10^{-4}:

- 39 percent of the radionuclides (24 of 61) cannot be detected using laboratory analysis methods for the residential exposure scenario.
- 25 percent of the radionuclides (15 of 61) cannot be detected using laboratory analysis methods for the commercial/industrial exposure scenario.

Laboratory measurements are adequate to detect almost all of the radionuclides included in the model calculations at a target risk level of 10^{-4}. Field measurement techniques may not be adequate for detecting most of the radionuclides included in the model calculations at a target risk level of 10^{-4}.

In addition to the lower limits of detection, the presence of background radionuclides in soil has significant implications with respect to the implementation of the rule. To distinguish radionuclide contamination from background, contamination levels in soil must be statistically significant with respect to background levels in soil. Tables 9 and 10 list the typical background concentrations of each nuclide in soil, along with a range of concentrations found in U.S. soils. The concentration of a radionuclide is considered to exceed the background concentration, with 95% confidence, if it is larger than the mean background concentration plus twice the standard deviation of the background measurements. Radionuclides not normally present in background (i.e., a background concentration of zero pCi/g) are considered to be present if their concentrations equals or exceeds their sample quantitation limits (MDCs). These definitions will be finalized in developing the implementation protocols for the rule. Nevertheless, using these general ground rules, the following can be concluded from the results:

- 64 percent of the radionuclides (39 of 61) included in the model calculations are not present in nature either naturally or as a result of global fallout (i.e., background is 0 pCi/g).

- 18 percent of the radionuclides (11 of 61) have risk-based radionuclide soil concentrations (RSCs) greater than 10 times background, and are considered detectable.

- C-14, Cs-137+D, Pb-210+D, Sr-90+D, Th-230+D, and U-238+D have radionuclide soil concentrations (RSCs) at the 10^{-4} cleanup level that are greater than twice background, but less than 10 times background. These radionuclides are considered detectable but may cause problems at sites with high natural background levels.

- K-40, Ra-226, Ra-228+D, Th-228+D, and Th-232 have RSCs less than twice background. These radionuclides may be indistinguishable from background at the target risk level of 10^{-4}.

- Six radionuclides (C-14, Cl-36, I-129, K-40, Pb-210, and Ra-226) are difficult to detect at the 10^{-4} level either because of MDC limitations or interference from background.

[1] values are preliminary and are under review and possible revision.

Table 9. Radionuclide Soil Concentrations (RSCs), Minimum Detectable Concentrations (MDCs), and Background Soil Concentrations for Residential Exposures

Radionuclide	Radionuclide Soil Concentration (pCi/g) Calculated at 10^{-6} Risk			Laboratory Analytical Capabilities		Field Analytical Capabilities		Background Soil Concentration	
	RAGS/HHEM	PRESTO	RESRAD	MDC (pCi/g)	Lifetime 10^{-6} Risk Level	MDC (pCi/g)	Lifetime Risk Level	Typical (pCi/g)	Range (pCi/g)
Ac-227	0.3	7	0.3	0.02	7E-06	31	1E-02	0.007	0.001 - 0.03
Ag-108m	1.3	1.3	1.3	0.005	4E-07	8	6E-04	0	N/A
Ag-110m+D	0.7	2	0.7	0.010	1E-06	4	6E-04	0	N/A
Am-241	7	83	8	0.010	1E-07	1,796	2E-02	0.009	0.003 - 0.015
Am-243+D	5	17	5	0.03	6E-07	79	2E-03	0	N/A
Bi-207	1.4	1.4	1.4	0.007	5E-07	506	4E-02	0	N/A
C-14	0.3	3	0.5	1.0	2E-04	NR	N/A	0.25	0.01 - 2.5
Cd-109	41	83	44	0.10	2E-07	7,219	2E-02	0	N/A
Ce-144+D	42	116	47	0.03	6E-08	270	6E-04	0	N/A
Cl-36	0.3	0.3	0.4	0.70	2E-04	82,526	2E+01	0	N/A
Cm-243	28	31	34	0.03	9E-08	117	3E-04	0	N/A
Cm-244	104	132	228	0.03	1E-08	64,490	3E-02	0	N/A
Cm-248	19	23	41	0.03	7E-08	13,828,088	3E+01	0	N/A
Co-57	32	83	34	0.004	1E-08	168	5E-04	0	N/A
Co-60	0.7	0.9	0.8	0.010	1E-06	4	5E-04	0	N/A
Cs-134	1.1	2	1.2	0.007	6E-07	8	7E-04	0	N/A
Cs-135	80	147	161	1.0	6E-07	NR	N/A	0	N/A
Cs-137+D	3	3	3	0.010	3E-07	17	6E-04	0.7	0.1 - 3.5
Eu-152	2	2	2	0.02	1E-06	9	5E-04	0	N/A
Eu-154	2	2	2	0.007	4E-07	8	5E-04	0	N/A
Eu-155	113	132	113	0.02	2E-08	510	5E-04	0	N/A
Fe-55	3,223	83,333	30,266	1.0	3E-09	NR	N/A	0	N/A
Gd-153	90	263	91	0.010	1E-08	397	4E-04	0	N/A
H-3	48	100,000	129	0.02	2E-08	NR	N/A	7	0.8 - 20

All values are preliminary and are under review and possible revision.

Table 9. Radionuclide Soil Concentrations (RSCs), Minimum Detectable Concentrations (MDCs), and Background Soil Concentrations for Residential Exposures (Continued)

Radionuclide	Radionuclide Soil Concentration (pCi/g) Calculated at 10^{-6} Risk			Laboratory Analytical Capabilities		Field Analytical Capabilities		Background Soil Concentration	
	RAGS/HHEM	PRESTO	RESRAD	MDC (pCi/g)	Lifetime Risk Level	MDC (pCi/g)	Lifetime Risk Level	Typical (pCi/g)	Range (pCi/g)
I-129	0.03	0.2	0.03	2	7E-03	2,650	9E+00	0.00003	1E-05 - 9E-05
K-40	2	5	3	0.10	3E-06	72	2E-03	10	3 - 20
Mn-54	2	5	2	0.05	2E-06	5	2E-04	0	N/A
Na-22	0.9	1.2	0.9	0.02	2E-06	5	6E-04	0	N/A
Nb-94	1.2	1.3	1.2	0.010	8E-07	6	5E-04	0	N/A
Ni-59	6,625	6,250	7,273	1.0	1E-08	NR	N/A	0	N/A
Ni-63	2,512	2,326	2,757	2	7E-08	NR	N/A	0	N/A
Np-237+D	0.9	1.3	0.7	0.02	4E-06	53	8E-03	0	N/A
Pa-231	2	3	0.4	0.03	8E-06	385	1E-01	0.607	0.001 - 0.03
Pb-210+D	0.5	14	4	2	5E-05	19,123	5E-01	1	0.23 - 4.2
Pm-147	3,278	66,667	62,933	1.0	2E-09	5,732,009	9E-03	0	N/A
Pu-238	28	83	141	0.03	2E-08	63,833	5E-02	0.001	0.0005 - 0.002
Pu-239	27	83	141	0.03	2E-08	116,314	8E-02	0.025	0.009 - 0.04
Pu-240	27	83	141	0.03	2E-08	67,005	5E-02	0.025	0.009 - 0.04
Pu-241	1,883	7,143	287	1.0	3E-07	4,473,835	2E+00	0	N/A
Pu-242	29	83	148	0.03	2E-08	80,259	5E-02	0	N/A
Pu-244+D	6	7	7	0.03	4E-07	38	6E-04	0	N/A
Ra-226 (+Rn)	0.07	N/A	0.13	0.15	1E-04	5	4E-03	1	0.23 - 4.2
Ra-226 (-Rn)	0.7	1.1	0.5	0.15	3E-05	NA	N/A	1	0.23 - 4.2
Ra-228+D	1.0	2	1.3	0.15	1E-05	10	8E-04	0.87	0.10 - 3.4
Ru-106+D	9	19	10	0.15	2E-06	62	6E-04	0	N/A
Sb-125+D	6	7	6	0.05	9E-07	30	5E-04	0	N/A
Sm-147	277	625	715	0.07	1E-08	NR	N/A	0	N/A
Sm-151	49,201	156,250	193,723	0.02	1E-11	NR	N/A	0	N/A

All values are preliminary and are under review and possible revision.

Table 9. Radionuclide Soil Concentrations (RSCs), Minimum Detectable Concentrations (MDCs), and Background Soil Concentrations for Residential Exposures (Continued)

Radionuclide	Radionuclide Soil Concentration (pCi/g) Calculated at 10^{-4} Risk			Laboratory Analytical Capabilities		Field Analytical Capabilities		Background Soil Concentration	
	RAGS/HHEM	PRESTO	RESRAD	MDC (pCi/g)	Lifetime Risk Level	MDC (pCi/g)	Lifetime Risk Level	Typical (pCi/g)	Range (pCi/g)
Sr-90+D	2	6	4	0.02	5E-07	NR	N/A	0.7	0.2 - 4.0
Tc-99	3	18	5	1.0	2E-05	NR	N/A	0	N/A
Th-228+D	1.0	2	1.1	1.0	9E-05	6	5E-04	0.87	0.10 - 3.4
Th-229+D	9	9	9	1.0	1E-05	39	4E-04	0	N/A
Th-230	264	270	5	0.05	1E-06	43,344	8E-01	0.96	0.12 - 3.8
Th-232+D	2	2	0.9	0.03	3E-06	71,545	8E+00	0.87	0.10 - 3.4
Tl-204	81	278	233	0.05	2E-08	38,389	2E-02	0	N/A
U-232	6	119	3	0.05	2E-06	43,280	2E+00	0	N/A
U-233	14	18	10	1.0	1E-05	63,694	6E-01	0	N/A
U-234	14	17	10	0.03	3E-07	61,677	6E-01	0.96	0.12 - 3.8
U-235+D	9	17	9	0.03	3E-07	95	1E-03	0.01	0.001 - 0.03
U-236	15	19	11	0.03	3E-07	73,402	7E-01	0.01	0.005 - 0.02
U-238+D	11	14	6	0.03	5E-07	670	1E-02	0.96	0.12 - 3.8
Zn-65	1	5	2	0.03	2E-06	23	1E-03	0	N/A

N/A Not Applicable

NR No Response expected from the selected detector due to absent or weak gamma emissions.

All values are preliminary and are under review and possible revision.

Table 10. Radionuclide Soil Concentrations (RSCs), Minimum Detectable Concentrations (MDCs), and Background Soil Concentrations for Commercial/Industrial Exposures

Radionuclide	Radionuclide Soil Concentration (pCi/g) Calculated at 10^{-6} Risk			Laboratory Analytical Capabilities		Field Analytical Capabilities		Background Soil Concentration	
	RAGS/HHEM	PRESTO	RESRAD	MDC (pCi/g)	Lifetime Risk Level	MDC (pCi/g)	Lifetime Risk Level	Typical (pCi/g)	Range (pCi/g)
Ac-227	0.5	23	0.7	0.02	3E-06	31	4E-03	0.007	0.001 - 0.03
Ag-108m	4	4	4	0.005	1E-07	8	2E-04	0	N/A
Ag-110m+D	2	6	2	0.010	4E-07	4	2E-04	0	N/A
Am-241	13	345	19	0.010	5E-08	1,796	9E-03	0.009	0.003 - 0.015
Am-243+D	11	59	12	0.03	2E-07	79	6E-04	0	N/A
Bi-207	4	5	4	0.007	2E-07	506	1E-02	0	N/A
C-14	10	294	18	1.0	6E-06	NR	N/A	0.25	0.01 - 2.5
Cd-109	41	20,408	25,157	0.10	4E-10	7,219	3E-05	0	N/A
Ce-144+D	123	370	153	0.03	2E-08	270	2E-04	0	N/A
Cl-36	12	122	16	0.70	4E-06	82,526	5E-01	0	N/A
Cm-243	91	109	119	0.03	3E-08	117	1E-04	0	N/A
Cm-244	327	588	1,194	0.03	3E-09	64,490	5E-03	0	N/A
Cm-248	58	100	218	0.03	1E-08	13,828,088	6E+00	0	N/A
Co-57	111	294	113	0.004	4E-09	168	1E-04	0	N/A
Co-60	2	3	3	0.010	4E-07	4	2E-04	0	N/A
Cs-134	4	6	4	0.007	2E-07	8	2E-04	0	N/A
Cs-135	1,528	14,493	1,569	1.0	6E-08	NR	N/A	0	N/A
Cs-137+D	10	11	11	0.010	9E-08	17	2E-04	0.7	0.1 - 3.5
Eu-152	5	6	6	0.02	3E-07	9	2E-04	0	N/A
Eu-154	5	6	5	0.007	1E-07	8	2E-04	0	N/A
Eu-155	364	435	364	0.02	5E-09	510	1E-04	0	N/A
Fe-55	7,325	769,231	6,640,106	1.0	2E-11	NR	N/A	0	N/A
Gd-153	282	833	295	0.010	3E-09	397	1E-04	0	N/A
H-3	148	357,143	318	0.02	6E-09	NR	N/A	7	0.8 - 20
I-129	0.05	1.3	0.09	2	2E-03	2,650	3E+00	0.00003	1E-05 - 9E-05

1 values are preliminary and are under review and possible revision.

Table 10. Radionuclide Soil Concentrations (RSCs), Minimum Detectable Concentrations (MDCs), and Background Soil Concentrations for Commercial/Industrial Exposures

Radionuclide	Radionuclide Soil Concentration (pCi/g) Calculated at 10^{-4} Risk			Laboratory Analytical Capabilities		Field Analytical Capabilities		Background Soil Concentration	
	RAGS/HHEM	PRESTO	RESRAD	MDC (pCi/g)	Lifetime Risk Level	MDC (pCi/g)	Lifetime Risk Level	Typical (pCi/g)	Range (pCi/g)
K-40	10	40	12	0.10	8E-07	72	6E-04	10	3 - 20
Mn-54	7	17	7	0.05	7E-07	5	7E-05	0	N/A
Na-22	3	4	3	0.02	7E-07	5	2E-04	0	N/A
Nb-94	4	4	4	0.010	3E-07	6	2E-04	0	N/A
Ni-59	71,050	1,111,111	86,957	1.0	1E-09	NR	N/A	0	N/A
Ni-63	26,941	625,000	3,307,972	2	6E-11	NR	N/A	0	N/A
Np-237+D	2	5	2	0.03	2E-06	53	3E-03	0	N/A
Pa-231	4	11	1.0	0.03	3E-06	385	4E-02	0.007	0.001 - 0.03
Pb-210+D	1.2	244	7	2	3E-05	19,123	3E-01	1	0.23 - 4.2
Pm-147	6,080	400,000	684,932	1.0	1E-10	5,732,009	8E-04	0	N/A
Pu-238	59	357	687	0.03	4E-09	63,833	9E-03	0.001	0.0005 - 0.002
Pu-239	57	357	702	0.03	4E-09	116,314	2E-02	0.025	0.009 - 0.04
Pu-240	57	357	702	0.03	4E-09	67,005	1E-02	0.025	0.009 - 0.04
Pu-241	3,840	34,483	693	1.0	1E-07	4,473,835	6E-01	0	N/A
Pu-242	60	370	741	0.03	4E-09	80,259	1E-02	0	N/A
Pu-244+D	17	22	22	0.03	1E-07	38	2E-04	0	N/A
Ra-226 (+Rn)	0.2	N/A	0.4	0.15	4E-05	5	1E-03	1	0.23 - 4.2
Ra-226 (-Rn)	2	4	1.3	0.15	1E-05	NA	N/A	1	0.23 - 4.2
Ra-228+D	3	8	4	0.15	3E-06	10	2E-04	0.87	0.10 - 3.4
Ru-106+D	30	63	32	0.15	5E-07	62	2E-04	0	N/A
Sb-125+D	18	23	18	0.05	3E-07	30	2E-04	0	N/A
Sm-147	834	2,778	3,888	0.07	2E-09	NR	N/A	0	N/A
Sm-151	147,695	1,000,000	2,701,243	0.02	7E-13	NR	N/A	0	N/A
Sr-90+D	7	2,778	11	0.02	2E-07	NR	N/A	0.7	0.2 - 4.0
Tc-99	8	182	14	1.0	7E-06	NR	N/A	0	N/A

values are preliminary and are under review and possible revision.

Table 10. Radionuclide Soil Concentrations (RSCs), Minimum Detectable Concentrations (MDCs), and Background Soil Concentrations for Commercial/Industrial Exposures

Radionuclide	Radionuclide Soil Concentration (pCi/g) Calculated at 10^{-6} Risk			Laboratory Analytical Capabilities		Field Analytical Capabilities		Background Soil Concentration	
	RAGS/HHEM	PRESTO	RESRAD	MDC (pCi/g)	Lifetime Risk Level	MDC (pCi/g)	Lifetime Risk Level	Typical (pCi/g)	Range (pCi/g)
Th-228+D	5	6	4	1.0	3E-05	6	2E-04	0.87	0.10 - 3.4
Th-229+D	23	29	29	1.0	3E-06	39	1E-04	0	N/A
Th-230	828	909	16	0.05	3E-07	43,344	3E-01	0.96	0.12 - 3.8
Th-232	5	8	3	0.03	1E-06	71,545	2E+00	0.87	0.10 - 3.4
Tl-204	1,676	23,810	24,237	0.05	2E-10	38,389	2E-04	0	N/A
U-232	11	417	6	0.05	8E-07	43,280	7E-01	0	N/A
U-233	250	67	25	1.0	4E-06	63,694	3E-01	0	N/A
U-234	250	67	25	0.03	1E-07	61,677	2E-01	0.96	0.12 - 3.8
U-235+D	20	63	22	0.03	1E-07	95	4E-04	0.01	0.001 - 0.03
U-236	27	67	27	0.03	1E-07	73,402	3E-01	0.01	0.005 - 0.02
U-238+D	19	53	14	0.03	2E-07	670	5E-03	0.96	0.12 - 3.8
Zn-65	10	31	11	0.03	3E-07	23	2E-04	0	N/A

N/A Not Applicable

NR No response expected from the selected detector due to absent or weak gamma emissions.

BUTLER INPUT

2/23/95

Meeting with Cleveland Department of Health Regarding AMS

On February 21, Region III management and staff met with a representative of the Cleveland Department of Health, Division of Environment, to discuss the status of emergency planning and water management issues at the licensee's facility in Cleveland and NRC's oversight of the licensee's activities. The Cleveland official was appreciative of the NRC's commitment to keep the city abreast of the actions of one of our licensees in Cleveland and was satisfied with the status report and NRC oversight.

Meeting with Ohio EPA and Northeast Ohio Regional Sewer District Regarding AMS

On February 22, 1995, Region III management and staff participated in a meeting with OEPA, AMS and NEORSD. The meeting was chaired by OEPA and was intended to identify if there was any common ground between NEORSD and AMS to build consensus for a solution to AMS' discharge problems that would include acceptance of discharges by NEORSD. The meeting was not successful in identifying common ground.

AMS offered a variety of assurances to NEORSD including limits on cobalt-60 concentration and total daily volume of discharges and in-process sampling at the NEORSD facilities involved in the discharge. NRC indicated that it would consider issuing a letter indicating that should AMS discharge within those limits, the NRC would not exercise regulatory authority over any cobalt-60 in the resultant ash. AMS was not willing to indemnify NEORSD from any costs associated with dealing with any ash contaminated with cobalt-60 because there were other licensees in Cleveland authorized to discharge to the sewers.

NEORSD indicated that they would not accept any risk resulting from discharge of cobalt-60 to the sewers and consequently NEORSD would not accept discharges of waste water from AMS.

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ARTER & HADDEN

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(216) 696-2372

February 23, 1995

Mr. John A. Grobe
Nuclear Materials Inspection
Section 2
Nuclear Regulatory Commission
801 Warrenville Road
Lisle, Illinois 60532-4351

Re: Advanced Medical Systems, Inc.
License No. 34-19089-01
Our File: 62931/49779

Dear Mr. Grobe:

We refer to our telephone conversation of earlier today and confirm our request that the NRC assist AMS, its licensee and our client, in completing arrangements for the immediate treatment and discharge into the sewer system of water containing low levels of soluble Cobalt 60 (between undetectable and 200 pico Curies per liter). As you know the water that is the subject of this request has accumulated on the basement floor of our client's facility at 1020 London Road, and in the foundation drains and surrounding soil on the exterior of the building, due to the installation of a sewer plug by NEORSD.

We request that NRC, in writing:

1. direct AMS promptly to treat and discharge this water to the sanitary sewer system, as authorized under 10 C.F.R. 20.2003;

IN COLUMBUS
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Irvine, California 92714-8517
714/252-7500

IN LOS ANGELES
ARTER & HADDEN
700 South Flower Street, Suite 3000
Los Angeles, California 90017-4250
213/629-9300

IN WASHINGTON, D.C.
ARTER & HADDEN
1801 K Street, N.W., Suite 400K
Washington, D.C. 20006-1301
202/775-7100

2. confirm by reference to your letter of February 1, 1995 that the discharge of this water (containing no more than 200 pico Curies per liter of soluble Cobalt 60) will pose no health or safety risk to any party; and,

3. confirm that the discharge of this material from AMS will not result in the initiation of any regulatory activity on the part of NRC against the sewer district (NEORSD).

We also request NRC's assistance in providing a witness who can testify to these matters in court, if necessary.

We recognize that these are unusual requests. We are sure, however, that you agree that the unusual circumstances presented by this case warrant the issuance of this directive if we are to avert what could be a far more serious safety problem: the accumulation of excessive water inside and around the foundation of the building at 1020 London Road with resulting structural damage to the facility.

Yesterday's long and unrewarding meeting with the representatives of the NEORSD and Ohio EPA may have caused you to conclude, as we did, that the position the sewer district has taken (no discharge of water containing even a single atom of Cobalt 60) is indefensible from a regulatory standpoint. Indeed, the only justification that the NEORSD representatives could offer for the extreme position they are taking is a draft EPA technical summary that is so preliminary that its citation as authority is proscribed on the face of the document. Clearly, there is no justification for this position under any reading of current NRC regulations, which preempt those of NEORSD.

More to the point, however, as Ms. Berger demonstrated during the course of our telephone call earlier today, even at a discharge rate of 200 pico Curies per liter (assuming 10,000 gallons per day total discharge) the total discharge of Cobalt 60 from AMS under the proposed treatment and discharge protocol, if every atom travelled unimpeded to NEORSD's plants, would result in filtercake that is below the maximum discharge limits for Cobalt 60 set forth in the EPA draft technical summary. It should be noted that the

same can not be said for the radioactive potassium that would be present in the filtercake. There is, accordingly, absolutely no merit to NEORSD's position in this matter, even if they are correct in their assertion that they are entitled to enforce their regulations in defiance of those of the NRC.

Given the grave circumstances presented by the state of affairs at our client's facility at London Road, and the absence of any practical alternative for dealing with the accumulation of water at the site there is no alternative to the issuance of the directive that we have requested.

You have graciously agreed to convey our requests to the appropriate authorities at the NRC. We thank you for this undertaking and also request that, if there is any hesitation on the part of the NRC to grant our requests, we be given the opportunity to address, in person, whomever is the appropriate person, or persons, to make this decision.

We are available to meet with you, or whomever you designate, in Chicago or in Washington, as soon as practicable.

Thank you.

Very truly yours,

ARTER & HADDEN

Henry E. Billingsley, II

HEB/b

cc: Mr. David Cesar
Advanced Medical Systems
121 North Eagle Street
Geneva, Ohio 44041

Dwight Miller, Esq.
Stavole & Miller
55 Public Square
Suite 1604
Cleveland, Ohio 44113

Ms. Carol D. Berger, C.H.P.
IEM
1680 East Gude Drive
Suite 305
Rockville, Maryland 20850

February 24, 1995

ADVANCED MEDICAL SYSTEMS, INC.

STATUS OF WORK ITEMS

Inspection Issues

Status of Temporary Restraining Order regarding sewer discharges

* TRO issued in federal court 12/14 which retains plug, but allows the discharge of all (non-contaminated) waters.
* Four 3000 gallon tanks have been filled from pumping the manhole. A fifth empty 3000 gallon tank and an empty 2500 gallon tank is onsite.
* Manhole water level is being monitored twice and basement water is being monitored once every day. The distance from the manhole bottom to the basement floor slab is 23 inches. Examples of the level on certain days over the last several months are listed below:

Date	Manhole	Basement
12/12	53 inches (high in December)	2 inches
--Pumped to Tanks--		
1/13	0 inches (empty after pumping)	2 inches
1/16	67 inches (3 1/2 inches of rain)	18 inches
1/17	70 inches	19 inches
1/19	84 inches	19 inches
1/23	94 inches (high in January)	19 inches
1/25	87 inches	20 1/2 inches
--Pumped to Tanks--		
1/27	83 inches	21 inches
1/31	80 inches	22 inches
--Pumped to Tanks (down to 64 inches)--		
2/1	71 inches	22 1/4 inches
2/8	68 3/4 inches	23 inches
2/15	61 inches	24 inches
2/22	59 1/2 inches	24 3/4 inches
2/24	62 inches	25 inches
--Minor precipitation and melt--		

--Current differential between ground and basement water is 14 inches.--

The licensee has developed a plan that to address: (1) the structural integrity of the building; (2) the control of ground water; (3) the clean up of existing contaminated waters; and (4) the isolation of contaminated piping. As of yesterday, based on NEORSD refusal to take discharges, the licensee is not inclined to pump to tanks (approximately 60,000 gallons of contaminated water). Order drafted for water processing.

9

3/6

WHUT room analysis complete and will be forwarded to us by 3/3.

Front plug milling - Alaron and its subcontractor, a Chicago based engineering firm who is familiar with nuclear work, have been awarded the contract to mill out front plug (two month time line after they start work). Expect rig fabrication to begin next week and milling to begin approximately April 1.

Shipment of GE 500 cask with approximately 12,000 Ci of contaminated non-leak tested sources is on hold - cask is bolted and stored in overpack in isotope warehouse. Alaron proposal $75,000 to ship cask normal form. SEG and Vectra are also making proposals for repackaging and shipment. This is a lower priority for AMS than the front plug milling and water operations. The motivation for lower priority is strictly financial. J. L. Shepard remains interested in the material.

NRC structural assessment of AMS ongoing. First site visit 10/12. No significant issues identified. Second site visit late January - no new cracks: Final visit necessary and will be scheduled when water subsides.

10 CFR 2.206 Requests

* March 1993 - AMS to Pay for Remediation - Stein (OGC) has lead and is drafting Commission options paper -- no significant movement.
* August 1994 - Sewer Discharge Radiation Monitor - DeCicco drafting response - We are supporting -- no significant movement.

Mayor of Cleveland Ad Hoc Task Force on Emergency Planning regarding AMS progressing. Grobe met with Task Force in December and with task force leader in January and February. Slawinski attended Task Force meeting in February. Subcommittee including AMS, State, County and City continues to meet on a regular basis. AMS performed inventory of dispersible material for emergency planning purposes (does not include WHUT room, hot cell or source garden per agreement between the parties on the Task Force). State did dose projections for various scenarios - no offsite hazard. Licensee cleared warehouse of radiological hazards and is restructuring fire alarm zones and panels to be consistent with contaminated areas. Licensee is coordinating closely with fire department. City and State comfortable with progress - County not comfortable.

SEG will be submitting a proposal to develop an emergency exercise scenario. Expect the drill could be accomplished during the third calendar quarter in conjunction with wrap up of Cleveland Ad Hoc Task Force. Schedule is being controlled by City of Cleveland Fire Department. There will likely be several smaller drills before the exercise.

Licensing Issues

Renewal received (dated 1/30/95). Region III team established for review. Decommissioning plan and financial instrument ($1.8M) in NMSS on expedited review track with contractor. Emergency plan will be reviewed in headquarters. Expect deficiency letter to be issued by mid-March.

Hearing on renewal requested by NEORSD. OGC attorneys assigned (Zobler and Bordenick). Hearing requests also in from Cleveland, Cuyahoga County and Earth Day Coalition. NEORSD, Cleveland and Cuyahoga County will likely have standing. NRC internal interfaces established and familiarization briefing conducted 1/12. Region III supporting NMSS.

NEORSD Legal Issues

NEORDS/AMS Lawsuit - Federal lawsuit filed. NRC/Region III involvement not expected at this time. No currently scheduled court action on lawsuit.

Federal temporary restraining order issued allowing the plug to remain in the AMS sewer, but moot on whether AMS may discharge clean water to the sewers.

AMS Facility Status

Hot cell radiological conditions:
- Hot cell general area - 8 to 15 R/hr
- Front plug general area - 10 R/hr
- Several isolated hot areas ranging up to 35 R/hr (396 R/hr on contact with chuck)
- Contamination into the millions of dpm per 100 cm2

Inventory Reduction Program
- Current Inventory
  - ≈70,000 Curies in sealed and bulk sources
  - ≈15,000 Curies in GE-500 cask awaiting shipment to J. L. Shepard
  - ≈200 Curies in WHUT room
  - ≈50 Curies in solid low level waste
  - ≈10 Curies in facility contamination (cell, ventilation room, etc)
- Shipments in 1993
  - 18,000 Curies Co-60 transferred to J. L. Shepard
  - 6,500 Curies Cs-137 transferred to J. L. Shepard
  - 3,000 Curies Co-60 transferred to Neutron Products, Inc.
- Shipments in 1994
  - None
- Shipments in 1995
  - 12,000 Curies Co-60 pending shipment

Radwaste Volume Reduction
- AMS is soliciting a proposal from SEG to perform radwaste volume reduction

Staffing at London Road Facility:
- Bob Meschter - RSO since August 1994
- Steve Haddock - Experienced isotope handler
- Chris Reed - Experienced radiation control technician (Perry)

Advanced Medical Systems, Inc.

121 North Eagle Street • Geneva, Ohio 44041
(216) 466-4671 FAX (216) 466-0186

Ar 32-398249 -3/1/95

March 1, 1995

Mr. J. A. Grobe
Nuclear Materials Inspection, Section 2
United States Nuclear Regulatory Commission
801 Warrenville Road
Lisle, Illinois 60523-4351

Re: Application to Amend License No. 34-19089-01

Dear Mr. Grobe:

Advanced Medical Systems, Inc. (AMS) requests amendment of License No. 34-19089-01 to permit water treatment and sewer remediation at the London Road facility. Supplement 1 contains a brief listing of the steps that will be followed for this work. Supplement 2, which is being forwarded to you under a separate cover, contains the detailed procedures. Supplement 3 contains a copy of the Radiation Work Permit (RWP) that will remain in force until completion of the project. This work will commence immediately upon my receipt of the license amendment.

AMS understands that the license amendment fee will be assessed and billed at a later date by the USNRC. Therefore, no fee is enclosed. If you have any questions, please contact me at (216) 466-4671.

Sincerely,

D Cesar

David Cesar, Treasurer

cc: D. A. Miller, Esq., Stavole & Miller
H. Billingsley, Esq., Arter & Hadden

3/7

~~9503276087~~ (19)

MAR 0 3 1995

SUPPLEMENT 1
PROCEDURE DESCRIPTION

Task Description
Purchase and calibrate an in-house gamma spectroscopy system for quick screening of water and soil samples.
Establish contract for treatment of accumulated water.
Obtain specifications and issue purchase orders for collapsible storage containers, water evaporator, and ancillary equipment.
Obtain License Amendment to permit water treatment and sewer remediation to proceed.
Install collapsible storage containers.
Mobilize project manager and water treatment contractor to the AMS site, and notify analytical laboratory of pending sample receipt schedule.
Provide training in radiological protection to all on-site personnel pursuant to AMS license requirements.
Provide personnel dosimetry for all on-site personnel pursuant to AMS license requirements.
Treat water that exists in above-ground storage tanks.
Obtain confirmatory sampling results from treated water.
Pump water that meets the release criteria to collapsible storage containers in the AMS warehouse.
Simultaneously process water that currently exists in the manhole, the lateral, the sump and the basement into an above-ground storage tank.
Obtain confirmatory sampling results from treated water.
Pump water that meets the release criteria to collapsible storage containers in the AMS warehouse.
Collect and analyze core samples in the vicinity of the old lateral connection.
Mobilize excavation contractor, issue personnel dosimetry, and provide general employee training.
When the areas are de-watered, excavate soils in the vicinity of the four-inch line and the footer drains, disconnect the footer drains from the sump, grout in the four-inch line, and grout in the lateral connection to the interceptor.
Obtain and analyze soil and water samples during excavation activities.
Evaluate the contamination status of the footer drains, decontaminate or remove as necessary, and reconnect to the sump.
Process any remaining water beneath the AMS facility by pumping from the sump into an above-ground storage tank.
Obtain confirmatory sampling results from treated water.
Pump water that meets the release criteria to collapsible storage containers in the AMS warehouse.

Task Description
Install a new lateral connection to the NORSD interceptor.
Purchase and install a composite sampler and flow gauge into the new lateral connection.
When sampling results indicate that no detectable cobalt is present, connect the footer drainage system to the new lateral connection.
De-mobilize the treatment contractor and project manager.
Install/test water evaporation system.
Begin slow evaporation of water in the collapsible storage containers.
Complete a remediation report.
Forward a copy of the remediation report to the USNRC.

SUPPLEMENT 2
RADIATION WORK PERMIT
ISP-38B

Permit No: 95-10	Type: ☒ Job Specific ☐ Extended
Expiration Date:	

Description and Location of Work:	Water Treatment and Remediation of Lateral Sewer Connection. Work locations are (a) ISA and ISA Basement Water removal, (b) site where water processing equipment is staged, and (c) site of excavations on exterior south and southeast wall of the building. Work procedures described elsewhere (see RSO).

SURVEY INFORMATION

General Area Dose Rates (mR/hr):	(a) Basement to 50; ISA to 60 (b) To be determined (c) Less than 1
Maximum Accessible Dose Rates (mR/hr):	(a) Basement to 1000; ISA to 200 (b) To be determined (c) Less than 1
Removable Contamination (dpm/100 cm^2):	(a) Basement to 10^6; ISA to 200,000, with 50,000 average (b) To be determined (c) To be determined. Dose rates and contamination status to be established during excavation and when water levels in manhole and pit drop.

ALARA REVIEW

Estimated Total Dose:	Actual Total Dose:
Pre-Job Briefing by: RSO and HP Technician	Post-Job Briefing by: RSO
Dose Reduction Techniques to be Employed: Continuous health physics coverage required. Specific dose reduction techniques to be determined by HP Technician as work progresses. General ALARA commitments and procedures are described in Attachment 1.	

DOSIMETRY REQUIREMENTS

TLD/Film Badge ☒	Finger Ring ☒	SRPD (200mR) ☒	SRPD (1R) ☐	SRPD(5R) ☐
Other (Specify): To be determined by RSO as radiological conditions change.				

PROTECTIVE EQUIPMENT

Coveralls ☒	Lab Coat ☐	Hood ☒	Rubber Gloves ☒	Booties ☒
Rubbers ☐	Respirator ☐	Taped Seams ☒	HP Coverage ☒	Air Sampling ☒ (BZA)
Other Precautions and Special Instructions: Specific precautions and protective equipment needs to be determined by RSO as work progresses. Requirements subject to change based upon real-time survey results. General health and safety procedures are described in Attachment 2.				

horized by:
Terminated by:

ATTACHMENT 1 to RWP

AMS has the responsibility for providing a work-place environment in which employees, visitors and contractors are adequately protected from hazards, including the hazards associated with exposure to radiation and radioactive material. While the exposures associated with the water treatment and sewer remediation operations are expected to be low, all exposures are assumed to entail some risk to the employee. Therefore, AMS has adopted the following three principles to govern all work activities with the potential for exposure to radiation or radioactive materials:

1. No activity or operation will be conducted unless its performance will produce a net positive benefit.

2. All radiation exposures will be kept as low as reasonably achievable (ALARA) considering economic and societal costs.

3. No individual will receive radiation doses in excess of federal or administrative limits.

In addition to administrative controls implicit in this Plan, close attention to the basic radiation protection principles of "time, distance, shielding, and contamination control" is required. Since the act of filtration and ion exchange tends to concentrate activity from a large volume of water into a much smaller confined space, the project manager will alert those in the vicinity of the operation that dose rates may (will) increase over a period of time during daily Tailgate Safety Training. Safeguards to minimize unnecessary exposure will include performance of ambient radiation surveys prior to entering the area, along with planned and periodic routine surveys to assess changing radiological conditions, and communication of survey results to all operations personnel. In addition, no maintenance will be performed on water treatment, excavating, or other equipment without performance of a pre-job survey. Finally, administrative requirements for exit surveys and personnel dosimetry will provide confirmation of the adequacy of the ALARA program.

ATTACHMENT 2 to RWP

Existing health and safety procedures and the provisions of the AMS Radiation Protection Program contain the worker protection requirements for any operations that occur at the London Road plant. Therefore, all work performed with licensed materials at the AMS facility will be completed under the direction of the AMS Radiation Safety Officer, the provisions of AMS License No. 34-19089-01, and the AMS ISP Manual. To address specific radiological issues during water treatment and sewer remediation, on-site health and safety will be monitored continuously by a health physics technician (HP Technician) operating under the direction of the AMS Radiation Safety Officer.

There will be one HP Technician for every 10 contractor personnel. The technician will provide tailgate safety training, implement the personnel monitoring program, perform release surveys for personnel and equipment, and maintain records generated as part of this work plan (Plan).

This Plan will remain in effect throughout the water treatment and sewer remediation operation.[1] Changes to the Plan to accommodate static or dynamic conditions may be made by the AMS Radiation Safety Officer after approval by the AMS Isotope Committee. The following are the health and safety responsibilities for each member of the operations team:

- The HP Technician is responsible for the implementation of this Plan.
- The AMS Radiation Safety Officer is responsible for providing oversight for implementation of this Plan and making changes to the Plan to reflect field situations that were not anticipated during the Plan's initial development. Changes in the Plan can only be made by the AMS Radiation Safety Officer and must be approved by the AMS Isotope Committee.
- The team leader of the contractor personnel is responsible for ensuring field implementation of the Plan. This includes communicating site requirements to all personnel on the job, field supervision, and consultation with the AMS Radiation Safety Officer regarding appropriate changes to the Plan.
- The team members are responsible for understanding and complying with all site health and safety requirements, including proper maintenance of health and safety equipment and facilities. This understanding will be documented by the signature of each team member on an attendance sheet for the briefing.

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[1] In the event of a discrepancy between this Plan and existing AMS Health and Safety policy, the AMS policy will prevail.

Site Entry

The HP Technician will enter the work area before any work begins in order to verify that work zones are established. The daily site entry procedure will include the following:

- Qualitatively assess the wind direction and stay apprised of it throughout the day, identifying the direction during the tailgate safety meeting;
- Confirm the proper placement of emergency information and operational status of equipment.
- Visually scan for signs of actual or potential life or health threatening hazards;
- Note the physical conditions of the site and determine potential exposure pathways;
- Identify new boundaries of the work zones; and
- Document site activities in a "Field Activity Daily Log", including observations related to field conditions and the site, and samples collected.

Employee Training

Employee training in radiation protection will be provided to each contractor employee prior to the start of water treatment and sewer remediation operations. Training will consist of an oral presentation, hand-out of materials, and completion of the form entitled "Statement of Training", ISA-37B. The oral presentation shall address the following:

- Potential contaminants which may be encountered;
- The hazards associated with the potential contaminants
- Protective measures described in this Plan and the provisions of the AMS site-wide Radiation Protection Program;
- Work zone setup and decontamination procedures; and
- Emergency procedures.

Tailgate safety meetings will be conducted at the beginning of each shift or whenever new personnel arrive at the job site in order to discuss health and safety procedures to be followed during the day's work activity. The information discussed will be recorded on a "Tailgate Safety Meeting" form and will serve as confirmation that the information was discussed with those persons whose signature is on the form.

Medical Program

Any team member who develops a lost-time illness or sustains a lost-time injury during water treatment or sewer remediation operations will be examined by a physician. The physician must certify that the employee is fit to return to work before further participation in the effort.

Emergency Procedures

This Plan is established to allow operations to be conducted without adverse impacts on worker health and safety. In the event of an accident or other emergency situation, appropriate measures will be taken in order to reduce the impact on worker health and safety.

Minor accidents will be handled on site by the HP Technician and the team leader. The work area will have a first aid kit to handle minor incidents. Should there be an incident that cannot be handled by the team leader (e.g., a major accident, fire, or chemical release), then the AMS Radiation Safety Officer will be informed of the location and type of incident, and the need for assistance. The HP Technician will notify the AMS Radiation Safety Officer of all first aid cases so that the potential for radionuclide uptake through wounds can be assessed.

In the event that outside medical attention is needed, the hospital designated by the AMS Radiation Safety Officer will be used. Arrangements will be made by the AMS Radiation Safety Officer prior to the start of remediation activities for this hospital to accept injured personnel. The AMS Radiation Safety Officer (or designee) will accompany injured persons to the hospital to perform contamination monitoring prior to treatment, and to assist in decontamination activities as directed by the physician. A list of emergency response telephone numbers will be compiled and distributed during tailgate safety training. Prior to the start of each day's work activities, the nearest AMS telephone will be identified for use during an emergency. The list of emergency phone numbers will be readily available on site, along with a plant map and directions to the nearest hospital.

Contamination Controls

To assure radioactive materials remain under the control of AMS, each worker involved in water treatment or sewer remediation operations will be frisked by the HP Technician prior to leaving the work area. Equipment and materials will be frisked and decontaminated, as necessary, by the HP Technician prior to exiting the work area. The release criteria for personnel and equipment are 1,000 dpm/100 cm^2 removable activity, and 5,000 dpm/100 cm^2 total (fixed plus removable) activity, with the maximum total (fixed plus removable) activity not to exceed 15,000 dpm/100 cm^2 over an area of not more than 100 cm^2. Records of these actions will be maintained on a "Radiological Survey Form" and a "Radiological Survey Map". Contamination control during sample collection shall include the following:

- Personnel will wear latex gloves to collect and handle samples.
- The sample port will be located in an area readily accessible to personnel.
- An impervious area under the sample port from which water can be readily absorbed with rags should a small spill or drop occur.

- The drawing of the sample itself will be controlled with a valve that is manually-operated by the individual taking the sample.

Protective Clothing

The initial level of protection for on-site operations in contaminated areas will be tyvek coveralls, booties, and gloves, and other items as shown on the Radiation Work Permit. Activities involving liquids, fines, or heavy equipment require the use of hard hats, safety glasses with side shields, and steel-toed safety shoes. Upgrading of the level of protection will be based on ambient conditions as work proceeds. The AMS Radiation Safety Officer will be notified if it is deemed necessary to upgrade to a higher level of protection.

External Exposure Monitoring

Personnel shall be assigned a film-based dosimeter for use throughout the on-site operations. Assignment, use, retrieval, and processing shall be coordinated by the AMS Radiation Safety Officer pursuant to AMS Standard Operating Procedures for Radiation Protection. The Radiation Safety Officer shall evaluate the need for enclosing the dosimeters in protective covers (plastic bags), and shall document the methodology for use in interpreting the results of dosimeter processing. In addition, personnel will wear self-reading pocket dosimeters (or an equivalent self-reading device), with usage and readings recorded on a "RWP Sign-in Sheet", ISP-38C. Chambers with residual readings of 50% full scale will be re-charged prior to issue.

Release of Treated Water

Processed water will be stored, initially, in above-ground storage tanks. Samples will be collected from the tanks by a pre-determined procedure (see RSO). Samples shall be collected in large (two liter) bottles and/or one liter Marinelli beakers. No preservatives shall be used. Sufficient sample will be collected to permit it to be "split" (in volume) with the USNRC. Two samples will be collected per tank. The water will be dipped from the tank through the open manway or taken from a sample port on the recirculation pump when the tank has been "turned over" a pre-determined number of times. Sample ports shall not have a dead-leg or static line leading to the valve, so flushing prior to filling the sample bottle is not necessary.

For process control purposes, samples will be analyzed in the AMS gamma spectrometry system, using NIST-traceable sources (water equivalent density) of ^{60}Co for system calibration. For confirmatory analysis, as necessary, the samples shall be sent for analysis to Quanterra, Inc., a commercial analytical laboratory in (St. Louis, Missouri. There the ^{60}Co concentration will be determined by the methodology of gamma spectroscopy. A minimum detection limit of 20 to 30 pCi per liter has been specified. The solubility of ^{60}Co in samples containing "detectable" activity, up to a maximum of 200 pCi per liter, will be demonstrated by the methodology of the American Public Health Association's Method 7110, "Gross Alpha and Gross Beta Radioactivity (Total, Suspended, and Dissolved)" from Standard Methods for the Examination of Water and Wastewater.

Once the analytical results have been received and validated, water in the storage tanks that meets the release criteria (e.g., consistent with Information Notice 94-07, "Solubility Criteria for Liquid

Effluent Release to Sanitary Sewerage Under the Revised 10 CFR Part 20") may be discharged or stored in collapsible storage containers. (Water held in the collapsible storage tanks may be evaporated at a nominal rate of 300-700 gallons per 24-hour day.) Water that does not meet the release criteria will be re-processed or evaporated.

Solid Waste Management

Soils excavated or removed during remediation activities that contain ^{60}Co in concentrations in excess of eight (8) pCi/gram will be disposed of by conventional means at the discretion of the contractor personnel. Soils that exceed eight (8) pCi of ^{60}Co per gram, along with any other solid waste (resins, spent filters) will be stored in the basement of the AMS facility. Protective clothing and other compactable items worn in a contaminated area will be frisked to determine the level of removable and total contamination. Those that do not meet the release criteria of 1,000 dpm/100 cm^2 removable activity, and 5,000 dpm/100 cm^2 total (fixed plus removable) activity will be placed into drums and stored in the basement of the AMS facility.

Noise Monitoring and Abatement

The water treatment and excavation contractors shall provide noise monitoring during heavy equipment operations pursuant to their procedures and specifications. As necessary, noise abatement methods and/or hearing protection shall be provided by the contractors.

Control of Fugitive Dust

The excavation contractor shall ensure that dust is controlled through the use of water spray or containment, if necessary.

Forms

The following pages are copies of the forms that may be used in addition to those specified in the AMS ISP Manual. All completed health and safety forms will be maintained on site by the HP Technician until completion of the project. At that time, they will be relinquished to the AMS Radiation Safety Officer who will maintain them as AMS records.

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
TAILGATE SAFETY MEETING

F:		
D:	Time:	Job Number:
Client Name:		
Address of Work Site:		
Type of Work		
Hazardous/Radioactive Materials Used:		

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment:		
Chemical Hazards:		
Radiological Hazards:		
Physical Hazards:		
Emergency Procedures:		
Hospital/Clinic:	Phone:	Paramedic Phone:
Hospital Address		
S ' Equipment:		
Other:		

ATTENDEES

NAME PRINTED	SIGNATURE

Meeting Conducted by:
Signature:

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
FIELD ACTIVITY DAILY LOG

F[illegible]y:		
D[illegible]	Time:	Job Number:
Client Name:		
Address of Work Site:		
Type of Work		

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS

Visitors on Site:	Changes from Plans and Specifications, and Other Special Orders and Important Decisions:
Weather Conditions:	Important Telephone Calls and Interactions:
Personnel on Site:	
Name Printed:	Signature:

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Reference No _____

Page 1 of _____

(1) Client Name	(7) Samples Shipment Date	(5) Bill to:
(2) Sample Team Leader	(8) Lab Destination	
(3) Task No.	(9) Lab Contact	
(4) Project Manager	(12) Technical Contact/Phone	(10) Report to:
(6) Purchase Order No.	(13) Carrier/Waybill No.	
(11) Required Report Date		

ONE CONTAINER PER LINE

(14) Sample Number	(15) Sample Description/Type	(16) Date/Time Collected	(17) Container Type	(18) Sample Volume	(19) Preservative	(20) Requested Testing Program

23) Special Instructions

24) Possible Hazard Identification Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐	(25) Sample Disposal Return to Client ☐ Disposal by Lab ☐ Archive _____ months
26) Turnaround Time Required: Normal ☐ Rush ☐	(27) QC Level: I ☐ II ☐ III ☐ Project Specific _____
28) Relinquished by: (signature, date, time):	Received by: (signature, date, time)
Relinquished by: (signature, date, time):	Received by: (signature, date, time)
Relinquished by: (signature, date, time):	Received by: (signature, date, time)

(See Reverse for Instructions)

INSTRUCTIONS FOR COMPLETING THIS FORM

1. **Client Name**: Record the name of the client/site location.

2. **ple Team Leader**: List the name of the team taking these samples.

3. **Task No.**: Indicate the IEM task number, if applicable.

4. **Project Manager**: Record the project manager's name.

6. **Purchase Order No.**: Non-IEM personnel should use this space to record the purchase order number authorizing the analysis of these samples. IEM and IEM subcontractors should leave this space blank if a project number has been given for billing.

7. **Samples Shipment Date**: Indicate the date these samples are shipped to the laboratory.

8. **Lab Destination**: Indicate the laboratory designated for sample shipment. Do not list more than one lab on this form. Be certain before sending samples that the laboratory you are designating is aware of the shipment and is capable of accepting these sample types and has available capacity.

9. **Lab Contact**: Give the name of the laboratory contact (typically the lab's project manager).

10. **Report to**: Give the name, address and phone number of the person to receive the data report for these samples.

11. **Required Report Date**: Record the date which you and the laboratory contact have determined the results will be reported (include verba or final report as appropriate).

12. **Technical Contact/Phone**: Indicate the name of the person to be contacted in case of any questions regarding these samples and the phone number where the contact may be reached the day the samples arrive in the laboratory.

13. **Carrier/Waybill Number**: If you are sending the samples by a commercial carrier such as Airborne or Federal Express, record the courier company name and the waybill or airbill number under which these samples will be shipped (Example - Fed-Ex/#513631771).

1. **ple Number**: List the complete, unique identification number of each sample. These numbers must correspond with the identificatio nu. ..s on the sample containers and the field sample collection document(s).

15. **Sample Description/Type**: Provide a short physical description of the sample and the sample type such as soil, sediment, sludge, water, wipe, air, concentrated waste or bulk.

16. **Date/Time Collected**: Record date and exact time each sample was collected. Use a 24-hour clock; i.e., 1645 not 4:45 p.m.

17. **Container Type**: Indicate the volume, color and type of the sample container used (Example - 1 gallon amber glass, 1 liter clear plastic, 40 milliliter clear glass).

18. **Sample Volume**: Estimate the amount of sample in the container. For air samples, indicate the volume of air sampled.

19. **Preservative**: Indicate what type of preservative, if any, has been used for the samples (Example - ice to 4°C nitric acid, hydrochloric acid).

20. **Requested Testing Program**: List the analyses to be performed on each sample by method number or quotation number.

23. **Special Instructions**: Use this space to record any special instructions to the lab regarding the processing of these samples.

24. **Possible Hazard Identification**: Indicate all hazard classes associated with the sample(s).

25. **Sample Disposal**: Indicate how the samples should be disposed of following analysis. The lab may charge for packing, additional archiving and disposal.

26. **Turnaround Time Required**: Check "Normal" or "Rush" as determined by the Technical Contact and the Lab Contact. Rush samples are subject to a surcharge.

2. **Level**: These should be specific to the analytical laboratory and should not be confused with USEPA Analytical Levels. Project S. should reference a quotation number or other specifications that have been submitted to the laboratory before beginning work.

28 **Signatures**: When releasing custody of these samples, use the "Relinquished By" space to sign your full legal name, date and time of release. After verifying that all samples are present, the person receiving the samples must sign the "Received By" spac to take custody of the samples.

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
RADIOLOGICAL SURVEY FORM

Survey Number _____ Date of Survey _____

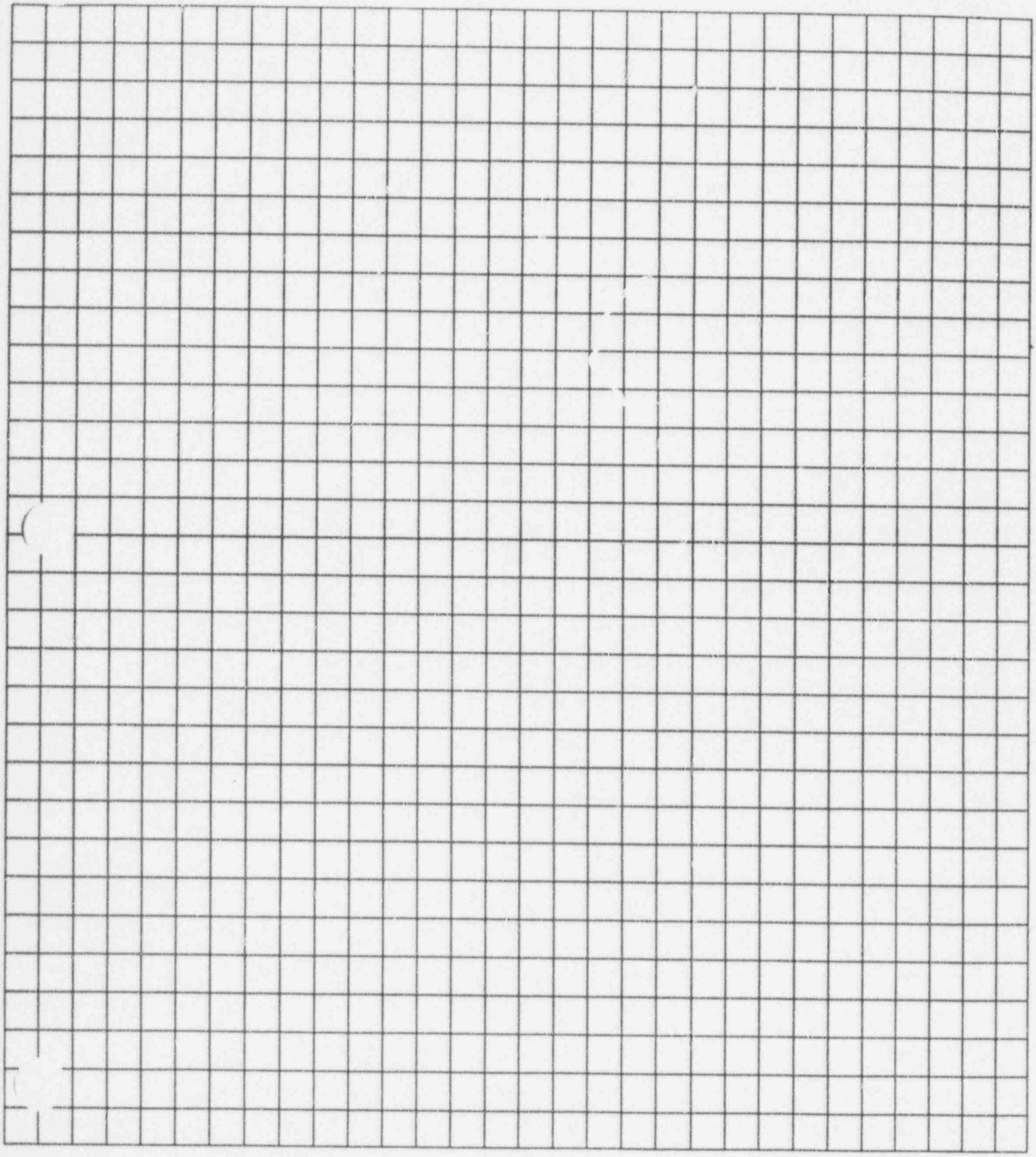
Survey Description:	Survey Performed by:
Drawing ☐ Yes ☐ No	Signature Print Name

Instrument (1)	Instrument (2)	Instrument (3)
Model:	Model:	Model:
Serial No.	Serial No.	Serial No.
Calibration Due:	Calibration Due:	Calibration Due:
Efficiency	Efficiency	Efficiency
MDA CF BKG	MDA CF BKG	MDA CF BKG

Survey #	Smearable Contamination		Radiation Levels (including fixed contamiantion)	Instrument Used	Comments and Additional Information
	Beta/gamma (dpm/100 cm²)	Alpha (dpm/100 cm²)	Ambient (microR/hour)		

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
RADIOLOGICAL SURVEY MAP

Survey Number _____ Date of Survey _____



INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
POCKET IONIZATION CHAMBER DATA SHEET

	Date	Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			
		Begin	End	mR	Begin	End	mR	Begin	End	mR	Begin	End	mR	Begin	End	mR	
Su																	S
M																	M
T																	Tu
W																	W
Th																	Th
F																	F
Sa																	Sa

	Date	Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			Dosimeter Number / Name / Employee Number			
		Begin	End	mR	Begin	End	mR	Begin	End	mR	Begin	End	mR	Begin	End	mR	
Su																	Su
M																	M
T																	Tu
W																	W
Th																	Th
F																	F
Sa																	Sa

Building/Location

Radiation Surveyor (print)

Surveyor (Signature)

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
INSTRUMENT FI[illegible] CHECK FORM

Site:	Probe Type:	Probe Number
Meter Number:	Suggested Operating Voltage:	Check Source Number:

Number	Date	Location	Battery OK	Operating Voltage	Background cpm	Check Source cpm	Name	Remarks
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								

ADVANCED MEDICAL SYSTEMS, INC.
DAILY SAMPLE COUNT RECORD

Sample No.	Collection Date/Time	Date/Time/ Hour of Count	Inst. Model and Serial No.	Inst. Efficiency (c/d)	(1) Bkg	(2) Bkg count time (min)	(3) Bkg count rate (1/2) cpm	(4) Sample counts	(5) Sample count time (min)	(6) Sample count rate (4/5) cpm	(7) Net sample count rate (6-3)	(8) dpm (7/Eff)
Background				—	—	—	—				—	—
Efficiency (solid)				—								—
Efficiency (liquid)				—								—

Printed Name:

Signature: