



GROSS ALPHA AND BETA ACTIVITY
IN SOLID SAMPLES

LAL-91-SOP-0061

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1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide instruction and guidance to staff of Lockheed Analytical Laboratory on the procedures necessary for determining the gross alpha and beta activity in solid samples.

2.0 SCOPE AND APPLICATION

2.1 ASSIGNMENT OF RESPONSIBILITY

This SOP is to be used by trained personnel working in the radionuclide section of the laboratory when preparing solid samples for gross alpha and beta measurement. This procedure is applicable to soil samples, the insoluble fraction of water or sludge samples, vegetation samples and air filters.

2.2 SUMMARY OF METHOD

Soil and sludge samples are dried and ground to a fine powder. An aliquot of the sample is distributed on a planchet and fixed with an acrylic solution.

Larger quantities of the soil may be ashed and the ash leached. The leachate is measured for alpha and beta activity.

The insoluble fraction of a water sample is filtered and dried. The filter is transferred to a planchet and counted.

Air filters are transferred to a planchet and counted.

Vegetation samples are ashed and the ash is transferred to a planchet for counting.

The samples are counted in a low-background, gas-proportional counter.

The gross alpha and gross beta concentrations are calculated from the net sample count rate, the sample quantity and the counting efficiency. The efficiency is determined as a function of the sample mass using Am-241 as a standard for alpha and Sr-90 as a beta standard.

3.0 DEFINITIONS

ATTENUATION - The absorption of radioactive particles by the sample and all substances located between the sample and the detector.

ATTENUATION CURVE - Calibration curves which correct for the changes in attenuation due to the changing weight on the sample planchet.

COUNTING ERROR (CE) - The statistically determined 95% confidence limit of the average count rate. The counting error is based on an assumed gaussian distribution and includes only the error associated with counting the sample.

LABORATORY CONTROL SAMPLE (LCS) - A standard prepared from a source other than the calibration standard, at a concentration of 5 to 50 times the Minimum Detectable Activity (MDA). The Laboratory Control Samples (LCS) are used to indicate the accuracy and consistency of the calibration.

MATRIX SPIKE (MS) - A sample plus a known quantity of constituent. The matrix spike indicates the sample matrix effect on the analysis and on the accuracy of measurement.

MATRIX SPIKE DUPLICATE (MSD) - A second matrix spike sample. The matrix spike duplicate indicates intralaboratory precision.

MINIMUM DETECTABLE ACTIVITY (MDA) - The method or sample detection limit.

MSDS - Material Safety Data Sheet.

OHS - Occupational Health Services, Inc. 11 West 42nd Street, 12th Floor, New York, NY 10036.

2.3 SENSITIVITY

For gross alpha measurements the residue distributed in a 2-inch planchet should not exceed 100 mg. The minimum detectable activity (MDA) for a 100 mg sample counted for 100 minutes would be 0.7 pCi for alpha and 0.6 pCi for beta or a concentration of 7 pCi/g and 6 pCi/g for alpha and beta respectively. A weighless (1 mg) efficiency will be used for air filters giving a MDA of 0.2 pCi/filter for gross alpha and 0.5 pCi/filter for gross beta. The MDA would be lower for the leach and vegetation procedures depending upon the weight reduction from the process.

2.4 LIMITATIONS

This method is subject to rather severe limitations and should be used only for screening purposes. Because the maximum sample mass which can be measured for gross alpha measurement is 100 mg, the selection of a representative aliquot from a large sample quantity may be impossible.

Volatile radionuclides such as radioiodine and tritium will be lost during sample drying. Less volatile radionuclides such as Cs-134, 137 may be lost during ashing.

Results will be inaccurate if the energy of the radionuclide(s) being measured is significantly different from the energy of the calibration standard.

REAGENT-GRADE WATER (ASTM Type III) - Deionized water (which meets American Society for Testing and Materials (ASTM) specifications) that has a measured conductance of less than 1 $\mu\text{S}/\text{cm}$ at 25°C. This water is used in the preparation of standards, calibration and reagent blanks, reagents and dilutions.

REAGENT BLANK- A quality control sample that contains reagent-grade water. The data obtained from the analysis of this sample is used to estimate the amount of the contamination during sample preparation and analysis.

SAMPLE (SMP)- A sample that is to be duplicated.

TAP WATER - A calibration standard containing tap water which is used to determine the amount of radioactive contamination in the tap water used to perform the absorption curve determination.

4.0 SAFETY

4.1 GENERAL

- 4.1.1 All laboratory personnel must be thoroughly familiar with the LAS Environmental, Safety and Health Operations, Chemical Hygiene Plan and the Radiation Safety Manual before undertaking any laboratory work in the radionuclide section of the laboratory. Employees must adhere to all guidelines described in these documents.
- 4.1.2 Safety glasses and lab coats are available through Lockheed and must always be worn in the laboratory. In addition, rubber or latex gloves must be worn when handling any chemicals or samples.
- 4.1.3 Personnel must be aware of the location of the nearest emergency wash facilities, including an eye wash fountain and a quick drench shower, and must be familiar with the operation of each facility.
- 4.1.4 Care must be exercised in handling solvents, standards, and samples. Analysts must be familiar with the Material Safety Data Sheets for all chemicals used. MSDS information is available from the ESH officer, and will be thoroughly reviewed before performing this sample preparation procedure.
- 4.1.5 In consideration of the radioactivity and/or chemical composition of samples, all samples must be treated as a potential health hazard. Exposure to these hazards must be reduced to the lowest practicable levels. The use of fume hoods and rubber or latex gloves are of utmost importance.
- 4.1.6 All procedures that have a potential to generate airborne radioactivity must be performed in a fume hood.
- 4.1.7 All radioactive wastes must be handled according to LAL-91-SOP-0173, Radioactive Sample Handling.

4.2 SPECIFIC

- 4.2.1 Nitric acid is a colorless to pale yellow liquid with a suffocating odor. It is a strong oxidizer, and may ignite other combustible materials (wood, paper, oil, etc.). It reacts violently with water and fuels. Thermal decomposition products may include toxic oxides of nitrogen, and runoff to sewer may create fire or explosion hazard. It is TOXIC BY INHALATION AND INGESTION, and is corrosive upon inhalation, ingestion, and by skin and eye contact. Persons with impaired pulmonary function and pre-existing eye and skin disorders are at increased risk from exposure. It is incompatible with many other chemicals, and should be handled in a hood while wearing a face shield or with the hood sash pulled down as far as possible to shield the operator's face,.
- 4.2.2 Acetone is a clear, colorless, volatile liquid with a characteristic, sweetish mint-like odor and a sweetish taste. Stable under normal conditions, may react with oxidizers, acids, and other chemicals. May cause irritation upon inhalation, ingestion, and eye or skin contact. Wear protective clothing, gloves and safety goggles.

5.0 APPARATUS/MATERIALS/STANDARDS

5.1 APPARATUS

- 5.1.1 Planchets, stainless steel, 2-inch diameter.
- 5.1.2 Drying oven.
- 5.1.3 Hotplate.
- 5.1.4 Beakers, 250 mL or 400 mL, Pyrex or equivalent.
- 5.1.5 Muffle Furnace
- 5.1.6 Analytical balance
- 5.1.7 Centrifuge

5.2 REAGENTS

All materials used must be reagent grade or equivalent unless otherwise specified.

- 5.2.1 Reagent-grade water - shall be ASTM Type II or better; may be generated using a water purification system (Barnstead NANOpure or equivalent).
- 5.2.2 Nitric acid, 70% HNO_3 (concentrated).
- 5.2.3 Nitric acid, 0.1 N - add 6.25 mL nitric acid (70%) to 500 mL reagent grade water. Dilute to 1 L with reagent grade water.
- 5.2.4 Clear acrylic solution, Dissolve 50 mg clear acrylic in 100 ml acetone.

5.3 CALIBRATION STANDARDS

5.3.1 Gross Beta Attenuation Curve Standards

5.3.1.1 In separate 250 mL beakers, add Sr-90/Y-90 standard solution, 250 to 500 pCi of Sr-90 spike (the same amount in all beakers), then add the following different amounts of plain tap water. Perform a duplicate preparation for the 0, 20, 60 and 100 mL portions of tap water.

0 mL (100 mL reagent-grade water)
20 mL
40 mL
60 mL
80 mL
100 mL
120 mL
140 mL

5.3.1.2 Perform steps 5.3.3.2 to 5.3.3.4 on each standard from 5.3.1.1 and deliver the standards to the counting room for absorption curve (efficiency - attenuation vs solids) determination for beta counting per the instrument specific counting procedures.

5.3.2 Gross Alpha Attenuation Curve Standards

5.3.2.1 In separate 250 mL beakers, add Am-241 standard solution, 100 to 250 pCi of Am-241 spike (the same amount in all beakers), then add the following different amounts of plain tap water. Perform a duplicate preparation for the 0, 20, 60 and 100 mL portions of tap water.

0 mL (100 mL reagent-grade water)
20 mL
40 mL
60 mL
80 mL
100 mL
120 mL
140 mL

5.3.2.2 Perform steps 5.3.3.2 to 5.3.3.4 on each standard from 5.3.2.1 and deliver the standards to the counting room for absorption curve (efficiency - attenuation vs solids) determination for alpha counting per the instrument specific counting procedures.

5.3.3 Tap Water Blank

5.3.3.1 To each of three 250 mL beakers add 100 mL of tap water.

5.3.3.2 Add 5ml of concentrated HNO_3 (70%) to the beakers and evaporate the contents to near dryness on a hotplate. Repeat this twice more to convert all chloride salts to nitrate salts.

5.3.3.3 Add 5ml of 0.01 N HNO_3 solution to the beaker, warm and swirl to dissolve residue solution to a marked and preweighed planchet on a hotplate. Evaporate the solution to dryness at a temperature below the boiling point of the solution to avoid splattering.

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5.3.3.4 Dry the samples in an oven at 105°C for one hour, cool in desiccator. Weigh the planchets and record all data in a logbook.

6.0 PROCEDURE

6.1 SAMPLE PREPERATION

Soil and Sludge Samples (Total Activity)

- 6.1.1 Weigh the sample and record the weight on the % Moisture Worksheet (see appendix). Dry in an oven at 105°C and record the dry weight on the Worksheet.
- 6.1.2 If the sample contains extraneous material (i.e., glass, rocks, twigs), check with supervisor to ascertain if this material should be separated.
- 6.1.3 Mix sample and remove approximately 5 grams. Using a mortar and pestle, grinder or by milling reduce the 5g aliquot to a fine powder.
- 6.1.4 Transfer approximately 100mg of the sample to a tared planchet. Weigh sample and record as ALQT VOL (g) on the Gross Alpha/Beta Worksheet (See Appendix).
- 6.1.5 Add a few ml of water to the samples. Spread the slurry evenly on the planchet and dry on a hotplate.
- 6.1.6 Proceed to step 6.1.35.

Solids Seperated from Water Samples

- 6.1.7 Determine the volume of the sample that will result in 80 mg of the residue when filtered through a 47mm, 0.45um membrane filter by filtering 10ml of the sample through a tared filter and weighing.
- 6.1.8 Mix the sample, measure the aliquot to be filtered and record the volume on the worksheet.
- 6.1.9 Weigh a filter and planchet and record the data.

- 6.1.10 Filter the sample through the filter with suction and wash the filter funnel with a few ml of water.
- 6.1.11 Transfer the filter to the planchet.
- 6.1.12 Proceed to step 6.1.35.

Activity of Fixed Solids in Vegetation

- 6.1.13 Weigh the sample and dry in an oven at 105°C. Weigh the dry sample and record weights on a % Moisture Worksheet.
- 6.1.14 Cut up sample and blend as much as possible.
- 6.1.15 Weigh approximately 5g of sample and record weight on the worksheet.
- 6.1.16 Ignite the sample in a muffle furnace for one hour at 550°C. Cool, weigh the ash and record data.
- 6.1.17 Reduce the ash to a fine powder with a mortar and pestle.
- 6.1.18 Transfer approximately 100mg of ash to a tared planchet and weigh. Record weight.
- 6.1.19 Determine the quantity of the vegetation being measured by the following and record as ALQT VOL on the worksheet.

$$(\text{Aliquot of ash 6.1.18}) * \frac{\text{dry weight 6.1.15}}{\text{ashed weight 6.1.16}}$$

- 6.1.20 Add a few ml of water to the sample. Spread the slurry on the planchet and dry on a hotplate.

6.1.21 Proceed to step 6.1.35.

Activity of Soil, Sludge or Solids Separated from Water Samples- Leaching Method

- 6.1.22 Dry the soil, sludge or solids separated from water samples in an oven at 105°C. Record the initial weight and dry weight of the samples on the % Moisture Worksheet and the volume of sample filtered if applicable.
- 6.1.23 Transfer a weighed aliquot (5-10g) of the dried sample (or the sample and filter if filtered sample) to a 250-ml beaker. Record the sample quantity used on the worksheet.
- 6.1.24 Ash the sample for 2 hours in a muffle furnace pre-adjusted to 500°C (don't exceed 500°C).
- 6.1.25 Acidify the ashed solids by slowly adding 50ml of 8 M HNO₃ to the beaker, while allowing sufficient time for any foaming to subside.
- 6.1.26 Place the beaker on a hotplate pre-adjusted to heat water in a beaker to 90-95°C. Digest the sample below the boiling point (90-95°C) for one hour, with frequent stirring.
- 6.1.27 If there are no visible undissolved solids in the sample, transfer the solution to a 100ml volumetric flask. Rinse the beaker with two 10 ml portions of 8M HNO₃ and one 10ml portion of reagent water, transferring the rinses to the volumetric flask. Allow the solution to cool and dilute to the mark with reagent water.
- 6.1.28 For samples containing visible undissolved residue, transfer the sample solution to a 100ml plastic centrifuge tube. Centrifuge for 10 minutes at 1500 rpm. Decant the liquid into a 250ml volumetric flask and retain.
- 6.1.29 Rinse the residue from the centrifuge tube back into the original 250 ml beaker with approximately 50ml of 8M HNO₃. Return the beaker to the hot plate and further digest the residue for 30 minutes with frequent swirling.

- 6.1.30 Repeat step 6.1.28 using the same centrifuge tube. Wash the residue in the tube with 20ml of 8M HNO₃ followed by washes with 20ml of water, centrifuging and decanting each wash solution into the volumetric flask. Fill flask to mark with water.
- 6.1.31 Transfer one ml of the leachate from the volumetric flask onto a tared planchet. dry on a hotplate, reweigh and determine the residue weight. Calculate the volume of leachate which will give approximately 100mg of residue.
- 6.1.32 Transfer the leachate volume determined above to a beaker and evaporate to near dryness. Determine the quantity of sample being measured as follows and record on worksheet.

$$ALQT\ VOL(g) = \frac{\text{Initial sample (6.1.23)}}{\text{Volumetric Flask Vol.}} * \text{Leachate Volume Used (6.1.32)}$$

- 6.1.33 Add 5ml of 0.1N HNO₃ to the beaker, warm and swirl to dissolve residue and transfer the residue to a marked and preweighed planchet on a hotplate.
- 6.1.34 Add 1.0ml of diluted colloidal silicon oxide dispersion to the planchet. Evaporate the solution to dryness at a temperature below the boiling point to avoid spattering.
- 6.1.35 Dry the residue in an oven at 105°C for one hour.
- 6.1.36 If residue adheres well to planchet, cool in a desiccator to room temperature. If sample particles don't adhere to planchet, cover residue with a few drops of clear acrylic solution and dry in an oven at 105°C for one hour. Cool in a desiccator.
- 6.1.37 Weigh the planchet and record on the worksheet. Immediately after weighing, transfer planchet back to a desiccator until samples are counted.

- 6.1.38 Enter the sample data into the spreadsheet and have the data approved prior to submitting the samples for counting.
- 6.1.39 Leave the samples in the appropriate place for samples requiring counting. Leave the original worksheet and a printout of the data, that was put into the spreadsheet, with the samples.

Activity of Air Filters

- 6.1.40 Put a dot of glue or double-sided tape in the center of a planchet. Place the filter inlet (darkened) side up into the planchet. Record the sample quantity on the worksheet.
- 6.1.41 Enter the sample data into the spreadsheet and have the data approved prior to submitting the samples for counting.

Note Air filters should not be submitted for counting until at least three days after the sample collection date. This delay permits the decay of radon and thoron progeny.

- 6.1.42 Leave the sample in the appropriate place for samples requiring counting. Leave the original worksheet and a printout of the data, that was put into the spreadsheet, with the samples.

6.2 SAMPLE COUNTING

- 6.2.1 Count the samples according to LAL-91-SOP-0078, Calibration, Maintenance and Operation of the Tennelec LB-4000 α/β counting system or LAL-91-SOP-0079, Calibration, Maintenance and Operation of the Tennelec LB-5500 α/β counting system.

6.3 STANDARDS

- 6.3.1 A minimum of one Laboratory Control Sample must be run with each batch of samples. Prepare the LCS using 100 mL of reagent-grade water and add 2-15 pCi of AM-241 for the alpha and 2-12 pCi of Sr-90 in equilibrium with Y-90 for the beta. The minimum frequency of LCS shall be 5%.

6.4 BLANKS

- 6.4.1 For each batch of samples a blank consisting of 100 mL of reagent-grade water must to be analyzed. The minimum frequency of blanks shall be 5%.

6.5 REPLICATES

- 6.5.1 For each batch of samples at least one replicate must be analyzed. The minimum frequency of replicates is 10%.

6.6 CALIBRATION

- 6.6.1 The calibration standards must be prepared as described in section 5.3.
- 6.6.2 The calibration of efficiency and attenuation curves will be performed using the instrument operating and calibration procedures for the individual instruments.

6.7 CALCULATIONS

6.7.1 Gross Alpha Calculation

$$\alpha \text{ (pCi/g)} = \frac{C_{\alpha G} - C_{\alpha B}}{2.22 \cdot E \cdot Q}$$

Where:

- $C_{\alpha G}$ = gross alpha counts per minute
- $C_{\alpha B}$ = background alpha counts per minute
- 2.22 = conversion factor to pCi
- E = efficiency from efficiency curve
- Q = sample quantity in grams

6.7.2 Gross Beta Calculation

$$\beta \text{ (pCi/g)} = \frac{\frac{(C_{\beta G} - [(C_{\alpha G} - C_{\alpha B}) \cdot X])}{T_s} - \text{CPM}_{\beta B}}{2.22 \cdot E \cdot Q}$$

Where:

- $C_{\alpha G}$ = gross alpha counts
- $C_{\beta B}$ = gross beta counts
- $C_{\alpha B}$ = background alpha counts
- $\text{CPM}_{\beta B}$ = background beta counts per minutes
- 2.22 = conversion factor to pCi
- E = efficiency from efficiency curve
- Q = quantity in grams
- T_s = sample count time in minutes
- X = alpha into beta crosstalk from curve

6.7.3 Minimum Detectable Activity (MDA)

$$MDA(pCi/g) = \frac{4.65 \cdot \sqrt{B} + (2.71)}{2.22 \cdot E \cdot Q \cdot T_s}$$

Where:

- 4.65 = a statistical factor ($2\sqrt{2k}$ at the 95% confidence level)
- T_s = count time of sample
- 2.22 = conversion factor to pCi
- E = efficiency from efficiency curve
- Q = quantity in grams
- B = background gross counts

6.7.5 Counting Error (CE) at the 95% confidence level

$$CE(pCi/g) = 1.96 \cdot \frac{\sqrt{\frac{C_s}{T_s^2} + \frac{C_b}{T_b^2}}}{2.22 \cdot Q \cdot V}$$

Where:

- C_s = gross counts of the sample
- T_s = count time of the sample
- C_b = gross counts of the background
- T_b = count time of the background
- 2.22 = conversion factor to pCi
- E = efficiency from efficiency curve
- Q = quantity grams

7.0 QC REQUIREMENTS

7.1 CONTINUING CALIBRATION VERIFICATION

- 7.1.1 Instrument background will be verified once a week per the applicable instrument operation procedure. The limits are incorporated in the instrument operating procedure.
- 7.1.2 Instrument check standard response will be verified once a week per the applicable instrument operation procedure.

7.2 METHOD BLANKS

- 7.2.1 The activity of the constituent of interest in the method blank must be less than the RDL or less than the MDA. The minimum frequency of reagent blanks is 5%.

7.3 DUPLICATES

- 7.3.1 The duplicates will be analyzed using a similar sized aliquot and same count time as the original sample. The minimum frequency of duplicates is 10%.
- 7.3.2 Duplicate data will be evaluated using the customer required criterion. The following criteria have been specified by various customers to date.

7.3.2.1 Relative Percent Difference (RPD)

$$RPD = \frac{S - R}{\left(\frac{S + R}{2} \right)} * 100\%$$

Where:

S = Sample Result
R = Replicate Result

The RPD shall be less than 30% for samples with activity greater than ten times the MDA.

7.3.2.2 Relative Error Ratio (RER)

$$RER = \frac{R - S}{STD_R + STD_S}$$

Where:

S = Sample Result

R = Replicate Result

STD_s = Standard Deviation of the Sample Result at the 95% confidence level (2σ)

STD_R = Two Sigma Standard Deviation of the Replicate Result at the 95% confidence level (2σ)

The RER must be less than 1.

7.3.2.3 Weighted Average

The weighted average \bar{x} for duplicates is calculated as follows:

$$\bar{x} = \frac{S + w \cdot R}{1 + w}$$

Where:

S = Sample Result

R = Replicate Result

$$w = \left[\frac{\sigma_S}{\sigma_R} \right]^2$$

The standard deviation of the weighted average $\sigma_{\bar{x}}$ is calculated as follows:

$$\sigma_{\bar{x}} = \sqrt{\frac{\sigma_S^2 + W^2 * \sigma_R^2}{(W + 1)^2}}$$

Where:

$$W = \left[\frac{\sigma_S}{\sigma_R} \right]^2$$

σ_S = The standard deviation of the sample result.

σ_R = The standard deviation of the replicate result.

The sample and replicate results must be within 3 sigma of the weighted average.

7.4 LABORATORY CONTROL SAMPLES

- 7.4.1 Unless set by customer requirements, LCS control limit will be set at 3 standard deviations and have a relative percent difference of less than 30 %.

7.5 MATRIX SPIKE AND MATRIX DUPLICATES

The use of a matrix spike (MS) for this procedure is not recommended and would not be applicable for some types of samples.

In some cases a MS can be used to meet customer requirements. AM-241 will be used for the gross alpha and Sr-90 for the gross beta. The acceptable requirements will vary with the technique used and customer requirements.

8.0 CORRECTIVE ACTION

8.1 INSTRUMENT OUT OF CONTROL

If the counting instrument background or instrument check standard is out of control limits, no samples will be counted using the instrument until the problem is identified and the instrument is brought back into control using the instrument operating procedure.

8.2 QUALITY CONTROL SAMPLE (QCS) OUT OF CONTROL

If the Method Blank (MBB) or Laboratory Control Sample (LCS) is out of control, the problem will be determined and the method brought back into control. The samples analyzed with the out of control QCS will be repeated unless the client requests that the data be reported and tagged as being out of control. If there is insufficient sample for the analysis to be repeated, the data will be tagged as being out of control. A narrative of the out of control data and reason for the out of control situation will be prepared and attached to the analysis batch work sheet.

8.3 DUPLICATE SAMPLE OUT OF CONTROL

If the Duplicate (DUP) sample is out of control, the matrix homogeneity will be taken into account as to whether to repeat the analysis. If the sample is homogeneous and the DUP is out of control, the analysis will be repeated. If the sample is inhomogeneous and the DUP is out of control, the analysis will be repeated once. If the DUP is still out of control, all of the results will be reported and the customer notified that a representative sub-sample of the submitted sample cannot be obtained for analysis. A narrative of the out of control data and reason for the out of control situation will be prepared and attached to the analysis batch work sheet.

9.0 DOCUMENTATION REQUIREMENTS

On the Gross Alpha/Beta Analysis Sample Preparation Worksheet record all of the required data.

Upon completion of the worksheet enter the data into the spreadsheet and print one copy. Sign the worksheet. After the supervisor approves the data, copy the worksheet. Place the copy in the Gross Alpha/Beta binder. Attach the original to the raw data and submit to the counting room with samples.

After counting, the calculation sheet will be printed and signed by the counting room analyst. The entire package is then included in the appropriate data reporting packages(s).

10.0 REFERENCES

- 10.1 RADIOCHEMICAL ANALYTICAL PROCEDURES FOR ANALYSIS OF ENVIRONMENTAL SAMPLES, MARCH 1979. EMSL-LV-0539-17.
- 10.2 PRESCRIBED PROCEDURES FOR MEASUREMENT OF RADIOACTIVITY IN DRINKING WATER, AUGUST 1980. METHOD 900, EPA-600/4-80-032.
- 10.3 RADIOCHEMICAL DETERMINATION OF GROSS ALPHA AND GROSS BETA PARTICLE ACTIVITY IN WATER, 1984. METHOD 00-01, EPA 520/5-84-006.
- 10.4 OHS MSDS #OHS16550 for all chemicals use in this procedure.
- 10.5 STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTE WATER, 17th Edition. METHOD 7110B.

May 4, 1995

Advanced Medical Systems, Inc.
ATTN: David Cesar
Treasurer
121 North Eagle Street
Geneva, OH 44041

Dear Mr. Cesar:

Pursuant to your request in letter dated April 27, 1995, you are hereby granted an additional 30 days in which to respond to our letter of March 30, 1995. We will expect a response no later than May 30, 1995.

If you have any questions, please feel free to contact Kevin Null of my staff at (/08) 829-9854.

Sincerely,

Original Signed By
John Madera, Chief
Nuclear Materials Licensing Section

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Northeast Ohio Regional Sewer District

3826 Euclid Avenue • Cleveland, Ohio 44115-2504

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FAX: 216 • 881 • 9709

May 4, 1995

Mr. John Madera
U. S. Nuclear Regulatory Commission
Region III
901 Warrenville Road
Lisle, Illinois 60532-4351

Re: Advanced Medical Systems, Inc. Emergency Plan

Dear Mr. Madera:

Confirming our discussion on the telephone today, it does not appear that as of this date the Northeast Ohio Regional Sewer District ("District") has received a copy of the proposed emergency plan from Advanced Medical Systems, Inc. As we also discussed, I will let you know when the District actually does receive the subject plan.

Sincerely,

Lawrence K. English
Assistant General Counsel

cc: Erwin Odeal
Richard Connelly
William Schatz
Sara Fagnilli
Thomas Lenhart

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RECEIVED

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REGION III