UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

February 2, 1995

NOTICE OF SIGNIFICANT LICENSEE MEETING

Name of Licensee: Advanced Medical Systems, Inc.

Docket No.: 030-16055

License No.: 34-19089-01

Enforcement Action No.: N/A

Date and Time of Meeting: Monday, February 6, 1995
1:00 p.m. (CST)

Location of Meeting: U.S. Nuclear Regulatory Commission
Region III Office
Lisle, IL 60532-4351

Purpose of Meeting: Management meeting to discuss findings identified during recent special inspections and the licensee's proposed corrective actions including plans for dealing with contaminated sewage pipelines.

NRC Attendees:
W. L. Axelson, Director, Division of Radiation Safety & Safeguards
J. A. Grobe, Chief, Nuclear Materials Inspection Section 2
B. A. Berson, Counsel, Region III
W. J. Slawinski, Radiation Specialist
Representatives of Nuclear Materials Safety & Safeguards

Licensee Attendees:
S. S. Stein, President
D. Miller, Counsel,
H. Billingsley, Counsel
C. Berger, Certified Health Physicist

NOTE: Participation by NRC personnel at the Region III Management Meeting should be made known by 4:00 p.m. (CST), Friday, February 3, 1995, via a telephone call to Wayne Slawinski, Region III, (708) 829-9824.

Approved By: John A. Grobe
John A. Grobe, Chief
Nuclear Materials Inspection Section 2

See Attached Distribution

B/41

Distribution
J. Milhoan, Deputy Executive Director for Nuclear Reactor Regulation, Regional Operations, and Research, EDO
H. Thompson, Deputy Executive Director for Nuclear Materials Safety, Safeguards and Operations Support, EDO
J. Lieberman, Director, Office of Enforcement
J. Goldberg, Deputy Assistant General Counsel for Enforcement, Office of the General Counsel
R. Bernero, Director, Office of Nuclear Material Safety and Safeguards
C. J. Paperiello, Director, Division of Industrial and Medical Nuclear Safety, NMSS
J. Glenn, Chief, Medical, Academic and Commercial Use Safety Branch, NMSS

February 2, 1995

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

Dear Mr. Cesar:

This confirms our plans to conduct a management meeting with you at 1:00 p.m. (CST) on February 6, 1995, in the NRC Region III Office, 801 Warrenville Road, Lisle, IL. The meeting will be transcribed and will be open to public observation. The purpose of our meeting is to discuss:

- The findings of the special inspection documented in our report sent to you on November 7, 1994 (Inspection Report No. 030-16055/93003(DRSS))
- The findings of the special inspection documented in our report sent to you on December 6, 1994 (Inspection Report No, 030-16055/94003(DRSS))
- Your responses dated December 28, 1994, and January 26 and 27, 1995, to our Confirmatory Action Letter (CAL) No. RIII-94-08 issued December 15, 1994, and CAL No. RIII-94-08 (Revision 1) issued February 1, 1995.

Regarding the findings of the inspections, this meeting provides you the opportunity to point out any errors in our inspection reports and present any actions you plan or have taken regarding the findings of those inspections. Regarding your response to the CAL, we have several questions about the actions you have proposed.

We will gladly discuss any questions you may have concerning this meeting

Sincerely,

Original Signed by John A. Grobe

John A. Grobe, Chief
Nuclear Materials Inspection Section 2

License No. 34-19089-01
Docket No. 030-16055

See Attached Distribution

B142

DOCUMENT NAME: G:\LTRS2LIC\MTLS\030\95316055.L08

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	RIII	C	RIII		RIII	C		
NAME	Slawinski:dp		Berson		Grobe			
DATE	02/2/95		02/2/95		02/2/95			

9502100030 2PP.

2/2/95

BLAHA INPUT

Advanced Medical Systems, Inc. (AMS)

Safety assessment of the AMS facility ground water problems continues with NMSS hydrogeology and structural engineering support to Region III health physics staff. On site inspection of environmental radiological safety, licensee ground water studies and facility structural integrity are being conducted this week. A public meeting will be conducted on February 6, 1995, to review recent inspection findings and licensee plans for resolution of facility problems. Filter/demineralization of contaminated water in and around the basement will begin within the next two weeks. The Commissioner's Assistants were briefed on the facility status on January 30, 1995. Region III staff will continue to monitor licensee progress.

IEM
Integrated Environmental Management, Inc.

9040 Executive Park Drive, Suite 205
P.O. Box 50785
Knoxville, TN 37950-0785
Phone: (615) 531-9140
FAX: (615) 531-9130

1680 East Gude Drive, Suite 305
Rockville, MD 20850
Phone: (301) 762-0502
FAX: (301) 762-0638

February 2, 1995

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

Re: Treatment of Water at the London Road Facility (License No. 34-19089-01)

Dear Mr. Grobe:

As follow-up to your letter dated February 1, 1995, AMS is preparing to process and discharge waste water as early as the week of February 6, 1995. Diversified Technologies Services, Inc. (DTS) of Knoxville, Tennessee, has been contracted to provide treatment services. Attachment 1 contains a listing of similar projects and experience by DTS for your review.

DTS will implement a system of multi-stage filtration and pressure vessels for application of ion exchange/activated carbon process media. If required, the same type of cobalt-selective ion exchanger applied at nuclear power plants for cleanup of cobalt-bearing liquid waste will be utilized. Attachment 2 contains the water processing protocols that will be followed by DTS.

Processed water will be stored in above-ground storage tanks. Samples will be collected from the tanks by the procedure shown in Attachment 3. The samples will 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 (see Attachment 4). 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 (see Attachment 5).

Once the analytical results have been received and validated, water in the storage tanks that meets the release criteria described in your February 1st letter (e.g., consistent with Information Notice 94-07, "Solubility Criteria for Liquid Effluent Release to Sanitary Sewerage Under the Revised 10 CFR Part 20") will be discharged into the local sewerage system. Water that does not meet the release criteria will be re-processed.

B144

~~9502130083 1PP~~

Because of the need for continuous radiological surveillance services, as well as coordination of the pumping, treatment, sampling, and discharge activities, an on-site project manager, Mr. Allen Duff, NRRPT (AWK Consulting Engineers, Inc. of Knoxville, Tennessee), has been contracted. Attachment 6 contains a listing of similar projects managed by Mr. Duff for your review.

Please forward your written approval of these procedures to Dwight Miller, Esq., Stavole & Miller, 55 Public Square, 1604 Illuminating Building, Cleveland, Ohio, 44113. However, feel free to contact me at (301) 762-0502 if you have any questions or if I can provide you with additional information. Thank you in advance for your assistance and your prompt attention to this matter. I am looking forward to timely and successful completion of this project.

Sincerely,

Carol D. Berger

Carol D. Berger, C.H.P.

cc: D. A. Miller, Esq.
D. Cesar
B. A. Kelly, C.H.P., P.E.
File 94009

ATTACHMENT 1 - DTS PROJECT EXPERIENCE

DTS - Diversified Technologies Services, Inc.
2680 Westcott Blvd. Knoxville, TN 37931 615-539-9000 / Fax 615-539-9001

PROJECTS & EXPERIENCE

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
DEMINERALIZATION - DEWATERING - CHROMATE REMOVAL			
Public Service Electric & Gas Co. Salem Station	Mr. Ron Werline Radwaste Engineer 609-339-2685	Liquid radwaste processing services; manpower, equipment and media to process Plant LRW stream	4/91 - 4/97
		Portable system, services for chemical adjustment of PWST	11/91 - 3/92
Omaha Public Power District Fort Calhoun Station	Mr. Joe Mattice Radwaste Operations 402-533-7195	Liquid radwaste processing services; manpower, equipment and media to process Plant LRW stream	9/91 - 5/96
GPU Nuclear Corporation Oyster Creek, TMI-I and Saxton Stations	Mr. Lee Beatlys Materials Management 201-316-7331	On-demand filtration, demineralization, and dewatering services	9/91 - 12/92
Maine Yankee Atomic Power Company	Mr. Adam Mancini Radwaste Coordinator 207-882-5723	Purchase of High Velocity Vacuum (HVV™) Dewatering System	12/91
Wolf Creek Nuclear Operating Corp.	Mr. Johnny Freeman Supv., RW Operations 316-364-8831 x4422	Lease of portable demineralization system with removable-core, corrosion-resistant vessels	9/92 - 6/95
TU Electric Company Comanche Peak SES	Ms. Lisa Hughes Operations RW Supv. 817-897-0295	Liquid radwaste processing services; manpower, equipment and media to process Plant LRW stream	7/92 - 1/96
		Special portable demin skid for aux. sump cleanup	10/93 - 9/94
		Special demin/bag filter system to treat secondary plant effluents and remove suspended solids, oil and grease before release to environment	12/94 - 1/96
Pacific Gas & Electric Diablo Canyon 1 & 2	Mr. Clint Miller Consulting RW Engineer 805-545-4582	On-demand liquid radwaste filtration and demineralization services	2/93 - 12/93

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
Long Island Power Authority Shoreham Station	Mr. Tom Jernigan Project Engineer 516-929-8300 x3222	Temporary Spent Fuel Pool Cleanup Demineralizer System w. 50 cf process vessel and media	3/93
		Mobile LRW Filter/Demineralizer Unit w. 30 cf process vessel, duplex mechanical pre-filters, and media	4/93
Entergy Operations, Inc. Arkansas Nuclear One Units 1 & 2	Mr. Mike Frala Supv., Nuclear Chemistry 501-964-5822	Liquid radwaste processing services; manpower, equipment and media to process Plant LRW stream	5/93 - 12/95
	Mr. Bill McKelvy Radchem Supervisor 501-964-5822	Equipment and personnel for chemical adjustment and cleanup of sodium hydroxide release	12/93 5/94
U.S. Department of Energy West Valley Nuclear Services	Mr. Phil Winger Project Engineer 716-942-4456	Lease/purchase of 2 skid-mounted 2-vessel ion exchange units and media for groundwater cleanup	5/94 - 1/95
U.S. Department of Energy Brookhaven National Laboratory	Mr. Pete Kwaschyn Supervising Engineer 516-282-4235	Portable skid-mounted ion exchange unit, media and personnel for batch processing of radioactive liquid waste	8/94 - Ongoing
Pacific Gas & Electric Diablo Canyon 1 & 2	Mr. Wendell Davenport Project Coordinator 805-545-6938	Labor, materials to remove chromates from ICW, CCW, SCW and Diesel Generator Jacket Cooling Systems, dewater and package expended resins, re-apply potassium molybdate	4/91 - 12/91
ALARON Corporation at Argonne National Laboratory	Mr. Greg Garlock Project Manager 708-972-0690	Portable demineralizer system for use in ALARON Project	1/95 - 5/95

UNDERWATER FILTRATION

GPU Nuclear Corporation Oyster Creek	Mr. Gus Spivak Corporate Engineering 201-316-7126	Equipment and manpower to operate, maintain temporary underwater Reactor Water Cleanup Filtration System in support of 13R outage	2/91 - 5/91
Houston Lighting & Power Co. South Texas Project	Mr. Tim Powell RadPro Supervisor 512-972-3611 x7875	Lease of UF-600 for fuel pool cleanup	2/91 - 3/91

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
Indiana & Michigan Power Co. D.C. Cook	Mr. John Fryer General Supervisor, Rad. Mail's Control 616-465-5901 x1333	Lease/purchase of UF-600 for filtration in support of refueling outage, w. UF-powered skimmer to remove floating debris and minimize hot particles	3/92
		Purchase of UF-600 for use in refueling outage	1/94
Maine Yankee Atomic Power Company	Mr. John Card RX Engineering 207-882-5159	Purchase of UF-600 to filter and vacuum in fuel pool, maintain water clarity in cavity during refueling	11/91
	Mr. Rick Peacock Engineering 207-882-6321	Standby lease of UF-600/2S for use in refueling cavity pool during Plant thermal shield repairs	8/93 - 9/93
Niagara Mohawk Power Co. Nine Mile Point Unit 2	Mr. Scott Stefanco Buyer 315-349-7935	Purchase of UF-600 to maintain water clarity and vacuum cavity internals in support of refueling outage	3/92
South Caroline Electric & Gas Co. V.C. Summer Station	Mr. Gary Guy RW Process Coordinator 803-345-4323	Lease of UF-600 for fuel pool cleanup	10/91 - 12/91
General Electric Nuclear Energy for Tokai Outage Project (Japan)	Mr. S. L. Stein Buyer 408-925-2340	Purchase of dual-train, 250 gpm, pressurized underwater filtration system	6/92
PCI Energy Services for Yankee Rowe	Mr. Jim Jesko Project Engineer 708-680-8100	Purchase of 2 UF-600/2S Underwater Filters w. vacuum capabilities and slag tank to support decommissioning	5/93
Yankee Atomic Electric Company Yankee Rowe	Mr. Bernie Jwaszewski Systems Engineer 508-779-6711 x2857	UF-100/1S and Mechanical Filter for decontamination support during plasma cutting in RX cavity	5/94 - Ongoing
		UF-600 for decontamination support during plasma cutting in RX cavity	4/94 - Ongoing
Centerior Service Company Perry Nuclear Power Plant	Mr. Perry Moskowitz Operations 216-259-3737 x5307	Pool skimmer for Torus cleanup	3/94

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
SOLIDIFICATION / ENCAPSULATION / STABILIZATION			
Commonwealth Edison Company Dresden Station	Mr. Roger Stobert Operations Manager 312-294-2920 x2827	Polymer solidification of concentrated liquid decon solution, in situ polymer solidification of spent ion-exchange resin	12/90 - 12/92
South Carolina Electric & Gas Co. V.C. Summer Station	Mr. Gary Guy RW Process Coordinator 803-345-4323	Dewatering and VERI™ solidification of chelant-containing resins from LOMI decon of fuel assembly	11/91 - 12/91
Westinghouse Electric Corporation Naval Reactors Facility	Mr. Clay Hess Project Engineer 208-535-5280	Testing and full-scale demonstration of polymer solidification to stabilize radioactive zircaloy swarf underwater to mitigate fire hazard - followed by delivery of complete system to process radioactive swarf	10/91 - Ongoing
Pacific Gas & Electric *Diablo Canyon 1 & 2*	Mr. Clint Miller Consulting RW Engineer 805-545-4582	Resin solidification and filter encapsulation using VERI™ process	12/92 - Ongoing
U.S. Department of Energy EG&G Idaho, Inc. Idaho Nat'l Engineering Lab	Mr. Dave Tyson Project Engineer 208-526-5443	55-gallon drum VERI™ Solidification System for encapsulation of hazardous materials, including circuit boards, cadmium and lead	5/93
U.S. Department of Energy Princeton Plasma Physics Laboratory	Mr. Mike Karl Subcontract Administrator 609-243-2076	On-demand solidification of initiated liquids for disposal at Westinghouse Hanford	5/94 - 12/95
U.S. Department of Energy Knolls Atomic Power Laboratory	Mr. Jim McCafferty Buyer 518-395-6083	Testing to demonstrate VERI™ solidification of KAPL-supplied ion exchange resin and charcoal media	8/94 - Ongoing
U.S. Department of Energy Westinghouse Savannah River	Mr. K.Vann Anderson Procure. Administrator 803-644-1395	Treatment of silver-coated packing material and aqueous mercury and lead by VES encapsulation to meet land disposal restrictions	8/94 - 2/95
SOCODEI, France (subsidiary of Electricite de France)	Mr. Robert Thivet Technical Manager (1)34 32 36 36	Supply of vinyl ester solidification materials	3/94

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
REVERSE OSMOSIS			
Alabama Power Company Farley Station Units 1 & 2	Mr. Jack Kale Chem/Envir. Manager 205-899-5156 x4271	RO and microfiltration equipment and personnel to remove colloidal and dissolved silica and recover boron from 1M gallons of water in two RWSTs	11/91 - 8/92
Pacific Gas & Electric Diablo Canyon 1 & 2	Mr. Clint Miller Consulting RW Engineer 805-545 4582	On-demand reverse osmosis services	2/93 - 2/94
MEDIA			
U.S. Department of Energy Westinghouse Savannah River Savannah River Site	Ms. Deborah Robinson Buyer 803-644-1320	Carbon-based process media for organic removal in Effluent Treatment Facility	9/91
Pacific Gas & Electric Diablo Canyon	Mr. Clint Miller Consulting RW Engineer 805-545-4582	DT-80 cobalt-specific ion-exchange media	11/91
Maine Yankee Atomic Power Company	Mr. Steve Pratte Systems Ops Specialist 207-882-5730	Organic and cesium-specific ion-exchange media	11/91
New York Power Authority Indian Point 3	Mr. John LePere Waste Mgmt. Supt. 914-736-8472	DT-30 cesium-specific ion-exchange media	9/91
Virginia Power North Anna Station and Surry Station	Mr. Pete Hensley Ops Coordinator 703-894-2774	Anion, cation and lithiated mixed bed resin, anion and cation powdered resins for use in Plant and vendor-supplied systems	6/90 - 4/95
Niagara Mohawk Power Co. Nine Mile Point Unit 2	Mr. Oscar Henderson Supervisor, RW Ops 315-349-4227	Imbiber Beads for scavenging and immobilization of oily waste	6/90
Wolf Creek Nuclear Operating Corp.	Mr. Johnny Freeman Supv., RW Operations 316-364-8831 x4422	Organic processing media for use in WPS™ demin system	4/93 - Ongoing
U.S. Department of Energy West Valley Nuclear Services	Mr. Steve Reeves Senior Engineer 716-942-4588	Organic and cesium-selective ion-exchangers for use in DTS-supplied submerged water treatment system	3/93 - Ongoing
SA International Co. for Korea Atomic Energy Research Institute (KAERI)	Mr. Chan Sung President 714-731-4048	Carbon, DT-30 Cs-specific process media, and DT-90 Co-specific process media for liquid radwaste processing	7/94

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
EQUIPMENT DESIGN - REPLACEMENT - SALE			
U.S. Department of Energy West Valley Nuclear Services	Mr. Steve Reeves Senior Engineer 716-942-4588	Permanently-installed submerged water treatment system - demineralizer and underwater filter	8/91 - 8/93
Florida Power Corporation Crystal River	Ms. Phyllis Dixon Project Engineer 904-795-6486 x4512	Safety-related, corrosion-resistant ion-exchange vessel and resin strainer	9/91
		Chemical Addition Station	12/92
Maine Yankee Atomic Power Company	Mr. Steve Pratte Systems Ops Specialist 207-882-6760	Corrosion-resistant 60 cf PreCondition-ing Filter (PCF™) to replace vendor-supplied equipment	4/92
	Mr. Paul Plante Senior Engineer 207-882-5808	Design, construction of portable demin system in 40 ft trailer for use in desludging and dechromating ops	7/93
PCI Energy Services for Long Island Power Authority Shoreham Station	Mr. Dan Hirsch, P.E. Project Manager 706-680-8100	Design and fabrication of underwater filter and underwater demineralizer for use in conjunction with plasma cutting in reactor vessel	4/92
South Carolina Electric & Gas V. C. Summer Station	Mr. Gary Guy RW Process Coordinator 803-345-4323	Corrosion-resistant liquid radwaste process vessels to replace vendor-supplied equipment	2/92
Virginia Power North Anna Station	Mr. Pete Hensley Ops Coordinator 703-894-2774	30 cf and 60 cf corrosion-resistant liquid radwaste process vessels to replace vendor-supplied equipment	7/92
Omaha Public Power District Fort Calhoun Station	Mr. Joe Mattice Radwaste Operations 402-533-7195	Short-coupled lifting device for On-Site Storage Containers	12/92
TU Electric Company Comanche Peak SES	Mr. Jeff Edwards Operations RW Supv. 817-897-0635	100 gpm Bag Filter (with shield) to remove high levels of particulate from Plant waste stream	12/92
	Ms. Lisa Hughes Operations RW Supv. 817-897-0295	Purchase of second bag filter with shield	8/94
Public Service Electric & Gas Co. Salem Station	Mr. Gerald Dziuba Chemistry Department 609-339-2668	Skid-mounted 30 cf demin vessel w. fittings & instrumentation for chemical adjustment of CC and PWST systems	3/93

COMPANY & PLANT	CONTACT	DESCRIPTION	DURATION
General Electric Nuclear Energy for Laguna Verde Project (Mexico)	Mr. Wayne Hatton Project Manager 408-925-4324	Lease of Filter Consolidator and Accumulator	12/93-7/94
for Various GE Projects		Underwater dose rate monitoring systems in support of GE outage projects	9/92 - Ongoing
RUST Federal Services (for use at Brookhaven Nat'l Lab)	Mr. Stan Hodges Project Manager 803-779-3293	Lease of cask/shield system for use in source surveys and characterization	6/94 - Ongoing
Yankee Atomic Electric Co. Yankee Rowe	Mr. Bill Jones Project Manager 508-779-6711	Lease of specially-modified Filter Consolidator for CRP Internals Segmentation Project	12/93 - Ongoing
	Mr. Bernie Jwaszewski Systems Engineer 508-779-6711 x2857	Two UD-38A Underwater Demineralizer Vessels for decontamination support during plasma cutting in RX cavity	2/94 - Ongoing

1-03-95

ATTACHMENT 2 - WATER PROCESSING PROTOCOLS

GENERAL OPERATING PROCEDURE
MFIX-01
MOBILE FILTRATION/IX SYSTEM OPERATIONS

INFORMATION COPY

Issued To:

Ms. Carol Berger
Integrated Environmental
Management, Inc.
Suite 205
9040 Executive Pk Dr
Knoxville, TN 37923

Transmittal Date:

February 2, 1995

Prepared by:

DIVERSIFIED TECHNOLOGY SERVICES
2680 WESTCOTT BLVD
KNOXVILLE, TN 37931

Services	[signature]	2/2/95	Purchasing		
Technical			Administration		
Engineering			Quality Assurance		
Rev:0	6 Pages				2/2/95

A 502130088 ???

GENERAL OPERATING PROCEDURE MFIX-01 MOBILE FILTRATION/IX SYSTEM OPERATIONS

1.0 SCOPE

1.1 PURPOSE

The purpose of this procedure is to provide detailed instructions for the safe and efficient use of Diversified Technologies (DT) Mobile Filtration/IX (MFIX) System.

1.2 APPLICABILITY

This procedure will normally be used by a Diversified Representative trained and qualified in accordance with Diversified's current QIP 20-09, Operator Training Procedure.

2.0 REFERENCE

2.1 Diversified Technologies Contract File; Site Contract.

3.0 REQUIREMENTS

3.1 Prerequisites

3.1.1 This procedure will be read in its entirety before proceeding with the next step.

3.1.2 The Utility will designate a Representative(s) to interface with DT personnel.

3.2 Utilities Requirements.

3.2.1 Waste feed of sufficient volume and pressure to supply LRW to system.

3.2.2 Service Water (SW) - 30-50 GPM at 90 PSI. Plant demineralized (DI) water is preferred.

3.2.3 Service Air (SA) - 40 SCFM at 90 PSI. Unfiltered air containing minimal water is desirable.

3.3 Safeguards

3.3.1 NOTIFY Utility Rep to prior to any logic or system changes.

3.3.2 All Cam-lock connections must be safety-tied or wrapped prior to pressurization of any system component(s).

3.3.3 As a minimum, eye protection will be worn while working within three feet of any pressurized system component.

3.3.4 Higher than background radiation levels may be encountered. Normal ALARA (As Low As Reasonably Achievable) procedures and safeguards should be practiced.

3.3.5 Do not connect or disconnect any portable lines during system operation.

3.3.6 Do not break any pressure point without first verifying absence of pressure indicated on any pressure gauge(s) not isolated from the pressure point being broken.

3.4 Attachment Lists

3.4.1 DT-95-001, Rev. 0, Mobile Filtration/"IX" System P&ID Drawing.

3.4.2 MFIX-VCL, Valve Check List, Rev. 0.

4.0 OPERATING PROCEDURES

4.1 System operations

4.1.1 NOTIFY Utility Representative for verbal permission to process waste water.

4.1.2 OPEN inlet valve DT1 and outlet valve DT11.

4.1.3 NOTIFY Radwaste Operator that the MFIX is ready for processing and that the waste holdup tank can be aligned and the Plant's LRW Feed Pump started.

4.1.4 START AOD Pump by throttling open DT23 and verify pressure increase on all non-isolated pressure gauges.

4.1.5 When flow is established, log the flow rate and the pressure drop across the filters and vessel.

4.1.6 When processing is completed, SECURE the AOD pump by closing DT23.

4.1.7 When flow has stopped and pressure is relieved, CLOSE DT1 & DT11.

4.2 Media Sluicing: When the pressure drop becomes excessive resulting in an inadequate flow rate or the ion exchange capacity of the bed is depleted, the entire vessel may be sluiced.

4.2.1 VERIFY DT1 & DT11 are closed.

4.2.2 ATTACH Service Water (SW) to Top Sparger Quick-Connect (QC) located on the PV.

4.2.3 ATTACH Service Air to the connection at DT14 on the Influent Manifold.

4.2.4 BYPASS the filters by CLOSING DT2, DT4, DT5, and DT7. OPEN DT3 and DT6.

4.2.5 ATTACH the sluice hose from the fitting on DT12 to the spent resin receiving container or tank.

4.2.6 OPEN DT12 and DT24.

4.2.7 Start flow of SW from supply line through the Sparger. This will initiate the sluice through DT12 and into the spent resin container.

4.2.8 When media flow is established for five minutes, SECURE the Service Water and CYCLE DT14 open and closed to introduce SA to the vessel inlet through the CM for two minutes.

4.2.9 CONTINUE CYCLING between SA and DI water until a small amount of air is observed in SG-2. Do not introduce additional air during the rest of the procedure.

4.2.10 When no more material is coming out the sluice line, the sluicing can be stopped by SECURING the SA and the SW supply, and DISCONNECTING the SW line from the PV.

4.2.11 VERIFY pressure is relieved by checking PI-1, -2 , -3, -4, and -5 before CLOSING DT12 and DT24.

4.3 Adding New Media: New media may be added to the PV by performing the following steps.

4.3.1 BLOW-DOWN Control Manifold

4.3.2 Bypass the PV by Closing DT8 and DT9 and Opening DT10.

4.3.3 VERIFY DT11 is open and that a piping lineup exists to allow water in Control Headers and Hoses to be routed to the Plant monitor tank.

4.3.4 Initiate short bursts of Service Air to the Control Manifolds through the ICL to blow the water in the Manifolds and Hoses to the plant.

4.3.5 VERIFY that lines are clear of water by observing Sight Glass, SG-1.

4.3.6 When purging is complete, SECURE Service Air and allow air pressure to vent off. Verify absence of pressure on PI-1 and PI-5.

4.3.7 CLOSE DT6, DT10 and D11.

4.3.8 DISCONNECT the Jumper hose from the Cartridge filter to the PV Control Manifold.

4.3.9 CONNECT a transfer hose to the inlet of the Control Manifold to the PV and direct the other end to the drums of resin to be added.

4.3.10 DISCONNECT the hose from the inlet of the Effluent Manifold and CONNECT it to the inlet of the Transfer Pump. CONNECT SA to the Transfer Pump.

4.3.11 CONNECT a hose from the discharge of the Transfer Pump to the Inlet of the Effluent Manifold.

4.3.12 Set the opened shipping containers of new media in the process area. (30 Cubic Feet of media for a full PV loading.

4.3.13 Flood the shipping containers with Service Water (SW) using the Water Wand.

4.3.14 OPEN DT11 to provide a route for excess water to flow to the Monitor Tank or drain. This water can be released since it is clean.

4.3.15 OPEN DT9 and then DT8.

4.3.16 To start the loading process, START the Transfer Pump and slowly lower the Sluice Wand into the water-filled shipping container. Care should be taken to suction an ample amount of water to assure a good slurry in the hoses.

4.3.17 Continue to add water with the Water Wand as water is being suctioned out of the shipping container.

4.3.18 When the pump and line is finally full of water, start to slowly lower the Sluice Wand into the submerged media. Do not plunge the Wand deeply into the media as this may result in plugging of the pump or hoses.

4.3.19 CONTINUE this process until the shipping container is empty. Immediately SWITCH to the next shipping container. Try to minimize the amount of air suctioned during the transfer as this may result is loss of prime on the pump.

4.3.20 When all media is sluiced into the PV, allow the Transfer Pump to pump air for 1 minute and then OPEN DT10 and CLOSE DT8 and DT9, to clear the hoses of water. SECURE the Transfer Pump.

4.3.21 Disconnect the hoses from the Transfer Pump and RECONNECT the hoses disconnected in steps 4.3.8 and 4.3.10.

4.3.22 RETURN all Valves to positions indicated on VCL.

4.3.23 After performing any required leak checks, the system is ready for operation.

4.3.24 When processing starts, vent excess air from the PV through the Sample Port.

5.0 RECORDS

5.1 Pertinent information, including times, dates, actions and contents of communications are commonly noted in Diversified's Daily Log though no records are required under this procedure. Some of the records which may be applicable to this procedure include:

5.1.1 Diversified's Daily Log.

5.1.1.1 One copy of Daily Log is kept on site. This Log is an internal, proprietary Diversified document, though Utility may request to review it.

5.1.1.2 A second copy of the Daily Log is retained at Diversified Corporate.

6.0 ABBREVIATIONS

6.1 For sake of brevity and clarity, certain abbreviations unique to Diversified's procedures are used in this, and other Diversified procedures.

DT	Diversified Technologies	CM	Control Manifold
LRW	Liquid Radwaste	QA	Quality Assurance
SA	Service Air	QC	Quick Connections
MFIX	Mobile Filtration/IX System	SG	Sight Glass
SW	Service Water	TP	Transfer Pump (PDP)

Transfer Lines are 1-1/2" hoses fitted with Cam-Lok type fittings for transfer of water or media and Portable Lines are 1/2" (or 3/4") lines with Quick Connects used to supply plant Service Air or Service Water to desired locations.

FINAL PAGE - END OF PROCEDURE

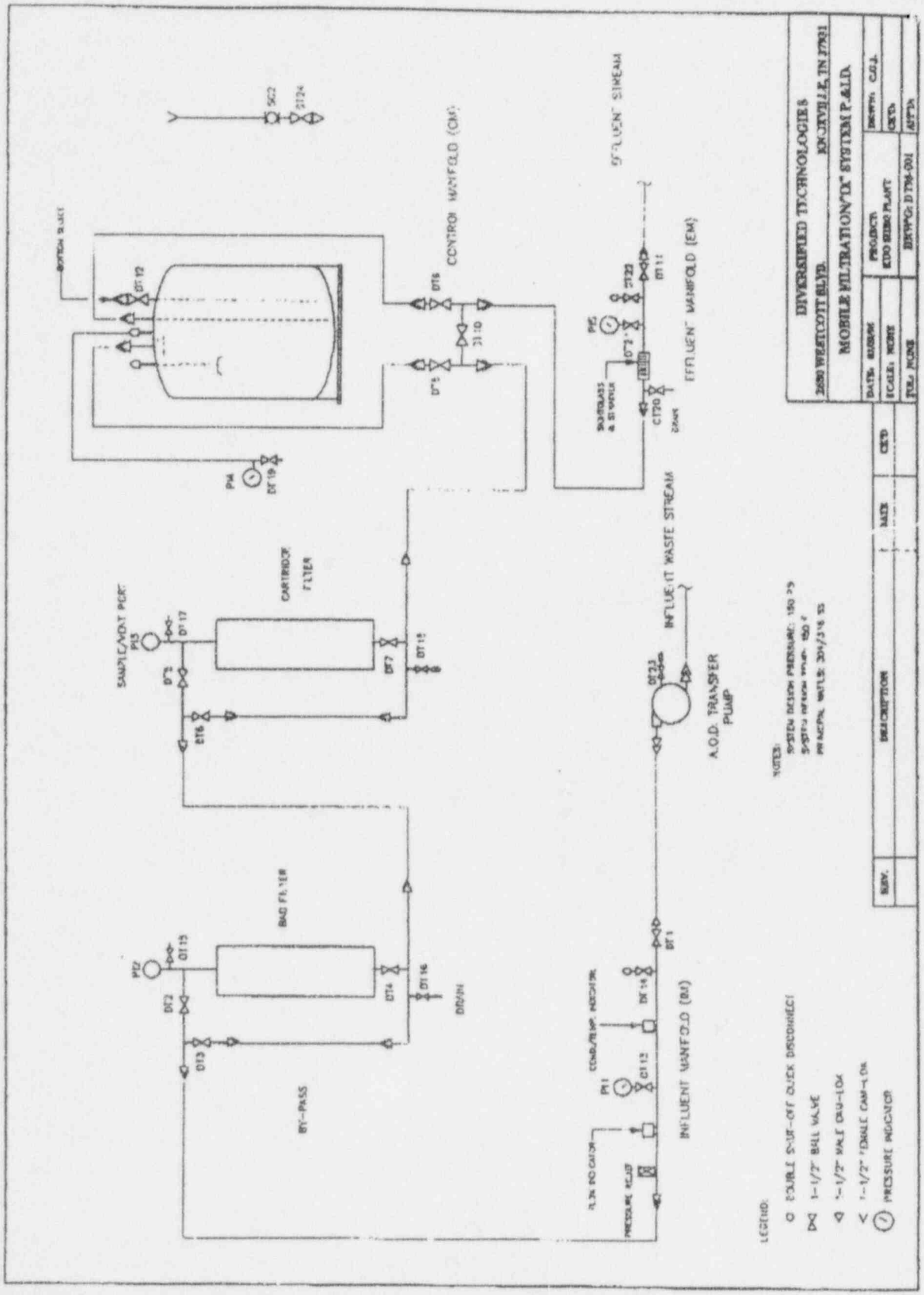
VALVE CHECK LIST
MFIX-VCL
MOBILE FILTRATION/IX (MFIX) SYSTEM

(Procedure Starting Positions)

VALVE #	DESCRIPTION	NORMAL POSITION	ACTUAL POSITION	INITIALS
DT1	IM Isolation Valve	X		
DT2	Inlet to Bag Filter	O		
DT3	Bag Filter Bypass	X		
DT4	Bag Filter Outlet	O		
DT5	Inlet to Cartridge Filter	O		
DT6	Cartridge Filter Bypass	X		
DT7	Cartridge Filter Outlet	O		
DT8	Control Manifold Inlet	O		
DT9	Control Manifold Outlet	O		
DT10	Control Manifold Bypass	X		
DT11	Effluent Manifold Discharge Valve	X		
DT12	PV Sluice Valve	X		
DT13	PG Isolation on IM	O		
DT14	SA/DI Water Valve on IM	X		
DT15	Bag Filter Sample Vent Port	X		
DT16	Bag Filter Drain Valve	X		
DT17	Cartridge Filter Sample Vent Port	O		
DT18	Cartridge Filter Drain Valve	X		
DT19	PV Sample/Vent Valve	X		
DT20	Flush Valve for Sight Glass	X		
DT21	PG Isolation on EM	O		
DT22	SA/DI Water Valve on EM	X		
DT23	Air Valve on Transfer Pump	X		
DT24	Sluice Valve on Sluice Hose	X		

Performed By

Date


DIVERSIFIED TECHNOLOGIES
2650 WESTCOTT BLVD. KNOXVILLE, TN 37921
MOBILE FILTRATION "IX" SYSTEM P&ID
CONTROL MANIFOLD (CM)
EFFLUENT MANIFOLD (EM)
EFFLUENT STREAM
INFLUENT WASTE STREAM
CARTRIDGE FILTER
BAG FILTER
BY-PASS
INFLUENT MANIFOLD (IM)
A.O.D. TRANSFER PUMP
SAMPLE/VENT PORT
DRAIN
LEGEND:

GENERAL OPERATING PROCEDURE
MFIX-02
FILTER CHANGEOUT PROCEDURE

INFORMATION COPY

Issued To:

Ms. Carol Berger
Integrated Environmental
Management, Inc.
Suite 205
9040 Executive Pk Dr
Knoxville, TN 37923

Transmittal Date:

February 2, 1995

Prepared by:

DIVERSIFIED TECHNOLOGY SERVICES
2680 WESTCOTT BLVD.
KNOXVILLE, TN 37931

Services			Purchasing		
Technical			Administration		
Engineering			Quality Assurance		
Rev:0	4 Pages				2/2/95

9502130091 4pp.

GENERAL OPERATING PROCEDURE
MFIX-02
FILTER CHANGEOUT PROCEDURE

1.0 SCOPE

1.1 PURPOSE

The document provides detailed instructions for the safe and efficient replacement of Bag/Cartridge Filters within Diversified Technologies Mobile Filtration/IX System (MFIX).

1.2 APPLICABILITY

This procedure will normally be used by a Diversified Representative.

2.0 REFERENCE

2.1 Diversified's Contract for Site Operations.

3.0 REQUIREMENTS

3.1 PREREQUISITES

3.1.1 This procedure will be read in its entirety before proceeding with the next step.

3.1.2 Pressure drop across the Bag/Cartridge Filter greater than 40 PSIG.

3.1.3 The MFIX has been secured and all valves returned to position indicated on VCL, Current Revision.

3.2 UTILITIES REQUIREMENTS.

3.2.1 Service Air (SA) - 20 to 40 SCFM at 90 to 125 PSI. Unfiltered air containing minimal water is desirable.

3.3 SAFEGUARDS

3.3.1 NOTIFY appropriate utility supervisor prior to any logic or system changes.

3.3.2 All cam-lock connections must be safety-tied or wrapped prior to pressurization of any system component(s).

3.3.3 As a minimum, eye protection will be worn while working within three feet of any pressurized system component.

3.3.4 Higher than background radiation levels may be encountered. Normal ALARA (As Low As Reasonably Achievable) procedures and safeguards should be practiced.

3.3.5 Do not connect or disconnect any portable lines during system operation.

3.3.6 Do not break any pressure point without first verifying absence of pressure indicated on any pressure gauge(s) not isolated from the pressure point being broken.

3.4 ATTACHMENTS

3.4.1 MFIX-VCL, Valve Check List, Rev. 0.

3.4.2 DT-95-001, Rev. 0, Mobile Filtration/"IX" System P&ID Drawing.

4.0 OPERATING PROCEDURES

4.1 VERIFY MFIX is secured by observing system feed pump(s) are secured.

4.2 VERIFY valve positions with Valve Check List, Attachment 1.

4.3 CONNECT SA to DT14 connection.

4.4 OPEN DT11 for return route for water.

4.5 CYCLE DT14 open and closed to initiate short bursts of air through the filters to remove the majority of the water.

4.6 When air is first noticed in the Effluent Manifold Sight Glass, SECURE air addition.

4.7 ALLOW pressure to bleed off through DT11 and then close DT11.

4.8 CLOSE Inlet (DT2 or DT5) and Outlet (DT4 or DT7) Valves to Bag/Cartridge Filter to be changed.

4.9 OPEN Vent Valve of Bag/Cartridge Filter being changed to verify absence of pressure.

4.10 SLOWLY LOOSEN all access cover bolts on the top of the Bag/Cartridge Filter Vessel and then remove them to allow removal of lid.

4.11 OPEN lid, exposing the top of the filter element.

CAUTION: Increased radiation levels may be encountered. Practice normal ALARA procedures and safeguards.

4.12 LIFT the cartridge filter holder assembly out of the housing, and place in double poly bags or other receptacle after taking appropriate radiological readings.

4.13 REMOVE and REPLACE Filter Bag/Cartridges.

4.14 After visual inspection, PLACE the bag/cartridge filter holder assembly in the Bag/Cartridge Filter Vessel. Check for snug fit.

4.15 INSPECT access cover gasket and CLOSE.

4.16 TIGHTEN bolts in a rotating pattern until snug.

4.17 OPEN Inlet and Outlet Valves that were closed in step 4.3.

4.18 LEAK Check the MFIX, in accordance with Diversified Technologies procedure MFIX-04, Current Rev, Leak Check.

5.0 RECORDS

5.1 Pertinent information, including times, dates, actions and contents of communications are commonly noted in Diversified's Daily Log though no records are required under this procedure. Some of the records which may be applicable to this procedure include:

5.1.1 Diversified's Daily Log.

5.1.1.1 A copy of Daily Log is kept on site. This Log is an internal, proprietary Diversified document, though Utility may request to review it.

5.1.1.2 A second copy of the Daily Log is retained at Diversified Corporate.

6.0 ABBREVIATIONS

6.1 For sake of brevity and clarity, certain abbreviations unique to Diversified's procedures are used in this, and other Diversified procedures.

DT	Diversified Technologies	CM	Control Manifold
LRW	Liquid Radwaste	QA	Quality Assurance
SA	Service Air	QC	Quick Connections
MFIX	Mobile Filtration/IX System	SG	Sight Glass
SW	Service Water	TP	Transfer Pump (PDP)

Transfer Lines are 1-1/2" hoses fitted with Cam-Lok type fittings for transfer of water or media and Portable Lines are 1/2" (or 3/4") lines with Quick Connects used to supply plant Service Air or Service Water to desired locations.

FINAL PAGE - END OF PROCEDURE

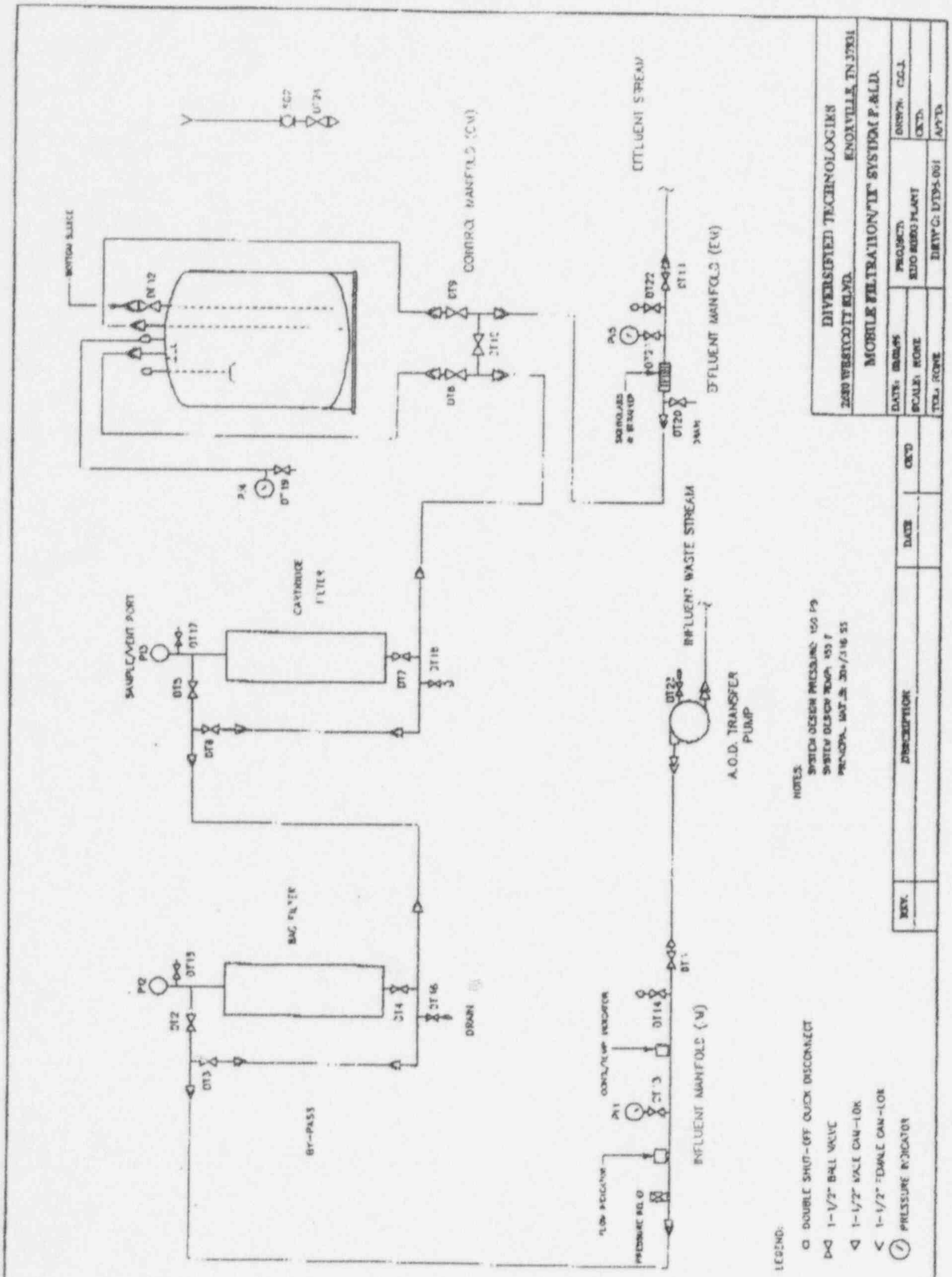
VALVE CHECK LIST
MFIX-VCL
MOBILE FILTRATION/IX (MFIX) SYSTEM

(Procedure Starting Positions)

VALVE #	DESCRIPTION	NORMAL POSITION	ACTUAL POSITION	INITIALS
DT1	IM Isolation Valve	X		
DT2	Inlet to Bag Filter	O		
DT3	Bag Filter Bypass	X		
DT4	Bag Filter Outlet	O		
DT5	Inlet to Cartridge Filter	O		
DT6	Cartridge Filter Bypass	X		
DT7	Cartridge Filter Outlet	O		
DT8	Control Manifold Inlet	O		
DT9	Control Manifold Outlet	O		
DT10	Control Manifold Bypass	X		
DT11	Effluent Manifold Discharge Valve	X		
DT12	PV Sluice Valve	X		
DT13	PG Isolation on IM	O		
DT14	SA/DI Water Valve on IM	X		
DT15	Bag Filter Sample Vent Port	X		
DT16	Bag Filter Drain Valve	X		
DT17	Cartridge Filter Sample Vent Port	O		
DT18	Cartridge Filter Drain Valve	X		
DT19	PV Sample/Vent Valve	X		
DT20	Flush Valve for Sight Glass	X		
DT21	PG Isolation on EM	O		
DT22	SA/DI Water Valve on EM	X		
DT23	Air Valve on Transfer Pump	X		
DT24	Sluice Valve on Sluice Hose	X		

Performed By

Date


SAMPLE/VENT PORT
P13
P12
DT2
DT15
DT3
DT5
DT17
DT8
BY-PASS
BAG FILTER
CARTRIDGE
FILTER
DT4
DT16
DRAIN
DT7
DT18
BOTTOM SLUICE
DT12
DT19
DT24
DT6
DT9
DT10
CONTROL MANIFOLD (CM)
FLOW INDICATOR
PRESSURE REL. D
CONT./TEMP. INDICATOR
PI1
DT13
DT14
DT1
DT23
INFLUENT MANIFOLD (IM)
INFLUENT WASTE STREAM
A.O.D. TRANSFER
PUMP
SIGHTGLASS
& STRAINER
PI5
DT22
DT20
DRAIN
DT11
EFFLUENT STREAM
EFFLUENT MANIFOLD (EM)
LEGEND:
DOUBLE SHUT-OFF QUICK DISCONNECT
1-1/2" BALL VALVE
1-1/2" MALE CAM-LOK
1-1/2" FEMALE CAM-LOK
PRESSURE INDICATOR
NOTES:
SYSTEM DESIGN PRESSURE: 150 PSI
SYSTEM DESIGN TEMP: 150 F
PRINCIPAL MAT.'S: 304/316 SS
DIVERSIFIED TECHNOLOGIES
2680 WESTCOTT BLVD.
KNOXVILLE, TN 37931
MOBILE FILTRATION/"IX" SYSTEM P.&I.D.
REV.
DESCRIPTION
DATE
CK'D
SCALE: NONE
TOL: NONE
PROJECT:
DRW'G: DT95-001
DRWN: C.G.J.
CK'D:
APP'D:

ATTACHMENT 3 - SAMPLE COLLECTION PROCEDURE

DTS DIVERSIFIED TECHNOLOGIES SERVICES, INC.
2680 Westcott Blvd. Knoxville, TN 37931 615-539-9000 Fax 615-539-9001

February 2, 1995

Ms. Carol Berger
Integrated Environmental
Management, Inc.
Suite 205
9040 Executive Pk Dr
Knoxville, TN 37923

Subj: Sampling Protocol

Dear Ms. Berger:

At your request, Diversified proposes the following sampling protocol for sampling the water inventory at the AMS facility in Ohio. The key facets of the sampling protocol is to ensure representative sample by adequate mixing of the water prior to sampling, sampling the water while exercising good laboratory techniques with isolation of the sampled water until disposition of the water is determined based on analysis.

An analysis protocol is being generated and will be submitted as soon as available. Should any questions arise or if I may be of further assistance, please contact me at 615-539-9000 or 615-539-9001 by fax.

Sincerely,
DIVERSIFIED TECHNOLOGIES

Charles E. Jansen
Vice President, Operations

att: Sampling Protocol

STANDARD SAMPLING PROTOCOL
Waste Water Cleanup Project, AMS Facility

1. Pre-sampling

As a minimum, the water in the tank must meet the following requirements.

1.1 Tank inlet must be secured to prevent introducing additional quantity of water from any other source.

Note: The tank recirculation suction/discharge should be located at opposite ends of the tank to insure maximum mixing during recirculation.

1.2 The tank must be recirculated to insure adequate mixing. As a minimum, three times the tank volume must be recirculated through the tank recirc pump.

1.3 Alternatively, water supplied to the tank directly from the processing system will meet the mixing requirements of 1.2 above.

Note: This is applicable for water processed directly into the tank. The water must have come from a common source, with no significant changes in flow rates, chemistry or process logic of the processing system for the duration of the filling of the tank, otherwise, 1.1 must be implemented.

2. Sampling

Good laboratory practices will be followed to ensure that the samples are representative of the tank volume, and that sample results are accurate. These practices include:

2.1 Samples used for "release" shall use clean, new sample bottles.

2.2 Pre-sampling conditions specified in Section 1.0 will be verified and recorded.

2.3 Sample bottle will be labeled and identified with a unique identifier, and will be traceable to the tank from which it was drawn.

2.4 Samples, results and pertinent information, including time, date, tank and technician drawing the sample will be logged in a secure, retrievable log.

3. Post-sampling

After drawing a sample, the following conditions must be met.

3.1 No additional water may be added or drained from the tank after sampling for release, until it is determined that the tank volume meets the requirements for release.

3.2 Any addition to the tank volume after acceptance of "release: sample results will void the sample results. This requires an additional "release" sample be taken and analyzed.

3.3 Pumps, pipes, hoses or lines which are used for transfer of "released" water volumes must be clean or have no detectable levels of contamination prior to use

ATTACHMENT 4 - GAMMA SPECTROSCOPY PROCEDURE

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: CALIBRATION OF THE GERMANIUM SPECTROSCOPY SYSTEM

Prepared By: Patricia A Haworth **Date:** 05/01/92

Reviewed By: James T. Harvey **Date:** 6/3/92
Technical Specialist

James M. Klymkowski **Date:** 06-26-92
Quality Control Coordinator

Janet M. Jones **Date:** 6/3/92
Director Quality and Compliance, ITAS

Approved By: R. L. Stites **Date:** 7/2/92
Laboratory Director

UNCONTROLLED COPY

Controlled Copy No: _____

Key Words: CALIBRATION, GERMANIUM, SPECTROSCOPY

Revision #	0	1					
Date	1/22/91	5/1/92					

4502130098 17PP

1.0 Purpose and Application

1.1 This procedure provides instructions for the energy calibration and efficiency determination for the computer assisted Germanium Spectroscopy System.

1.2 These instructions are applicable to all Germanium Spectroscopy Systems.

1.3 It is the responsibility of the Group Leader for the Radiochemistry Counting Lab to confirm that this procedure is followed whenever the energy calibration or efficiency determination of the Germanium Spectroscopy System is performed.

1.4 It is the responsibility of the Radiochemistry Laboratory Manager, or his designee, to delegate the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

1.5 It is the responsibility of the Laboratory Technician performing this procedure to follow the instructions and to report any abnormalities to the Group Leader for the Radiochemistry Counting Lab, immediately.

1.6 The Laboratory Technician performing this procedure shall be responsible for confirming that all equipment used is working properly prior to starting this procedure.

2.0 References

2.1 Canberra AccuSpec User's Manual, Documentation Version 03, March 1990.

2.2 U.S. Nuclear Regulatory Commission, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, Regulatory Guide 4.15.

2.3 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

2.4 ITAS Quality Assurance Manual.

2.5 ITAS-St.Louis Quality Assurance Manual, Laboratory Specific Attachment.

2.6 "Handbook for Analytical Quality Control in Radioanalytical Laboratories", L.G. Kanipe, EPA-600/7-77-088, August 1977.

3.0 Associated SOPs

3.1 St. Louis Laboratory, Daily Calibration Verification and Maintenance of the Germanium Spectroscopy System, SL13017, Radiochemistry Procedures.

3.2 St. Louis Laboratory, Operation of the Germanium Spectroscopy System, SL13018, Radiochemistry Procedures.

4.0 Definitions

4.1 Blank Sample - A known volume of a matrix that is equivalent to the samples being analyzed, and assumed to be free of radiological contamination.

4.2 Standard Sample - A mixed gamma standard of a matrix that is equivalent to the samples being analyzed.

4.3 Duplicate Sample - This is a routine sample that is processed in duplicate.

4.4 Minimum Detectable Activity (MDA) - The smallest amount of activity that can be detected given the conditions of a specific sample. It is reported at the 95% confidence interval, meaning that there is a 5% chance that a false signal was reported as activity, and a 5% chance that true activity went undetected.

5.0 Procedure

5.1 Summary

5.1.1 This procedure provides detailed instructions for an energy calibration and efficiency determination of the Germanium Spectroscopy System, and the requirements for maintaining a proper Quality Control Data Package.

5.2 Interferences

5.2.1 Gamma spectrometry has many potential interferences. These are usually in the form of radionuclides with poorly defined transition probabilities or overlapping photon emission lines. Such interferences are avoided by using gamma sources that are certified, and this certification evidenced ir the form of a certificate.

5.3 Sampling Handling, Preservation, and Holding Time

5.3.1 All applicable safety and compliance guidelines set forth by IT Corporation, and by federal, state and local regulations must be followed during performance of this procedure. All work must be stopped in the event of a known or potential compromise to the health or safety of any ITAS Associate, and must be reported immediately to a laboratory supervisor.

5.3.2 Preserve all aqueous standards with nitric acid to a pH of less than 2, or as directed by the standard supplier.

5.4 Required Equipment

5.4.1 Germanium Spectroscopy System utilizing a PC based data acquisition system.

5.5 Reagents/Standards

5.5.1 Mixed gamma standard prepared in the proper geometry, with all appropriate NIST Source Certificate information. Preferably with an energy range from 59.0 to 1836.0 KeV.

5.6 Detector Energy Calibration

5.6.1 Ensure that the spiked source container has sufficient activity to accumulate a minimum of 20,000 net counts per peak. The activity value must be accurately known.

5.6.2 Acquire a spectrum per procedure SL13018.

5.6.3 The calibration will be performed in SAMPO as follows:

Note: In SAMPO, move the cursor and make selections using the arrows and **ENTER**.

5.6.3.1 Check the Calibration Library using **Calibr/Libr/File/List**, to confirm that a file is present for the calibration source and geometry of interest. If it is present proceed to the next step.

Note: If it is not present contact the Radiochemistry Group Leader for assistance.

5.6.3.2 Retrieve the spectra acquired in step 5.6.2 using **Data/File/Contin/List**, the available spectra files will be listed on the right hand side of the screen. Using the down arrow select the desired file and press **ENTER**.

5.6.3.3 To display the spectra use the right arrow to key over to **Read** and press **ENTER**.

5.6.3.4 Center the peaks by keying **Peaks/Center/Contin/Go**, this will create a list of peak energies.

5.6.3.5 Identify the peaks of interest and note their significance. Key to **Significance** and set the level to eliminate as many unwanted energies as possibly without eliminating those of interest, and press **Go**.

5.6.3.6 The remainder of the unwanted energies can be removed by keying **Table/Print/displ/Go**. This will list the remaining energies, note the index number of the energies needing to be dropped.

5.6.3.7 The unwanted index numbers can be dropped one at a time by keying **Drop/Index** (enter the index number to be dropped)/**Go**. Continue this process until all unwanted energies have been dropped from the list.

Note: The index numbers will update with each drop, therefore care shall be taken to print the list after each dropped index number.

5.6.3.8 To fit the peaks, key **Fit/Calcul**/set the fitmode to 2, the runmode to 1/**Go**. This will display each of the significant peaks one at a time to be fit.

5.6.3.8.1 Use the following commands to adjust the peaks such that the Chi-Square (Chi-Squ) value is <10:

L = linear then F = fit
N = nonlinear then F = fit
W = width using the arrow to move the cursor adjust the left margin and press **Enter**, then using the arrow to move the cursor adjust the right margin and press Enter, then press F = fit. When you have reached the desired peak fit, press A = accept.

Note: If the Chi-Squ value cannot be reduced to less than 10 consult the Radiochemistry Counting Lab Group Leader.

5.6.3.8.2 To store the peak file key **Table/File/Filnam** (designate a file name or go to List, if a recal of an existing geometry)/**Write**. If you chose an existing file you will be asked if you want to write over the existing file type Y for yes.

5.6.3.9 To complete the calibration key **Calibr/Libr/File/List**, select calibration library then key **Read/Energy/Match/Go.**

5.6.3.10 If the detector being calibrated is new, adjust the peak shape by keying **Calibr/Libr/File/List**, select calibration library then key **Read/Shape/Match/Go.**

5.6.3.11 Check isotope list for completness and accuracy, if okay key **File** (indicate file name)/**Write.** If not okay, go back and redo the calibration.

5.6.3.12 Copy the calibration file into SAMPO/SPECTRA as follows:

5.6.3.12.1 At the DOS shell go to Windows press **Enter.**

5.6.3.12.2 Using the mouse, click on **Main**

5.6.3.12.3 Click on **Restore**

5.6.3.12.4 Double click on **File Manager**

5.6.3.12.5 Double click on **SAMPO**

5.6.3.12.6 Double click on **Calibr**

5.6.3.12.7 Click on the file you wish to copy, it will be highlighted in black.

5.6.3.12.8 Click on **Window**

5.6.3.12.9 Click on **Tile**

5.6.3.12.10 Click on the file to be copied, keeping your finger down drag the file to **SPECTRA.**

5.6.3.12.11 Close **SAMPO\CALI** file

5.6.3.12.12 Close **SAMPO** file

5.6.3.12.13 Close **File Manager**, click on **OK**

5.6.3.12.14 Close **MAIN**

5.6.3.12.15 Close **Program Manager**, click on **OK**

5.6.4 Print a copy of the Energy Calibration, if the energy uncertainty is < ± 0.2 kev update the file and continue. If > ± 0.2 kev proceed to section 6.0.

5.6.5 Print a copy of the Calibration Source Data File, initial and date, then file along with the Energy Calibration report generated in step 5.6.4 in the Gamma Spec file in the Radiochemistry Counting Lab.

5.7 Geometry Efficiency Calibration

5.7.1 Ensure that the spiked source container has sufficient activity to accumulate a minimum of 20,000 net counts per peak. The activity value must be accurately known.

5.7.2 Acquire a spectrum per procedure SL13018.

5.7.3 The calibration will be performed in SAMPO as follows:

Note: In SAMPO, move the cursor and make selections using the arrows and **ENTER**.

5.7.3.1 Check the Calibration Library using **Calibr/Libr/File/List/** select the appropriate file **/Read/Print/Displ/Enter**, to confirm that a file is present and that the activity and date of standard are correct for the calibration source and geometry of interest. If it is present proceed to the next step.

Note: If it is not present or if errors are found in the activity or date of standard contact the Radiochemistry Group Leader for assistance.

5.7.3.2 Retrieve the spectra acquired in step 5.7.2 using **Data/File/Contin/List**, the available spectra files will be listed on the right hand side of the screen. Using the down arrow select the desired file and press **ENTER**.

5.7.3.3 To display the spectra use the right arrow to key over to **Read** and press **ENTER**.

5.7.3.4 To center the peaks key **Peaks/Center/Contin/Go**, this will create a list of peak energies.

5.7.3.5 Identify the peaks of interest and note their significance. Key to **Significance** and set the level to eliminate as many unwanted energies as possible without eliminating those of interest, and press **Go**.

5.7.3.6 The remainder of the unwanted energies can be removed by keying **Table/Print/Displ/Enter**. This will list the remaining energies, note the index number of the energies needing to be dropped.

5.7.3.7 The unwanted index numbers can be dropped one at a time by keying **Drop**/entering the index number to be dropped/**Go**. Continue this process until all unwanted energies have been dropped from the list.

Note: The index numbers will update with each drop, therefore care shall be taken to print the list after each dropped index number.

5.7.3.8 To fit the peaks, key **Fit/Calcul**/set the fitmode to 2, the runmode to 1/**Go**. This will display each of the significant peaks one at a time to be fit.

5.7.3.8.1 Use the following commands to adjust the peaks such that the Chi-Squ value is <10:

Note: If the Chi-Squ value cannot be reduced to less than 10 consult the Radiochemistry Counting Lab Group Leader.

L = linear then F = fit
N = nonlinear then F = fit
W = width using the arrow to move the cursor adjust the left margin and press **Enter**, then using the arrow to move the cursor adjust the right margin and press **Enter**, then press F = fit. When the desired peak fit is reached press A = accept.

5.7.3.8.2 To store the peak file key **Table/File/Filnam** (designate a file name or go to List, if a recal of an existing geometry)/**Write**. If you chose an existing file you will be asked if you want to write over the existing file type Y for yes.

5.7.3.9 To complete the calibration key **Calibr/Libr/File/List**, select calibration library then key **Read/Detect/Match/Go**.

5.7.3.10 Check isotope list for completness and accuracy, if okay key **File** (indicate file name)/**Write**. If not okay, go back and redo the calibration.

5.7.3.11 Copy the calibration file into **SAMPO/SPECTRA** as follows:

5.7.3.11.1 At the DOS shell go to Windows press **Enter**.

5.7.3.11.2 Using the mouse, click on **Main**

5.7.3.11.3 Click on **Restore**

5.7.3.11.4 Double click on **File Manager**

5.7.3.11.5 Double click on **SAMPO**

5.7.3.11.6 Double click on **Calibr**

5.7.3.11.7 Click on the file you wish to copy, it will be highlighted in black.

5.7.3.11.8 Click on **Window**

5.7.3.11.9 Click on **Tile**

5.7.3.11.10 Click on the file to be copied, keeping your finger down drag the file to **SPECTRA**.

5.7.3.11.11 Close **SAMPO\CALI** file

5.7.3.11.12 Close **SAMPO** file

5.7.3.11.13 Close **File Manager**, click on **OK**

5.7.3.11.14 Close **MAIN**

5.7.3.11.15 Close **Program Manager**, click on **OK**

5.7.3.12 Once the calibration is complete rerun the standard to confirm the results, matching the observed activity to the actual activity, the observed activity should be within 90% to 110% of the actual.

5.7.3.13 Compare the new efficiency curve to one from previous year if such exists. If the comparison is outside the 90% to 110% range, input the new efficiency curve data.

5.7.4 Print a copy of the Calibration Source Data File and Detector Efficiency Calibration, initial and date, then file along with the comparison report generated in step 5.6.3.12 in the Gamma Spec file in the Radiochemistry Counting Lab.

5.8 Calculations

5.8.1 All calculations are performed automatically by the SAMPO software routines. Manual calculations are beyond the scope of this procedure.

5.8.2 Percent error calculation

$$\text{Percent Error} = \frac{\text{Found Activity} - \text{Known Activity}}{\text{Known Activity}} * 100$$

5.9 Quality Control

5.9.1 Germanium Efficiency Data Package

Note: **The following records shall be maintained anytime an efficiency calibration has been performed on a germanium detector.**

5.9.1.1 Peak Search Report

5.9.1.2 Peak Fit Report

5.9.1.3 Radionuclide Analysis Report

5.9.1.4 Peak Association Report

5.9.1.5 Percent Error Calculation

5.9.1.6 Copy of the Calibration Source Data File

5.9.1.7 Copy of the Detector Efficiency Calibration

5.9.1.8 Copy of the Energy Calibration

5.9.2 Precision and Accuracy

5.9.2.1 None

5.9.3 Acceptance Criteria

5.9.3.1 See sections 5.6.4, 5.7.3.12 and 5.7.3.13.

5.9.4 Check the expiration date of the radioactive standard to confirm the material is current.

5.9.5 This procedure shall be approved by the Quality Assurance staff for completeness and concurrence with the calibration criterion prior to issue.

6.0 Nonconformance and Corrective Action

6.1 Check source positioning and all instrument settings.

6.2 Check all cables for any apparent damage and to confirm that all cables are routed to proper connectors and are in good working order.

6.3 If the instrument fails to meet the acceptance criteria outlined in section 5.9.3, and the corrective actions above do not resolve the problem, the instrument must be declared "Out of Service". Note this action in the instrument Calibration Log, and notify the Radiochemistry Laboratory Manager, or his designee of the status.

6.5 The instrument may be returned to service once the malfunction has been corrected and the above acceptance criteria have been met. Note this action in the instrument Calibration Log.

6.6 Any deviation from this procedure must be approved by the Quality Control Coordinator and documented in the QC file.

6.7 Any unauthorized deviation from this procedure shall be documented as a Nonconformance with a cause and corrective action described.

7.0 Records Management/Documentation

7.1 A compilation of calibration data for all geometries must be maintained in the counting lab and the QC files (See Table 1), and be available to analysts at all times.

7.2 For each new geometry, maintain at a minimum a hard copy of the Germanium Efficiency Data Package.

7.3 Out dated Calibration data shall be released to Document Control.

Table 1

2 Liter Marinelli Beaker

1 Liter Marinelli Beaker

650 Gram Marinelli Beaker of solid

Petri Dish, 45 grams of solid

47MM Air Filter

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: DAILY CALIBRATION VERIFICATION AND MAINTENANCE OF THE GERMANIUM SPECTROSCOPY SYSTEM

Prepared By: Patricia A Haworth Date: 05/01/92

Reviewed By: James T. Hamey Date: 06/15/92
Technical Specialist

James M. Klymenski Date: 07-24-92
Quality Control Coordinator

James M. Jones Date: 06-26-92
Director Quality and Compliance, ITAS

Approved By: R.C. Stiles Date: 8/19/92
Laboratory Director

Controlled Copy No: UNCONTROLLED COPY

Key Words: CALIBRATION, DAILY, GERMANIUM, SPECTROSCOPY

Revision #	0						
Date	5/1/92						

450-130101 10pp

1.0 Purpose and Application

1.1 This procedure provides instructions for the daily calibration and maintenance of the Germanium Spectroscopy System to assure the system is functioning within acceptable limits.

1.2 These instructions are applicable to all Germanium Spectroscopy Systems.

1.3 It is the responsibility of the Group Leader for the Radiochemistry Counting Lab to confirm that this procedure is followed whenever the daily calibration and maintenance of a Germanium Spectroscopy System is performed.

1.4 It is the responsibility of the Radiochemistry Laboratory Manager, or his designee, to delegate the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

1.5 It is the responsibility of the Laboratory Technician performing this procedure to follow the instructions and to report any abnormalities to the Group Leader for the Radiochemistry Counting Lab, immediately.

1.6 The Laboratory Technician performing this procedure shall be responsible for confirming that all equipment used is working properly and is calibrated prior to starting this procedure.

2.0 References

2.1 Canberra AccuSpec User's Manual, Documentation Version 03, March 1990.

2.2 U.S. Nuclear Regulatory Commission, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, Regulatory Guide 4.15.

2.3 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

2.4 ITAS Quality Assurance Manual.

2.5 ITAS-St.Louis Quality Assurance Manual, Laboratory Specific Attachment.

2.6 "Handbook for Analytical Quality Control in Radioanalytical Laboratories", L.G. Kanipe, EPA-600/7-77-088, August 1977.

3.0 Associated SOPs

3.1 St. Louis Laboratory, Calibration of the Germanium Spectroscopy System, SL13014, Radiochemistry Procedures.

3.2 St. Louis Laboratory, Operation of the Germanium Spectroscopy System, SL13018, Radiochemistry Procedures.

4.0 Definitions

4.1 Autosequence - a computer program that, when initiated, acquires the spectrum for a specified period of time and automatically reduces the data. A report is printed with a summary of the spectrum and identification of isotopes contributing to the spectrum.

4.2 IQC - a computerized Quality Control Program where quality control data is input and the program compares it to the established parameters indicating compliance or noncompliance.

4.3 Out of Service - a detector or piece of equipment is not to be used for sample analysis until problems have been corrected.

5.0 Procedure

5.1 Summary

5.1.1 This procedure provides instructions for the daily calibration and maintenance of the Germanium Spectroscopy System.

5.2 Interferences

5.2.1 None

5.3 Sampling Handling, Preservation, and Holding Time

5.3.1 All applicable safety and compliance guidelines set forth by IT Corporation, and by federal, state and local regulations must be followed during performance of this procedure. All work must be stopped in the event of a known or potential compromise to the health or safety of any ITAS Associate, and must be reported immediately to a laboratory supervisor.

5.4 Required Equipment

5.4.1 Germanium Spectroscopy System utilizing a PC based data acquisition system.

5.5 Reagents/Standards

5.5.1 Mixed-gamma source with emmissions in the spectral range of 59 keV to 1400 keV shall be used to check this instrument.

5.6 Calibration

5.6.1 Each detector must be calibrated before analysis. The methods to calibrate the detector are described in procedure SL13014.

5.7 Analysis/Operation

5.7.1 Initial Setup

5.7.1.1 Establish the normal instrument settings for all controls. These settings are tabulated in Attachment 1. Controls shall be checked before each use of the instrument.

5.7.2 Background/Counts Reproducibility

5.7.2.1 Perform a 10 minute empty shield background count on each detector at least once per day or before each use. Select the autosequence "Background" to perform the check.

5.7.2.1.1 Sample units: G

5.7.2.1.2 Sample volume: 1

5.7.2.1.3 Geometry: Petri

5.7.2.1.4 Day of Collection: The current date.

5.7.2.1.5 Time of Collection: The hour just prior to the count.

5.7.2.2 Document the background check by recording the total counts, reported as area, in the Gamma Calibration Log Book.

5.7.2.3 Position the mixed-gamma source in a reproducible manner on the end cap of the germanium detector.

5.7.2.4 Once the source is properly positioned, close the lead shield and secure the door.

5.7.2.5 Respond to the Autosequence prompts to initiate a 10 minute count, using the following:

5.7.2.5.1 Sample units: G

5.7.2.5.2 Sample volume: 1

5.7.2.5.3 Geometry: Petri

5.7.2.5.4 Day of Collection: The current date.

5.7.2.5.5 Time of Collection: The hour just prior to the count.

5.7.2.6 Document the efficiency check by recording the counts for the 661.6 keV peak in the Gamma Calibration Log Book.

5.7.2.7 Input the counts for the 661.6 keV peak and the total counts for background in IQC.

5.7.3 Energy Calibration/Linearity Check

5.7.3.1 After counting the mixed-gamma source specified for this purpose, verify that the peak search report identifies peaks for Am-241, Cs-137, and two peaks for Co-60.

5.7.3.2 Peak energies for Am-241, Cs-137, and Co-60 must be within ± 0.9 keV of the following energies:

Am-241	59.5 keV
Cs-137	661.6 keV
Co-60	1173.2 keV 1332.5 keV

5.7.3.3 If the main peaks were within the specified range, record the energies in the Gamma Calibration Log Book.

5.7.3.4 If the peak search energies are outside the range specified in 5.7.3.2 or if the IQC program identifies out of specification data proceed to section 6.0.

5.7.4 Weekly Maintenance

5.7.4 Liquid nitrogen dewars cooling the detectors shall be filled weekly, and the activity logged into the Gamma Spec Maintenance Log Book.

5.7.4 Detectors shall not be used for sample or quality control analysis within 30 minutes of the completion of filling cycle.

5.8 Calculations

5.8.1 None

CONTROLLED COPY NO.:

ITAS ST. LOUIS LABORATORY

PROCEDURE/DOCUMENT CHANGE

PROCEDURE/DOCUMENT TITLE AND NUMBER: ITAS-St. Louis Standard Operating Procedure:

SL13017, Daily Calibration, Verification and Maintenance of the Germanium Spectroscopy System

PROCEDURE/DOCUMENT SECTION(S) AFFECTED BY CHANGE:

Section 5.9.3

REASON FOR ADDITION OR CHANGE:

Rather than performing a weekly visual review of all IQC data, we will use a daily report feature offered by IQC.

CHANGE EFFECTIVE FROM: 01-22-93 (DATE) TO: PRESENT (DATE)

SAMPLES OR PROJECTS AFFECTED:

All detectors will be evaluated using SOP 13017.

CHANGE OR ADDITION (SPECIFY SECTION, USE ADDITIONAL SHEETS IF NECESSARY):

The group leader for the Radiochemistry Counting Lab shall perform a daily review of the IQC statistical data report, and document the review by signing the report sheet. The reports will be kept in counting lab files.

SUBMITTED BY: Patricia A Hackett DATE: 01-22-93

for Thomas 01-22-93 TECHNICAL DIRECTOR/SPECIALIST

P.R. Bliss 1/29/93 LABORATORY MANAGER

Joyce M. Klepczynski 01-22-93 QUALITY CONTROL COORDINATOR

Judith Lee 1/29/93 DIRECTOR, QUALITY ASSURANCE & COMPLIANCE

5.9 Quality Control

5.9.1 The peak search report shall be maintained in the daily Quality Control File. This file shall be maintained in the operations files in the count lab for easy retrieval.

5.9.2 The Instrument Quality Control Program (IQC) shall be used to identify quality control data that falls outside the specified range.

5.9.3 The Group Leader for the Radiochemistry Counting Lab shall perform a weekly visual review of the IQC statistical plots for undesireable trends, and document the review in the IQC Log Book.

5.9.4 The Group Leader for the Radiochemistry Counting Lab shall generate hard copies of the IQC statistical plots monthly, file them in the counting lab, and document the activity in the IQC Log Book.

6.0 Nonconformance and Corrective Action

6.1 Check source positioning and all instrument settings.

6.2 Check all instrument cables for any apparent damage and to confirm that all cables are routed to proper connectors and are in good working order.

6.3 If the energies, identified for the isotopes contained in the check source, exceed ± 0.9 keV calibrate the detector in accordance with the methods described in SL13014.

6.4 If the response to the check source exceeds parameters established by the control chart and the problem is not resolved by steps 6.1 through 6.3, the instrument must be declared Out of Service. Note this action in the IQC program and in the Gamma Spec Maintenance Log Book. Red Out-of-service tags are located in the Quality Control Department. Notify the Radiochemistry Laboratory Manager, or his designee, of the status.

6.5 The instrument may be placed back into service once the malfunction has been corrected and the above outlined quality control criteria have been passed. Note this action in IQC and the Gamma Spec Maintenance Log Book.

6.6 Any deviation from this procedure must be approved by the Quality Control Coordinator and documented in the QC file.

6.7 Any unauthorized deviation from this procedure shall be documented as a Nonconformance with a cause and corrective action described.

7.0 Records Management/Documentation

7.1 Raw data associated with the current IQC series shall be maintained in the Radiochemistry Counting Lab for easy retrieval.

7.2 At the completion of an IQC series the raw data shall be released to Document Control.

7.3 When applicable, copies of the raw data shall be maintained in the associated project file.

7.4 All manufacturer-supplied documentation, including Standard Certificates, shall be retained as quality documents in the Quality and Operations Files.

7.5 All laboratory documentation generated in sections 5.0 and 6.0 shall be retained as quality documents in the Quality and Operations Files.

Attachment 1

Instrument settings for GE1 and GE2

DETECTOR	H.V. SETTING	AMPLIFIER SETTINGS
GE1	+ 3000 VOLTS	FINE GAIN = AS SET BY SL13014 COURSE GAIN = 50 PEAKING TIME = 8 uSEC BLR = AUTO/ASYM OUTPUT POLARITY = POS.
GE2	- 2800 VOLTS	FINE GAIN = AS SET BY SL13014 COURSE GAIN = 20 PEAKING TIME = 8 uSEC BLR = AUTO/SYM OUTPUT POLARITY = NEG.

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: OPERATION OF THE GERMANIUM SPECTROSCOPY SYSTEM

Prepared By: Patricia A Haworth Date: 01-21-93

Reviewed By: Bill Thomas Date: 01-22-93
Technical Specialist

Margaret C. Wurtz Date: 01-25-93
Quality Control Coordinator

Date: 1/29/93
Director Quality and Compliance, ITAS

Approved By: R. C. Stiles Date: 1/29/93
Laboratory Director

Controlled Copy No: UNCONTROLLED COPY

Key Words: GERMANIUM SPECTROSCOPY, OPERATION, RADIOCHEMISTRY

Revision #	0						
Date	12/29/92						

Title: Operation of the Germanium Spectroscopy System

1. *Purpose, Application & Responsibility*

1.1 The purpose of this procedure is to provide instruction for the operation of the Germanium Spectroscopy System using the Canberra AccuSpec data acquisition system and SAMPO nuclide identification software.

1.2 This procedure applies to the routine operation of the Germanium Spectroscopy System.

1.3 Responsibility: for the purpose of this procedure, the following responsibilities apply:

Counting Lab Group Leader: shall be responsible for confirming that this procedure is followed during the operation of the Germanium Spectroscopy System.

Radiochemistry Laboratory Manager, or designee: shall be responsible for delegating the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

Analyst: shall be responsible for following the instructions and immediately reporting any abnormalities to the Group Leader for the Radiochemistry Counting Lab. Shall be responsible for confirming that all equipment used is working properly, all instrument settings are set to their proper value or position, and all test equipment is calibrated.

2. *References*

2.1 Canberra AccuSpec User's Manual, Documentation Version 03, March 1990.

2.2 Canberra Sampo 90 User's Manual, Version 3.1, January 1991.

2.3 ITAS Radioanalytical Laboratories Counting Instrument QC: The IQC System User & Technical Guide, Copyright 1989,90,91.

2.4 U.S. Nuclear Regulatory Commission, Quality Assurance for Radiological Monitoring Programs (Normal Operations) -Effluent Streams and the Environment, Regulatory Guide 4.15.

2.5 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

2.6 ITAS Quality Assurance Manual.

2.7 ITAS-St.Louis Quality Assurance Manual, Laboratory Specific Attachment.

2.8 "Handbook for Analytical Quality Control in Radioanalytical Laboratories", L.G. Kanipe, EPA-600/7-77-088, August 1977.

3. *Associated SOPs*

3.1 St. Louis Laboratory, Calibration of the Germanium Spectroscopy System, SL13014, Radiochemistry Procedures.

3.2 St. Louis Laboratory, Daily Calibration Verification and Maintenance of the Germanium Spectroscopy System, SL13017, Radiochemistry Procedures.

3.3 St. Louis Laboratory, Nonconformance and Corrective Action, SL10004, Quality Control Procedures.

4. *Definitions*

4.1 Autosequence - a computer program that, when initiated, acquires the spectrum for a specified period of time

and automatically reduces the data. A report is printed with a summary of the spectrum and identification of isotopes contributing to the spectrum.

4.2 Geometry - the size and type of container used to hold the sample during counting.

5. *Procedure*

5.1 Summary

5.1.1 This procedure provides instructions for the initial setup, operation, system startup, system shutdown, and backup of system files.

5.1.2 The equipment operates on a PC and employs two programs, AccuSpec acquires the spectrum and SAMPO interprets the spectrum and reports the results. The autosequence acquires the spectrum using AccuSpec and transfers the spectrum via a saved file to SAMPO.

5.1.3 The system can be operated manually or automatically. The manual operation requires the use of the program MCA, located in the c:\MCA subdirectory. The automatic operation requires the use of several different autosequences located in c:\SAMPO\SPECTRA subdirectory. The automatic operation is covered in this procedure, however, manual operation is an acceptable alternative.

5.2 Safety

5.2.1 No hazardous chemicals are used to implement this procedure.

5.2.2 Samples shall be screened and classified before being handled by the associate. Controls shall be implemented to limit exposures to Category III samples as defined by the Radiation safety Officer.

5.2.3 The analyst should practice effective contamination control methods in order to minimize the spread of radioactive contamination from the prepared sample to one's hands or other surfaces.

5.2.4 All work must be stopped in the event of a known or potential compromise to the health or safety of any ITAS Associate, and must be reported immediately to a laboratory supervisor.

5.3 Interferences

5.3.1 None.

5.4 Preservation and Holding Time

5.4.1 Not Applicable.

5.5 Required Equipment

5.5.1 Germanium Spectroscopy System utilizing a PC based data acquisition system.

5.5.2 Plastic bags

5.6 Reagents/Standards

5.6.1 None.

5.7 Calibration

5.7.1 Daily quality control checks as specified in SL13017 must have been completed and verified that all are within the required limits before any operations may be performed on the system. Any part of the system that did not pass daily requirements will be tagged as out of service in accordance with SL10004.

5.8 Analysis/Operation

5.8.1 Initial Setup

5.8.1.1 Confirm that the instrument is energized and that controls are set as indicated in Attachment 1. Controls shall be checked before each use of the instrument.

5.8.1.2 Cover the germanium detector with a plastic bag to avoid any possibility of contamination. These bags shall be replaced prior to each count.

5.8.1.3 Place the sample on top of the germanium detector.

5.8.1.4 Once the sample is properly seated, close the lead shield and secure the door.

5.8.2 Initiating a Count

5.8.2.1 On the gamma spec PC terminal select autosequence for the appropriate counting geometry. Available autosequences are listed on Attachment 2.

5.8.2.2 Autosequence will automatically clear the previous spectrum and start data acquisition as soon as the detector and preset live time are designated.

5.8.2.3 The autosequence program will require a response to the following questions, the default response is listed in brackets, press "ENTER" to select the default or press "ENTER" after each response:

Note: An error message will be displayed if the detector is in use.

5.8.2.3.1 The number of the detector to be used?

5.8.2.3.2 Preset live time to be used?

5.8.2.3.3 Spectrum filename to be used (ex. 030201, for March 2 run #1)?

Note: The filename must be all numbers and no more than 7. A file is created when the AccuSpec software completes the count. The filename will be assigned a suffix of *.DAT (for example, A0030201.DAT). This file is located in the c:\MCA directory. A second file is created when SAMPO software is executed. The file is assigned a suffix of *.SPE (for example, S0030201.SPE). This file is located in the c:\SAMPO\SPECTRA directory.

5.8.2.3.4 Sample description?

5.8.2.3.5 Sample identifier (ITAS or client ID)?

5.8.2.3.6 Sample units to be used?

5.8.2.3.7 Sample volume to be used?

5.8.2.3.8 Date sample collection began (ex. 02-Mar-92)?

5.8.2.3.9 Time sample collection began (ex. 12:00)?

5.8.2.3.10 Date Sample collection ended?

5.8.2.3.11 Time Sample collection ended?

5.8.2.3.12 Enter your initials?

5.8.2.3.13 Geometry type to be used?

Note: Available geometries listed in Attachment 2.

5.8.2.3.14 Name of SAMPO Library to be used?

Note: Use the Main Library unless directed otherwise.

5.8.2.3.15 Do you wish to report MDA's?

Note: Autosequence will automatically perform a peak search, background subtraction, nuclide identification, minimum detectable activity calculation and generate a report of all results.

5.8.2.4 To run additional germanium detectors by autosequence perform the following key strokes:

Utility/Autosequence/Begin

The program will ask for the file, enter the name of the geometry to be used (Attachment 2). You will be prompted with the same questions listed in step 5.8.2.3.

5.8.3 Sample File Backup

5.8.3.1 Select a formatted floppy (3.5 inch) disk which has adequate space. Insert the disk, label side up, into drive B.

5.8.3.2 At the DOS shell, move the cursor to windows and press "ENTER".

5.8.3.3 Perform the following, using the mouse:

5.8.3.3.1 Click on Main

5.8.3.3.2 Double click on File Manager

5.8.3.3.3 Double click on SAMPO

5.8.3.3.4 Double click on Spectra

5.8.3.3.5 Click on View

5.8.3.3.6 Click on Include

5.8.3.4 Type *.SPE and hit "ENTER", this will display the sample files with the suffix of *.SPE.

5.8.3.5 Using the mouse, move the cursor to the first file to be moved and click, the file will be highlighted in black.

5.8.3.6 Move the cursor to the last file in a series to be moved, hold the shift key down and click at the same time. All the files will be highlighted in black. To select specific files, highlight one file at a time by clicking with the Ctrl key down.

5.8.3.7 Perform the following, using the mouse:

5.8.3.7.1 Click on Window

5.8.3.7.2 Click on Tile

5.8.3.7.3 Double click on directory B. Check disk capacity to confirm the files selected will fit on the floppy disk.

5.8.3.7.4 Place the arrow on the highlighted files click keeping your finger down, drag the files to drive B.

5.8.3.8 Move the cursor to "OK" and click.

5.8.3.9 To delete the files that were just transferred, perform the

following:

5.8.3.9.1 Click on **Window**

5.8.3.9.2 Click on **Cascade**

5.8.3.9.3 Highlight files to be deleted, using the sequence in steps 5.8.3.5 and 5.8.3.6.

5.8.3.9.4 Click on **File**

5.8.3.9.5 Click on **Delete**

5.8.3.10 Remove disk from drive B and store it in the appropriate file, record the date on the floppy disk.

5.8.4 System Shutdown

5.8.4.1 Turn the voltage down to 0, then turn voltage off.

5.8.4.2 Turn power supply off.

5.8.4.3 Turn NIMBIN power off.

5.8.4.4 Turn power off to the computer.

5.8.5 System Startup

5.8.5.1 Ensure that the cable is correctly installed from the amplifier to the ADC, before turning power on.

5.8.5.2 Turn power on to NIMBIN.

5.8.5.3 Turn power supply on.

5.8.5.4 Ensure voltage is set at 0, then turn voltage on.

5.8.5.5 Adjust voltage slowly, no more than 100 volts per second, until you have reached the manufacturers specifications for the detector in use.

5.8.5.6 Turn the computer on and reboot as follows:

Simultaneously hit: **Ctrl/Alt/Delete**

5.9 **Calculations**

5.9.1 The activity of each isotope, the associated percent error, and an MDA are calculated and reported for all radionuclides by the SAMPO program. Details of these calculations may be found in the reference cited in section 2.2.

5.10 **Quality Control**

5.10.1 Analyze quality control samples (QC) concurrent with routine samples. The frequency of QC samples is specified for each project. In the absence of specific instruction from Project Management, the frequency of quality control samples is based on a batch of 20 samples or less of a similar matrix. QC samples will consist of one blank, one LCS, and one duplicate.

5.10.2 The LCS must be a mixed-gamma standard in the same counting geometry and matrix as the samples, unless otherwise specified by the client.

6. Nonconformance and Corrective Action

6.1 Any deviation from this procedure must be approved by the Radiochemistry Laboratory Manager and the Technical Director and documented on a procedure change/development form.

6.2 Any unauthorized deviation from this procedure shall be documented as a Nonconformance with a cause and

corrective action described.

7. *Records Management and Documentation*

7.1 Raw data worksheets shall be generated for each sample and standard. Germanium Spectroscopy Data reports will be attached.

7.2 Raw data worksheets shall be copied and placed in the Analysis Notebook for future reference. At the completion of the project the copies shall be shredded.

7.3 Raw data shall be maintained in the associated project file.

7.4 All data reports will accompany it's associated paperwork and will be kept in the project files.

7.5 All counting and spectrum data will be backed up on disk and kept in the counting lab files for easy retrieval.

7.6 Results shall be reported in pCi/l or pCi/g unless specifically requested by the client.

7.7 Results shall be reported on a Germanium Spectroscopy Report and transcribed to an ITAS Certificate of Analysis.

7.8 All manufacturer-supplied documentation, including Standard Certificates, shall be retained as quality documents in the Quality and Operations Files.

7.9 All laboratory documentation generated in sections 5.0 and 6.0 shall be retained as quality documents in the Quality and Operations Files.

Attachment 1

Instrument settings for GE1, GE2, and GE3

DETECTOR	H.V. SETTING	AMPLIFIER SETTINGS
GE1	+ 3000 VOLTS	FINE GAIN = AS SET BY SL13014 COURSE GAIN = 100 PEAKING TIME = 4 μSEC BLR = AUTO/SYM MULTIPLIER = 1X THRESHOLD = AUTO PILE UP REJ = OFF PREAMP INPUT POLARITY = NEG.
GE2	- 2800 VOLTS	FINE GAIN = AS SET BY SL13014 COURSE GAIN = 20 PEAKING TIME = 8 μSEC BLR = AUTO/SYM INPUT POLARITY = NEG.
GE3	- 3200 VOLTS	FINE GAIN = AS SET BY SL13014 COURSE GAIN = 20 PEAKING TIME = 4 μSEC BLR = AUTO/ASYM INPUT POLARITY = NEG.

Attachment 2

Germanium Detector Efficiency Files/Geometries

DETECTOR	AUTOSEQUENCE	EFFICIENCY FILES	GEOMETRY
GE1	MARINELLI TWO LITER	MARN2L1	MARN2L
	PETRI DISH 45 GM SOLID	PETRI1	PETRI
	AIR FILTER 47 MM	AIR471	AIR47
	MARINELLI 650 GM SOLID	MARN6501	MARN650
	MARINELLI ONE LITER	MARN1L1	MARN1L
GE2	MARINELLI TWO LITER	MARN2L2	MARN2L
	PETRI DISH 45 GM SOLID	PETRI2	PETRI
	AIR FILTER 47 MM	AIR472	AIR47
	MARINELLI 650 GM SOLID	MARN6502	MARN650
	MARINELLI ONE LITER	MARN1L2	MARN1L
GE3	MARINELLI TWO LITER	MARN2L3	MARN2L
	PETRI DISH 45 GM SOLID	PETRI3	PETRI
	AIR FILTER 47 MM	AIR473	AIR47
	MARINELLI 650 GM SOLID	MARN6503	MARN650
	MARINELLI ONE LITER	MARN1L3	MARN1L

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: PREPARATION OF SAMPLES FOR GAMMA SPECTROSCOPY

Prepared By: Mary S. Laughter **Date:** 01-26-93

Reviewed By: BR Thomas **Date:** 01-26-93
Technical Specialist

James M. Klesczewski **Date:** 01-27-93
Quality Control Coordinator

Date: 1/27/93
Director Quality and Compliance, ITAS

Approved By: R. V. Struttmann **Date:** 1/29/93
Laboratory Director

UNCONTROLLED COPY

Controlled Copy No: _____

Key Words: GAMMA SPEC, PREPARATION, RADIOCHEMISTRY

Revision #	0						
Date	1/21/93						

Title: Preparation of Samples for Gamma Spectroscopy

1. Purpose and Application

1.1 The purpose of this procedure is to provide detailed instructions for the preparation of samples which require gamma spectroscopy analysis.

1.2 This procedure applies to samples requiring preparation prior to performing gamma spectroscopy analysis.

1.3 Responsibility: for the purpose of this procedure the following responsibilities apply:

Radiation Safety Officer (RSO): (or his/her designee) indicates to the analyst any necessary precautions that should be taken to protect their health and safety based on sample classification into hazardous and radioactive categories.

Radiochemistry Laboratory Manager: (or designee) to delegate the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

Analyst: Apply any precautions noted by the procedure, to adhere to the instructions contained in the procedure, and to perform this procedure independently only when formally qualified.

Analyst: Follow the instructions and to report any abnormalities, immediately, to the supervisor for the Radiochemistry Preparation Lab.

Analyst: Inspect worksheets for accuracy and completeness, inspect sample for proper volume and size, inspect equipment for proper operation, and inspect balances to ensure that the calibration is not out of date.

2. References

2.1 Nuclear Regulatory Commission, Title 10, Code of Federal Regulations Part 50, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criteria As Low As Reasonably Achievable for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents", Appendix I.

2.2 U. S. Nuclear Regulatory Commission, Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants"

2.3 U. S. Nuclear Regulatory Commission, Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment".

2.4 National Council on Radiation Protection and Measurements. A handbook of radioactivity measurement and procedures. NCRP Report 58 and Edition, Washington, DC; 1985.

2.5 Gamma Emitting Radionuclides in Drinking Water, Method 901.1, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA 600/4-30-032, Section 4, Environmental Protection Agency

2.6 Gamma, Section 4.5.2.3, EML Procedures Manual, HASL-300, Environmental Measurements Laboratory, US Department of Energy, 1990.

2.7 American Society for Testing and Materials. Standard practice for high-resolution gamma-ray spectrometry of

water in Annual Book of ASTM standards. Philadelphia, PA: ASTM D3649-85; 1987.

2.8 ITAS Quality Assurance Manual.

2.9 ITAS-St. Louis Quality Assurance Manual, Laboratory Specific Attachment.

3. Associated SOPs

3.1 St. Louis Laboratory, Standards Preparation, SL0001, Standards Preparation Procedures.

3.2 St. Louis Laboratory, Automatic Pipetter Calibration, SL1001, Instrument Calibration Procedures.

3.3 St. Louis Laboratory, Chain of Custody, SL2001, Sample Receipt Procedures.

3.4 St. Louis Laboratory, Personnel Training and Evaluation, SL7002, Quality Control Procedures.

3.5 St. Louis Laboratory, Nonconformance and Corrective Action, SL10004, Miscellaneous Procedures.

3.6 St. Louis Laboratory, Preparation of Soil, Sludge and Filter Paper Samples for Radiochemical Analysis, SL13006, Radiochemistry Procedures.

3.7 St. Louis Laboratory, Operation of the Gamma Spectroscopy System, SL13018, Radiochemistry Procedures.

3.8 St. Louis Laboratory, Drying and Grinding of Soil and Solid Samples, SL13029, Radiochemistry Procedures.

3.9 St. Louis Laboratory, Preparation of Tissue and Vegetation Samples, SL13031, Radiochemistry Procedures.

4. Definitions

4.1 Method Blank - A method blank is a laboratory initiated sample consisting of deionized water for liquid samples or beach sand for solid samples which is carried through all of the steps of an analysis. This sample serves to monitor the introduction of artifacts into the process.

4.2 QC Batch - A QC batch consists of a group of samples of the same matrix, analyzed within the same two week period. A QC batch cannot exceed twenty (20) samples not including method blanks, laboratory control samples, duplicates, and matrix spike samples.

4.3 Check Standard - A check standard is a commercially purchased or in-house prepared source consisting of either an aqueous solution, solid matrix or filter matrix (depending on the sample matrix and geometry) and serves to verify geometry efficiency.

4.4 Matrix Spike (MS) - A matrix spike sample is an aliquot of an original sample that has been spiked with known quantities of target analytes before being subjected to the entire analytical procedure. The recovery of the analytes is determined after the analysis of both the sample and its spiked aliquot. Matrix spikes will be performed at client request only.

4.5 Matrix Spike Duplicate (MSD) - A matrix spike duplicate is a matrix spike performed at the same levels as the MS. Matrix spike duplicates will be performed at client request only.

4.6 Duplicate - A duplicate sample is a split sample, both portions of which are analyzed without being spiked with the

target analyte.

4.7 Minimum Detectable Activity (MDA) - The smallest amount of radioactivity that can be detected given the conditions of a specific sample. It is reported at the 95% confidence interval, meaning that there is a 5% chance that a false signal was reported as activity, and 5% chance that true radioactivity went undetected.

5. *Procedure*

5.1 Summary

5.1.1 This procedure describes methods for preparation of samples of liquid, soil, vegetation, air filter, and core matrix prior to gamma spectroscopy analysis.

5.1.2 Samples are transferred to a standard geometry container for counting on the gamma detectors. Hyperpure germanium (HPGe) gamma detectors are used to detect isotopes with gamma ray energies between 40 and 2000 Kev. Activity concentration is determined using a commercially available computer system. Any sample matrix which can be mounted in one of the standard geometries may be analyzed for any of the isotopes included in the Canberra system software library. Gamma photon energies not identified in the reference library may be identified and evaluated manually.

5.1.3 The group/team leader has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

5.2 Safety

5.2.1 Procedures shall be carried out in a manner that protects the health and safety of all IT associates. The following requirements must be met:

5.2.1.1 Eye protection that satisfies ANSI Z87.1 (as per the Chemical Hygiene Plan), laboratory coat, and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated will be removed and discarded, other gloves will be cleaned immediately.

5.2.2 The health and safety hazards of many of the chemicals used in this procedure have not been fully defined. Additional health and safety information can be obtained from the MSDS files maintained in the laboratory. The following specific hazards are known:

5.2.2.1 The following materials are known to be corrosive: nitric acid.

5.2.2.2 The following material is a known oxidizing agent: nitric acid.

5.2.3 Exposure to chemicals will be maintained as low as reasonable achievable, therefore, unless they are known to be non-hazardous, all samples will be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers will be kept closed unless transfers are being made.

5.2.4 All work must be stopped in the event of a known, or potential compromise to the health or safety of any ITAS associate. The situation must be

reported immediately to a laboratory supervisor.

5.2.5 Waste generated in the procedure will be segregated, and disposed according to the facility hazardous waste procedures. The Health and Safety Coordinator should be contacted if additional information is required.

5.3 Interferences

5.3.1 None

5.4 Preservation and Holding Time

5.4.1 The sample container should be glass or polyethylene.

5.4.2 Liquid samples shall be preserved with nitric acid to a pH less than 2. The holding time for samples to be analyzed is 180 days.

5.5 Required Equipment

5.5.1 Equipment

5.5.1.1 Balance, top loader

5.5.1.2 Blender

5.5.1.3 Drying Oven

5.5.1.4 Mortar and pestle

5.5.1.5 Pulverizer

5.5.1.6 Food chopper/grinder

5.5.2 Materials

5.5.2.1 Filter disk, 47 millimeter diameter

5.5.2.2 Plastic tape

5.5.2.3 Marinelli beakers of various sizes

5.5.2.4 Petri dishes, 2.75 inch and 4 inch diameter.

5.6 Reagents/Standards

5.6.1 Deionized water, Type II (1991) obtained from the Millipore unit.

5.6.2 Nitric acid (16N HNO_3) - concentrated.

5.6.3 Beach Sand

5.6.4 Radioactive standards containing multiple radioactive isotopes emitting gamma radiation. All radioactive standards are traceable to calibration by NIST.

5.7 Calibration

5.7.1 On the day of use, the balance shall be checked with Class S weights and shall be within the permissible control limits prior to use.

5.8 Analysis/Operation

5.8.1 Liquid Samples for Gamma Analysis

5.8.1.1 Initiate laboratory worksheet for the samples being analyzed. See Figure 1.

5.8.1.2 Prepare the QC samples specified in section 5.10 at the same time as the client samples.

5.8.1.3 Liquid samples shall be prepared as either a 1000 ml or 2000 ml geometry.

5.8.1.4 The volume of sample used depends on:

5.8.1.4.1 The expected radioactivity in the sample; and/or

5.8.1.4.2 The volume of sample supplied by the client.

5.8.1.5 Confirm that the pH of the sample is less than or equal to 2 for liquid samples. If not, add 16N nitric acid to pH less than or equal to 2. Shake, and allow to stand for a minimum of 16 hours before proceeding. Initiate a Nonconformance Memo documenting that the sample was received by the Radiological Laboratory without proper preservation.

5.8.1.6 Shake the sample to suspend any residue and to ensure that the sample is homogeneous.

5.8.1.7 Using a clean graduated cylinder, measure the required sample volume (1000 or 2000 ml). Record the sample volume on the gamma worksheet.

NOTE: Dilute the sample with DI water to the correct volume if the client does not provide sufficient sample. A nonconformance may be necessary if the contract required detection limit (CRDL) cannot be achieved.

5.8.1.8 Write sample information (ie. ID #) on the beaker.

5.8.1.9 Pour the sample into the appropriately sized marinelli beaker.

5.8.1.10 Place lid securely on the marinelli beaker.

5.8.1.11 Seal the lid using plastic tape.

5.8.1.12 Inspect for leakage.

5.8.1.13 Submit sample for counting.

5.8.2 Soil Samples for Gamma Analysis

5.8.2.1 Initiate the laboratory worksheet for the samples being analyzed. See Figure 1.

5.8.2.2 Prepare the QC samples specified in section 5.10 at the same time as the client samples.

5.8.2.3 Soil samples shall be prepared as either 650 g marinelli geometry or a 45 g petri dish geometry based on the amount of available sample.

5.8.2.3.1 For the 650 g marinelli geometry, the sample should contain no more than 650 grams of soil.

5.8.2.3.2 For the petri dish geometry (2.75 inch diameter), the sample should contain no more than 45 grams of sample.

5.8.2.4 Dry and pulverize the soil sample as described in Procedure SL 13029.

5.8.2.5 Write sample information (ie. ID #) on the sample container.

5.8.2.6 Tare the empty container.

5.8.2.7 Fill the container with the appropriate amount of sample.

5.8.2.8 Record the sample weight on the gamma worksheet.

5.8.2.9 Close the sample container securely.

5.8.2.10 Seal the container with plastic tape.

5.8.2.11 Submit sample for counting.

5.8.3 Vegetation Samples for Gamma Analysis

5.8.3.1 Initiate laboratory worksheet for the samples being analyzed. See Figure 1.

5.8.3.2 Prepare the QC samples specified in section 5.10 at the same time as the client samples.

5.8.3.3 Vegetation samples shall be prepared as solids and counted directly or digested and counted as a liquid (see step 5.8.3.6).

5.8.3.4 For vegetation samples requiring drying and preparation prior to analysis, refer to SOP SL13031, Preparation of Vegetation and Tissue Samples, Section 5.8.1, "Preparation of a Vegetation Sample."

5.8.3.5 A dry solid sample counted directly shall be counted in a 650 g marinelli geometry or in a petri dish (diameter 2.75 inches) geometry. The containers shall be filled with the dried sample.

5.8.3.5.1 Write sample information (ie. ID #) on the container.

5.8.3.5.2 Tare the empty container.

5.8.3.5.3 Place sample in the tared container.

5.8.3.5.4 Weigh sample and record the weight on the worksheet as DRY weight in grams.

5.8.3.5.5 Close the sample container securely, seal with plastic tape and submit to counting for analysis.

5.8.3.6 A sample which must be digested is counted as a liquid sample.

5.8.3.6.1 Digest the sample as described in SOP SL 13031, Section 5.8.2, "Digestion of a Vegetation Sample."

5.8.3.6.2 Shake the sample to suspend any residue and to ensure that the sample is homogeneous.

5.8.3.6.3 Write sample information (ie. ID #) on the marinelli.

5.8.3.6.4 Using a clean graduated cylinder, measure the required sample volume (1000 or 2000 ml). Record the sample volume on the gamma worksheet.

5.8.3.6.5 Pour the sample into the appropriate size marinelli beaker.

5.8.3.6.6 Place lid securely on the marinelli beaker.

5.8.3.6.7 Seal the lid using plastic tape.

5.8.3.6.8 Inspect for leakage.

5.8.3.6.9 Submit sample for counting.

5.8.4 Air Filter for Gamma Counting

5.8.4.1 Air filters will be counted as single filters or as composite filters.

5.8.4.2 Initiate laboratory worksheet for the samples being analyzed. See Figure 1.

5.8.4.3 Air filters shall be counted directly or digested and counted as a liquid (see section 5.8.4.5).

5.8.4.4 Direct Filter Preparation

5.8.4.4.1 Write sample information (ie. ID #) on the planchet.

5.8.4.4.2 Load the air filter(s) into a two inch diameter counting planchet.

5.8.4.4.3 Place counting planchet with air filters into a petri dish.

5.8.4.4.4 Cover the petri dish.

5.8.4.4.5 Secure the petri dish lid with plastic tape.

5.8.4.4.6 Submit sample for counting.

5.8.4.5 Digested Filter Preparation

5.8.4.5.1 Refer to SOP SL13006, Sections 5.8.3.5.2 through 5.8.3.5.10.

5.8.4.5.2 Submit to counting for analysis.

5.8.5 Core Sample for Gamma Counting

5.8.5.1 Initiate laboratory worksheet for the samples being analyzed. See Figure 1.

5.8.5.2 To obtain sample, cut Shelby tube or sample container into two pieces.

5.8.5.2.1 Using a rigid pipe cutter, cut the tube completely through.

5.8.5.2.2 Using a wire saw, cut through the sample.

5.8.5.2.3 Cuts should be made at 2 inch intervals.

5.8.5.3 If more than 650 g of sample is available:

5.8.5.3.1 Weigh the empty container to be used for counting. Select a 650 g marinelli.

5.8.5.3.2 CAREFULLY remove sample from every other sliced section of the Shelby tube.

5.8.5.3.3 Dry and grind the sample as described in SOP SL 13029.

5.8.5.3.4 Tare the sample container.

5.8.5.3.5 Place the dried sample into the container for counting (= to 5.8.5.3.1).

5.8.5.3.6 Record sample weight on worksheet.

5.8.5.3.7 Secure the lid on the container.

5.8.5.3.8 Secure the lid with plastic tape.

5.8.5.3.9 Submit sample for counting.

5.8.5.3.10 Store unused sample in the labeled sample container.

Note: If less than 650 g of sample is available, contact the Laboratory Manager and follow his/her directions.

5.8.6 Preparation of Tissue Samples

5.8.6.1 Initiate laboratory worksheet for the samples being analyzed. See Figure 1.

5.8.6.2 Prepare the QC samples specified in section 5.10 at the same time as the client samples.

5.8.6.3 Determine whether the sample must be counted directly or must be digested and counted as a liquid.

5.8.6.4 If the sample must be counted directly, proceed to step 5.8.6.5.

5.8.6.4.1 If the sample must be digested, follow the instructions provided in SOP SL 13031.

5.8.6.4.2 Follow the instructions in step 5.8.1 to prepare the liquid for counting.

5.8.6.5 Prepare the meat sample to be placed in the appropriate container for counting.

5.8.6.5.1 Wash the sample removing skin, bones and fat as needed.

5.8.6.5.2 Cut the meat into small pieces.

5.8.6.5.3 Grind meat in food chopper/grinder, if required.

5.8.6.5.4 Weigh the record the WET weight in grams.

5.8.6.5.5 Proceed to Step 5.8.2.5 using the 0.5 L marinelli beaker geometry (approximately 650 grams) or the 45 gram petri dish geometry.

5.9 Calculations

5.9.1 None

5.10 Quality Control

5.10.1 The supervisor of the radiochemistry preparation laboratory or designee, shall review the sample generated from implementation of this procedure to confirm that each sample is prepared correctly for analysis by gamma spectroscopy.

5.10.2 For solid samples MS and MSD are not required to be prepared for each batch unless specifically required by the client. The sample may not be homogeneous. A commercially available calibration standard containing a solid matrix may be analyzed with each batch to measure the reproducibility of the gamma spectroscopy system.

5.10.3 For solid samples, the method blank shall be made using clean beach sand and analyzed as a similar manner as the client's samples. For liquid samples, deionized water will be used. For filter samples, 47mm filter disks will be used.

5.10.4 For in-house prepared liquid and solid check standards, the check standard shall contain radioactive isotopes at a concentration of 2 - 5 times the target detection limit specified by the client. The check standard may be counted with subsequent batches in order to measure the reproducibility of the gamma spectroscopy system. An in-house prepared check standard shall be taken out of service after 30 days or upon analysis of new client.

5.10.5 Commercially purchased check standards shall be used until the expiration date noted on the vendor supplied certificate.

5.10.6 Duplicate samples will be analyzed only at the request of the client. Specifically, solid samples are heterogeneous and are not as suitable to measure the reproducibility of the preparation and analysis procedures. In some instances, a prepared sample may be counted on two different detectors in order to measure the reproducibility of the analysis procedures.

QC	Frequency	Criteria (%)	Corrective Action
CS[1]	1/batch ≤20	80-120	reanalyze all samples associated with unacceptable check standard
MB[2]	1/batch ≤20	<TDL[3]	reanalyze samples associated with unacceptable blank except for samples below the detection limit or greater than 10X the blank level
MS	[4]	[4]	[4]
MSD	[4]	[4]	[4]

[1] Check Standard
[2] Method Blank
[3] Target Detection Limit
[4] Client specified

6. *Nonconformance and Corrective Action*

6.1 One time procedural variations are allowed only if deemed necessary in the professional judgement of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variation in procedure shall be completely documented using a Nonconformance Memo and approved by the Technical Director and QA/QC Coordinator. If contractually required, the client will be notified. The Nonconformance Memo will be filed in the project file.

6.2 Any unauthorized deviations from this procedure must be documented as a nonconformance, with a cause and corrective action described. An ITAS Nonconformance Memo shall be used for this documentation. The original Nonconformance Memo will be filed in the Project file.

7. *Records Management/Documentation*

7.1 All documentation supplied by the manufacturer, including Certificates, shall be retained as quality documents in the Quality and Operations files.

7.2 All laboratory documentation generated in Section 5.8 shall be retained as quality documents per Section 7.1.

7.3 Worksheets used to track samples through the analysis process shall be retained in the project files to which they are associated.

7.4 Quality control records associated with particular groups/batches of samples shall be filed in the appropriate project files along with the sample records.

7.5 Nonconformance reports shall be filed in the appropriate project files to which they refer.

Page _____ of _____

ITAS - ST. LOUIS
GAMMA SPEC ANALYSIS

Project No.:_____

Sample #	Matrix	Vol	Sample Collect Date/ Time	Counting Data: pH	Det No.	Count Date											

STANDARD

Prep Date: _____ Standard Solution #_____ Volume (ml)_____

Prep Analyst: _____ Activity (dpm/ml)_____ Reference Date_____

Analyst: _____

Reviewed By: _____

Date Reviewed: _____

Check Standard

Isotope	Target	Found	%Rec

DUP _____

Isotope	Orig	Dup	RPD

QC Acceptable? _____

Blank

Isotope	Activity

SL-92-RAD-0014

Figure 1 Gamma Spec Analysis Worksheet

ATTACHMENT 5 - SOLUBILITY TESTING PROCEDURE

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: GROSS ALPHA/BETA

Prepared By: Mary F. Laughlin Date: 07-12-93

Reviewed By: [signature] Date: 07-22-93
Technical Specialist

[signature] Date: 07-23-93
Quality Control Coordinator

[signature] Date: 7/25/93
Director Quality and Compliance, ITAS

Approved By: [signature] Date: 08-13-93
Laboratory Director

Controlled Copy No. UNCONTROLLED COPY

Key Words: GROSS ALPHA/BETA RADIATION, PREPARATION, RADIOCHEMISTRY

Revision #	0	1	2				
Date	1/21/91	1/21/93	7/02/93				

Regional Office
13715 Rider Trail North • Earth City, Missouri 63045 • 314-298-8566

Title: Gross Alpha/Beta

1. Purpose, Application & Responsibility

1.1 To provide instructions for preparation and analysis of samples for gross alpha and/or beta radioactivity.

1.2 This method is applicable to determination of gross alpha and/or gross beta activity in air filters, water, soil/sediment, and vegetation samples.

1.2.1 Since, in this method for gross alpha and gross beta measurement, the radioactivity of the sample is not separated from the solids of the sample, the solids concentration is very much a limiting factor in the sensitivity of the method for any given water sample. Also, for samples with very low concentrations of radioactivity such as from drinking sources, it is essential to analyze as large a sample aliquot as is needed to give reasonable counting times in meeting the required Minimum Detectable Activity (MDA).

1.2.2 The largest sample aliquot that should be counted for gross alpha activity is that size aliquot which gives a solids density thickness of 7 mg/cm² in the counting planchet. For a 2-inch diameter counting planchet (20 cm²), an aliquot containing 140 mg of dissolved solids would be the maximum aliquot size for that sample which should be evaporated and counted for gross alpha activity.

1.2.3 Radionuclides that are volatile under the sample preparation conditions of this method will not be measured. In some areas of the country the nitrated water solids (sample evaporated with nitric acid present) will not remain at a constant weight after being dried at 105°C for two hours and then exposed to the atmosphere before and during counting. Other radioactivities may also be lost during the sample evaporation and drying at 105°C (such as some chemical forms of radioiodine). Those types of water samples need to be heated to a dull red color for a few minutes to convert the salts to oxides. Sample weights are then usually sufficiently stable to give consistent counting rates and a correct counting efficiency can then be assigned. Some radioactivities, such as the cesium radioisotopes, may be lost when samples are heated to dull red color. Such losses are limitations of the test method.

1.3 Minimum Detectable Activity (MDA)

The MDA achievable by this procedure under routine operating conditions are summarized in the following tables:

GROSS ALPHA on 5.0 cm (2.0")Planchet

Matrix	Sample Analyzed	MDA, Unit	Count[A] time
Air	1 filter (20 cm²)	1 pCi/sample	50 min.
Water	0.10L[B]	5 pCi/L	200 min.
Drinking Water	0.50L[B]	2 pCi/L	200 min.
Soil, Sediment, Vegetation	0.10g	25 pCi/g	200 min.

GROSS BETA on 5.0 cm (2.0")Planchet

Matrix	Sample Analyzed	MDA, Unit	Count[A] time
Air	1 filter (20 cm²)	2 pCi/sample	50 min.
Water	0.10L[B]	4 pCi/L	200 min.
Drinking Water	0.50L[B]	2 pCi/L	200 min.
Soil, Sediment, Vegetation	0.20g	25 pCi/g	200 min.

[A] A lower MDA can be achieved with a longer counting period

[B] Sample volume may need to be adjusted in order not to exceed 140 mg of dried residue on planchet. Volume shown is "typical" maximum volume used.

1.4 Responsibilities: For the purpose of this procedure, the following responsibilities apply:

Analyst: To schedule and order samples requiring gross alpha/beta analysis, to follow this procedure, and to report any abnormal results to the Radiochemistry Group Leader.

Radiochemistry Group Leader :(or designate) to review data prior to release from the lab.

Laboratory Manager: (or designate) to delegate the performance of this procedure to analysts who are qualified to perform this procedure and operate associated equipment.

2. References

2.1 EPA 600/4-80,032, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Method 900.0

2.2 EPA 520/5-84,006, Eastern Environmental Radiation Facility Radiochemistry Procedures Material.

2.3 Method 7110, Gross Alpha and Gross Beta Radioactivity, Standard Methods for the Examination of Water and Waste Water, APHA, AWWA, WPCF, American Public Health Association, Washington, D.C., 18th Edition, 1992.

2.4 American Society for Testing and Materials, 1992, "Standard Specification for Reagent Water, D1193", Annual Book of Standards, Volume 11.01, ASTM, Philadelphia, Pennsylvania.

2.5 ITAS Quality Assurance Manual.

2.6 ITAS-STL Quality Assurance Manual, Laboratory Specific Attachment.

3. Associated SOPs

3.1 St. Louis Laboratory, Standards Preparation, SL 0001, Standards Preparation Procedures.

3.2 St. Louis Laboratory, Automatic Pipetter Calibration, SL 1001, Instrument Calibration Procedures.

3.3 St. Louis Laboratory, Chain-of-Custody, SL 2001, Sample Receipt Procedures.

3.4 St. Louis Laboratory, Personnel Training and Evaluation, SL 7001, Quality Control Procedures.

3.5 St. Louis Laboratory, Nonconformance and Corrective Action, SL 10004, Miscellaneous Procedures.

3.6 St. Louis Laboratory, Preparation of Stainless Steel Planchet for Radiochemistry, SL 10010, Miscellaneous Procedures.

3.7 St. Louis Laboratory, Evaluation of the Sample Transmission Factor, SL13012, Radiochemistry Procedures.

3.8 St. Louis Laboratory, Operation of Low Background Gas Flow Proportional Counting System, SL 13021, Radiochemistry Procedures.

4. Definitions

4.1 Method Blank - A method blank is a laboratory initiated sample consisting of deionized water or sodium sulfate solution, for solid analyses, which is carried through all of the steps of an analysis. This sample serves to monitor the introduction of artifacts into the process.

4.2 QC Batch - A QC batch consists of a group of samples of the same matrix analyzed within the same two week period. A QC batch cannot exceed twenty (20) samples not including method blanks, laboratory control samples, duplicates, and matrix

spike samples.

4.3 Laboratory Control Sample (LCS) - A LCS is a blank sample consisting of deionized water or sodium sulfate solution, for solid analyses, that has been spiked with known quantities of target analytes to monitor system performance. The LCS is analyzed exactly as other samples carried through the method.

4.4 Matrix Spike (MS) - A matrix spike sample for aqueous samples is an aliquot of an original sample that has been spiked with known quantities of target analytes before being subjected to the entire analytical procedure. The recovery of the analytes is determined after the analysis of both the sample and its spiked aliquot. Matrix spikes for solid samples is not routinely performed.

4.5 Matrix Spike Duplicate (MSD) - A matrix spike duplicate is a matrix spike performed at the same levels as the MS.

4.6 Duplicate (DUP) - A duplicate sample is a split sample, both portions of which are analyzed without being spiked with the target analyte.

4.7 Minimum Detectable Activity (MDA) - The smallest amount of activity that can be detected given the conditions of a specific sample. It is reported at the 95% confidence interval, meaning that there is a 5% chance that a false signal was reported as activity, and a 5% chance that true activity went undetected.

5. Procedure

5.1 Summary

5.1.1 Method

5.1.1.1 For total sample activity an aliquot of aqueous sample is evaporated to a small volume, treated with nitric acid to convert any chlorides to nitrates, and transferred quantitatively to a tared counting planchet. The sample residue is dried to constant weight, reweighed to determine dry residue weight, then counted for alpha and/or beta radioactivity.

5.1.1.2 For the activity of dissolved matter an aliquot of aqueous sample is filtered through a 0.45-μm membrane filter. The filtrate is evaporated to a small volume and transferred quantitatively to a tared counting planchet. The sample residue is dried to constant weight, then counted for alpha and/or beta radioactivity.

5.1.1.3 For the activity of suspended matter an aliquot of aqueous sample is filtered through a 0.45-μm membrane filter. The filter is transferred to a tared counting planchet. The sample residue is dried to constant weight, then counted for alpha and/or beta radioactivity.

5.1.1.4 Air filter samples are counted for gross alpha and/or beta activity without further processing.

5.1.1.5 Solid samples are analyzed for gross alpha and/or beta activity either as ash, or as a dry powder, usually without processing.

5.1.2 Training

5.1.2.1 The group/team leader has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience. The analyst

must be given two blind performance samples to analyze or process for analysis. Upon successful completion of the performance evaluation (PE) samples, these analyses shall be documented as initial qualification. Requalification must be performed annually thereafter for the procedure. The group/team leader must document the training and PE performance and submit the results to the QA/QC Coordinator for inclusion into the Associate's training file.

5.2 Safety

Procedures shall be carried out in a manner that protects the health and safety of all IT Associates. The following requirements must be met.

5.2.1 Eye protection that satisfies ANSI Z87.1 (as per the Chemical Hygiene Plan), laboratory coat, full shoes, and appropriate gloves must be worn while samples, standards, solvents, reagents, and wastes are being handled. Disposable gloves that have become contaminated shall be removed and discarded; other gloves shall be cleaned immediately. Working surfaces shall be protected with absorbent paper or other material as appropriate.

5.2.2 The health and safety hazards of many of the chemicals used in this procedure have not been fully defined. Additional health and safety information can be obtained from the Material Safety Data Sheets files maintained in the laboratory. The following specific hazards are known:

5.2.2.1 Chemicals that have been classified as poisons include: nitric acid.

5.2.2.2 The following materials are known to be corrosive: nitric acid.

5.2.2.3 The following materials are known to be oxidizing agents: nitric acid.

5.2.2.4 The materials that are radioactive are natural uranium, plutonium-239, thorium-230, americium-241, cesium-137, and strontium-90.

5.2.3 Exposure to chemicals shall be maintained as low as reasonably achievable. Therefore, unless they are known to be non-hazardous, all samples shall be opened, transferred, prepared, and processed in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers shall be kept closed unless transfers are being made.

5.2.4 The preparation of standards and reagents shall be conducted in a fume hood with the sash closed as far as operations will permit.

5.2.5 All work must be stopped in the event of a known or potential compromise to the health and safety of ITAS Associate. The situation must be reported immediately to a laboratory supervisor.

5.2.6 Waste generated in the procedure shall be segregated, handled, and disposed according to the facility's hazardous waste procedures. The Health and Safety Coordinator should be consulted if additional information is required.

5.3 Interferences

5.3.1 Moisture absorbed by the sample residue increases self absorption and, if uncorrected, leads to low-biased results. If a sample is counted in an internal (windowless) proportional

counter, static charge on the sample residue can cause erratic counting, thereby preventing an accurate count.

5.3.2 Non-uniformity of the sample residue in the counting planchet interferes with accuracy and precision of the method.

5.3.3 Sample weight on the planchet should not be more than 140 mg for gross alpha or gross beta when using the 5.0 cm (2.0") planchet.

5.3.4 When counting alpha and beta particle activity by a gas flow proportional counting system, counting at the alpha plateau discriminates against beta particle activity, whereas counting at the beta plateau includes alpha particle activity present in the sample.

5.4 Preservation and Holding Time

5.4.1 Aqueous samples at the time of collection should be preserved by adding sufficient nitric acid to a pH < 2.

5.4.2 If samples are collected without acidification, they should be brought to the laboratory within 5 days, nitric acid added to bring the pH to 2 or less, the sample shaken, and then held for a minimum of 16 hours in the original container before analysis or transfer of sample.

5.4.3 The sample container: plastic or glass.

5.4.4 The maximum holding time is 180 days from sample collection for all matrices.

5.5 Required Equipment

5.5.1 Analytical Balance (4 - or 5 - place)

5.5.2 Beakers: borosilicate glass, various sizes

5.5.3 Bottle, wash.

5.5.4 Counting planchets, stainless steel, 5.0 cm (2.0").

5.5.5 Desiccator with desiccant, Dri-Rite or equivalent.

5.5.6 Drying oven with thermostat

5.5.7 Filter paper: ashless, Whatman #41, and 0.45-μm membrane, 5.0 cm.

5.5.8 Gas flow proportional counting system

5.5.9 Graduated cylinder - size appropriate to sample volume

5.5.10 Heat lamp

5.5.11 Hot plate-stirrer

5.5.12 pH Meter or narrow-range pH indicating paper

5.5.13 Calibrated pipets, Eppendorf or equivalent

5.5.14 Policeman: rubber or plastic

5.5.15 Porcelain crucibles with lids, approximately 30 ml. capacity.

5.5 16 Muffle furnace.

5.6 Reagents/Standards

5.6.1 Reagents

CAUTION: Refer to Material Safety Data Sheets (MSDS) for specific safety information on chemicals and reagents prior to use or as needed.

5.6.1.1 ASTM Type II (1991) water obtained from the Millipore unit.

5.6.1.2 Nitric acid, concentrated (16N HNO_3) - **WARNING:** Corrosive liquid and hazardous vapor; oxidizer.

5.6.2 Prepared Reagents

Reagents are prepared from reagent grade chemicals, unless otherwise specified below, and reagent water.

CAUTION: During preparation of reagents, Associates shall wear laboratory coat, gloves, safety glasses with side shields, face shield (discretionary), and laboratory approved shoes as a minimum. Reagents shall be prepared in a fume hood.

Replace lab-prepared reagents annually, unless otherwise specified below. As a minimum, label all reagents with chemical name, concentration, date prepared and preparer's initials, and expiration date if less than one year from preparation.

5.6.2.1 4N Nitric acid (4N HNO_3) - Add 250 mL of 16N HNO_3 to 750 ml of reagent water and mix well. **WARNING:** Corrosive; oxidizer.

5.6.2.2 50 mg/ml. Sodium Sulfate (50mg/ml. Na_2SO_4). Dissolve 5g of Na_2SO_4 in 80 ml. of DI water. Dilute to 100 ml and mix well.

5.6.2.3 Natural uranium, thorium - 230, plutonium - 239, americium - 241, cesium - 137 and/or strontium - 90, calibrated - NIST traceable. **CAUTION:** Radioactive.

5.7 Calibration

5.7.1 The ratio of count rate to disintegration rate of the detectors shall be obtained through calibration of the detectors for both alpha and beta activity determinations using geometries and weight ranges similar to those encountered when performing the gross analyses. SOP #SL13021.

5.7.2 Calibration sources shall be traceable to the National Institute of Standards and Technology (NIST). For alpha-particle calibration, use natural uranium (not depleted uranium), thorium-230, plutonium-239, or americium-241. For beta-particle calibration, use cesium-137 or strontium-90 in equilibrium with its daughter yttrium-90.

5.7.3 Balances shall be checked to ensure calibration dates have not expired. Balance shall be in control as determined by routine balance check procedure.

5.8 Analysis/Operation

5.8.1 Aqueous Sample - Total Solid Screen

5.8.1.1 Record all analysis data on a sample worksheet.

5.8.1.2 Shake sample container thoroughly.

5.8.1.3 Pipet a 4 ml. aliquot on to a tared planchet.

5.8.1.4 Evaporate to dryness using a hot plate on low to medium heat. Cool.

5.8.1.5 Reweigh the planchet to estimate solids content of the sample.

5.8.1.5.1 From the net residue weight and sample volume used, determine the sample volume required to meet the target residue weight: Calculation step 5.9.1, 140 mg alpha, beta maximum dried residue on planchet.

NOTE: If alpha and beta are to be determined simultaneously from a single aliquot, the net residue weights for alpha apply.

NOTE: If the sample was previously rad screened as per SOP #SL13015, the total solid content can be determined from this procedure and steps 5.8.1 through 5.8.1.5.1 omitted.

5.8.2 Aqueous Sample Total Activity

5.8.2.1 Initiate appropriate sample worksheet for the samples to be analyzed and complete as required. (Figure 1)

5.8.2.2 Ensure that samples are acidic (pH < 2) prior to beginning analysis. If pH > 2, adjust accordingly with 16 N HNO_3 and wait 16 hours prior to beginning analysis. Notify laboratory supervisor and initiate a Nonconformance memo.

5.8.2.3 Shake the sample container thoroughly. Measure a volume of sample, previously determined in steps 5.8.1 through 5.8.1.5.1, with a graduated cylinder or a pipet into an appropriately sized beaker. Record volume of sample used.

5.8.2.4 Add 5 ml of 16N nitric acid.

5.8.2.5 Evaporate to near dryness using a medium to low temperature hot plate. Do not allow residue to "bake" on hot plate.

5.8.2.6 Quantitatively transfer the sample to a tared, stainless steel planchet.

5.8.2.7 Using a rubber policeman if needed to complete the transfer. Wash down the beaker wall with small portions of 4 N HNO_3 and add to the planchet.

5.8.2.8 Evaporate to dryness on a warm hot plate so that the sample does not boil. Remove sample from hot plate. Allow to cool.

5.8.2.9 Weigh the cooled planchet and record final weight.

NOTE: If alpha and beta are to be determined simultaneously from a single aliquot, the net residue weights for alpha apply.

140 mg (alpha,beta 5.0 cm planchet).

5.8.2.10 Store dry sample in a desiccator until counted for gross alpha and/or beta activity. Submit the sample for counting.

5.8.3 Oil

5.8.3.1 Initiate appropriate sample worksheet for the samples to be analyzed and complete as required.

5.8.3.2 Fill a 30 ml porcelain crucible ¼ full with confetti made from Whatman No. 41 filter paper.

5.8.3.3 Place crucible on analytical balance, then zero the balance.

5.8.3.4 Weigh to the nearest 0.0001 g, approximately 5 gm sample of the oil onto the shredded filter paper. Record the sample weight. Cover with a crucible lid.

5.8.3.4.1 If the sample is a mixture of oil and water, evaporate the water on a hot plate or under a heat lamp before muffling.

5.8.3.5 Heat the sample in a muffle oven for one hour at 750° C.

5.8.3.6 Remove the sample from the muffle oven and allow the sample to cool to room temperature.

5.8.3.7 Add approximately 2 ml of 4 N nitric acid to the residue in the crucible.

5.8.3.8 Quantitatively transfer the sample to a tared, stainless steel planchet, with 4 N nitric acid.

5.8.3.9 Use a policeman if needed to complete the transfer. Wash down the crucible walls with small portions of 4 N HNO_3 and add to planchet from step 5.8.3.8.

5.8.3.10 Evaporate to dryness on a warm hot plate so that the sample does not boil. Remove and cool.

5.8.3.10.1 If a green residue from chlorides which may be present forms, obtain technical assistance on how to proceed.

5.8.3.11 Weigh the cooled planchet and record final weight.

CAUTION: Ensure that the solids content do not exceed the maximum allowed weight for the determination and planchet used.

5.8.3.12 Store dry sample in a desiccator until counted for gross alpha and/or beta activity.

5.8.3.13 Submit the sample for counting.

5.8.4 Air Filter Samples

5.8.4.1 Initiate appropriate sample worksheet for the samples to be analyzed and complete as required. (Figure 1)

5.8.4.2 Secure the air filter in a stainless steel planchet with double-sided cellophane tape such that no portion of filter extends above the lip of the planchet.

5.8.4.3 Submit the air filter sample to the counting room.

5.8.5 Solid Samples

5.8.5.1 Initiate appropriate sample worksheet for the samples to be analyzed and complete as required. (Figure 1)

5.8.5.2 Remove an aliquot (typically 1 - 5 gm.) with a spatula and place into a clean, labeled aluminum pan. (Weighing pans work well)

5.8.5.3 Place sample on a medium to high hot plate and evaporate any moisture.

5.8.5.4 Remove from hot plate and allow sample to cool.

5.8.5.5 Using a metal spatula, reduce the solid sample to a fine particle size.

NOTE: Sample size is restricted to 140 mg for alpha/beta analysis.

5.8.5.6 Self adhesive label dots of the chosen planchet size can be used advantageously to hold finely divided solid material uniformly for gross alpha and/or beta analysis. Tare the prepared planchet.

5.8.5.7 Distribute the sample ash evenly in a tared stainless steel planchet.

5.8.5.8 Weigh and record the gross sample weight.

5.8.5.9 Submit samples to counting room.

5.9 Calculations

5.9.1 To calculate the aqueous sample volume required (ml) use the following equation.

$$mL\ required = \frac{target\ net\ residue\ weight\ (mg) \times initial\ aliquot\ volume\ (mL)}{initial\ aliquot\ net\ residue\ weight\ (mg)}$$

5.9.2 To calculate the density (mg/cm^2) use the following equation.

$$mg/cm^2 = \frac{net\ residue\ weight\ (mg)}{20.27 cm^2\ (2''\ planchet)}$$

5.9.3 Calculate the MDA for samples when any one of the following conditions are met:

5.9.3.1 R_s is less than R_b

5.9.3.2 The calculated activity is less than the error value. This can occur when R_s is greater than R_b, and it indicates interference such that an accurate determination may not be possible under these conditions.

MDA (pCi/unit mass or volume) =

$$4.65 \frac{\sqrt{R_b \times t_s} + 2.71}{2.22 \times AE \times TF \times V \times t_s}$$

Use the equations below to calculate sample activity and error for alpha and beta:

Activity (pCi/unit mass or volume) =

$$\frac{R_s - R_b}{2.22 \times AE \times TF \times V}$$

Error (pCi/unit mass or volume) =

$$1.96 \times Act. \times \sqrt{\frac{(Rs \times ts) + (Rb \times ts)}{((Rs \times ts) - (Rb \times ts))^2} + .0025}$$

Definitions

Rs = sample count rate, alpha or beta
Rb = background count rate, alpha or beta
2.22 = conversion factor, dpm/pCi
AE = absolute efficiency, alpha or beta
TF = transmission factor, alpha or beta
V = sample volume
Ts = sample counting time, alpha or beta
tb = background counting time, alpha or beta
1.96 = statistical constant
4.65 = statistical constant

5.9.4 Calculate the Relative Percent Difference (RPD) for all duplicate analysis using the equation below:

RPD (in percent) =

$$\frac{|Original - Duplicate|}{1/2\ (Original + Duplicate)} \times 100$$

5.10 Quality Control

5.10.1 Measure and record a method blank and one laboratory control sample with every analytical batch of 20 samples or less.

5.10.2 Activity in the method blank shall be less than the target or Minimum Detectable Activity (MDA).

5.10.3 The acceptable criteria for the LCS is ± 3σ from the mean as determined by laboratory control charts.

5.10.4 A duplicate sample is analyzed every 20 samples or less. Calculate the Relative Percent Difference (RPD) for all duplicate analyses. The suggested acceptance limit is the difference between the sample and its duplicate should be no greater than the 2σ error of the sample.

5.10.5 Matrix spike/matrix spike duplicates will be analyzed on project-specific basis. The suggested limits for the MS/MSD is ± 25% recovery.

5.10.6 Additional quality control measures (analysis of sample duplicates, for example) will be performed if they are requested by the client. The requirements of a client Quality Assurance Project Plan (QAPP) will have precedence over the requirements of this SOP in cases where they differ.

6. Nonconformance and Corrective Action

6.1 Any deviation from this SOP must be approved by the Quality Control Coordinator.

6.2 Any unauthorized deviation from this SOP shall be documented as a Nonconformance with a cause and corrective action described.

6.3 Samples associated with method blanks or laboratory control samples which fail the criteria of section 5.10 must be prepared and re-analyzed with an acceptable blank and LCS. For projects requiring matrix spikes and/or duplicate analysis, data will be reported with appropriate flags when the results fall outside the suggested control limits. No reanalysis will be performed for out-of-control matrix spikes or duplicates unless specifically requested by a project manager.

7. Records Management/ Documentation

7.1 Record all analysis data on a sample data sheet (Figures 1 and 2). Include all method blanks, LCSs, duplicates, and MS/MSDs.

7.2 All raw data, data run logs, copies of standard logs, and quality control charts are released to the Document Control Coordinator after review and approval.

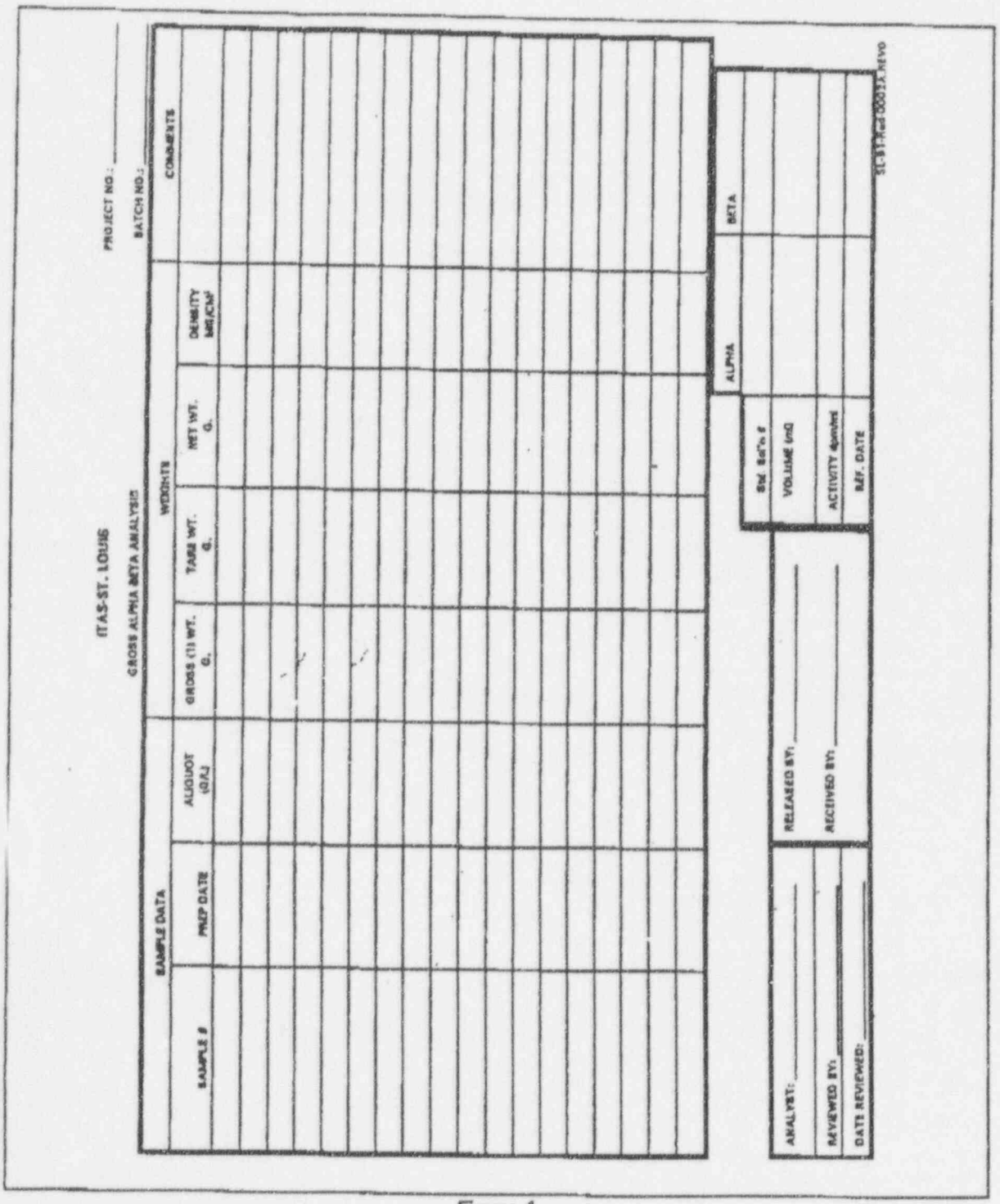

ITAS-ST. LOUIS
GROSS ALPHA BETA ANALYSIS
PROJECT NO.:
BATCH NO.:
SAMPLE DATA
WEIGHTS
COMMENTS
SAMPLE #
PREP DATE
ALIQUOT (Q/L)
GROSS (1) WT. G.
TARE WT. G.
WET WT. G.
DENSITY MEAS'M'
ALPHA
BETA
Std. Soln. #
VOLUME (mL)
ACTIVITY (pCi/mL)
REF. DATE
ANALYST:
REVIEWED BY:
DATE REVIEWED:
RELEASED BY:
RECEIVED BY:

Figure 1

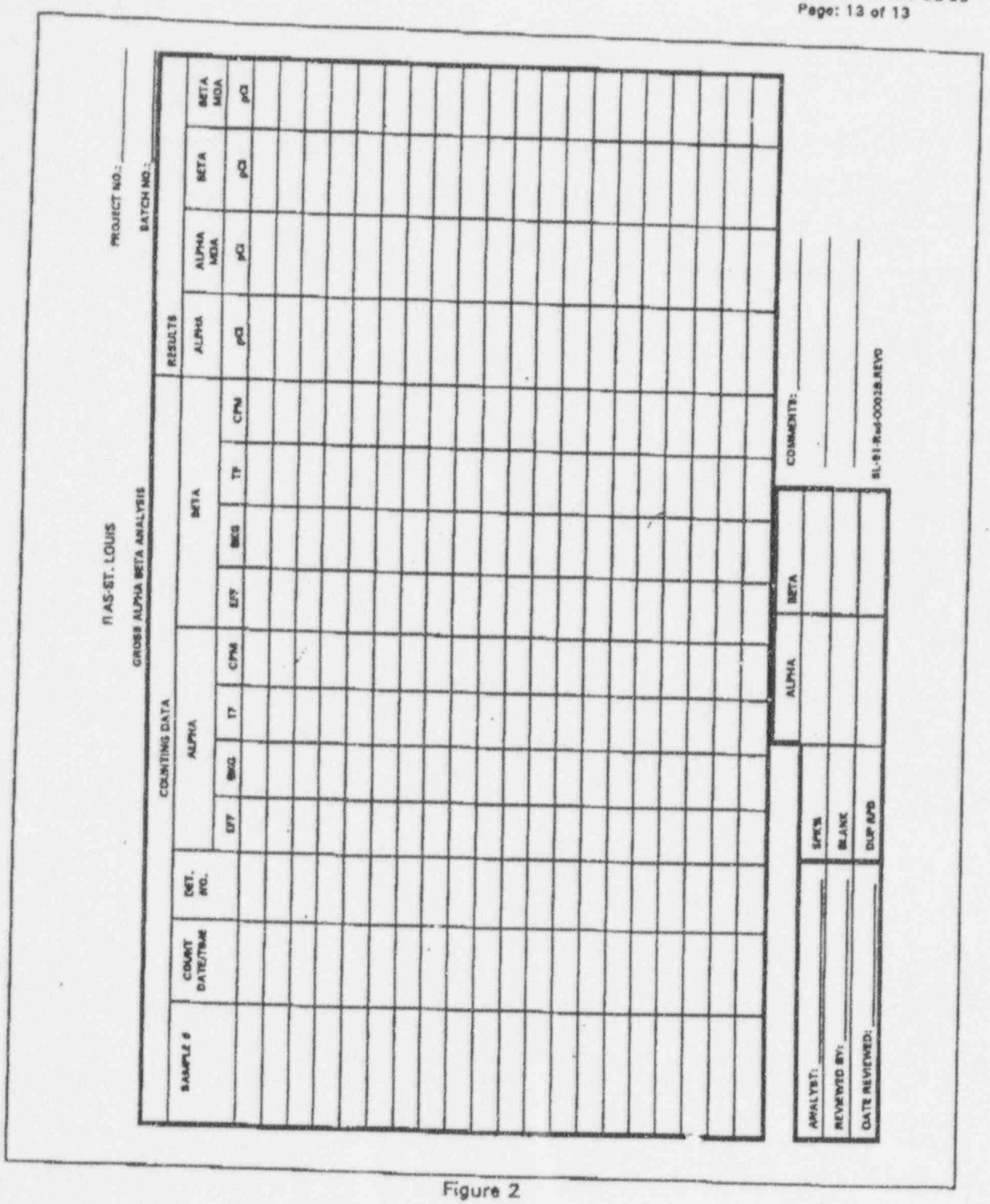

PROJECT NO.:
BATCH NO.:
GROSS ALPHA BETA ANALYSIS
COUNTING DATA
RESULTS
SAMPLE #
COUNT DATE/TIME
DET. NO.
ALPHA
BETA
EF7
BKG
T7
CPM
EF7
BKG
T7
CPM
ALPHA
ALPHA MDA
BETA
BETA MDA
pCi
COMMENTS:
ALPHA
BETA
ANALYST:
REVIEWED BY:
DATE REVIEWED:
SPKS
BLANK
DUP APD
SL-91-Rad-00028.REVD

Figure 2

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory Standard Operating Procedure

Title: CALIBRATION OF THE LOW BACKGROUND GAS FLOW PROPORTIONAL COUNTING SYSTEM

Prepared By: Patricia A Haworth Date: 01-26-93

Reviewed By: R A Thomas Date: 01-26-93
Technical Specialist

M Winter Date: 01-26-93
Quality Control Coordinator

Date: 1/29/93
Director Quality and Compliance, ITAS

Approved By: R. C. Stutz Date: 1/29/93
Laboratory Director

Controlled Copy No: UNCONTROLLED COPY

Key Words: GAS PROPORTIONAL, CALIBRATION, RADIOCHEMISTRY

Revision #	0						
Date	1/22/93						

Regional Office
13715 Rider Trail North • Earth City, Missouri 63045 • 314-298-8566

9502130110 950

CONTROLLED COPY NO.:

ITAS ST. LOUIS LABORATORY
PROCEDURE/DOCUMENT CHANGE

PROCEDURE/DOCUMENT TITLE AND NUMBER:

Calibration of the Low Background Gas Flow Proportional Counting System - SL 13019

PROCEDURE/DOCUMENT SECTION(S) AFFECTED BY CHANGE:

5.8.1.4
5.8.2.7
5.8.3.13

REASON FOR ADDITION OR CHANGE:

To make Calibration Documentation uniform for all detectors.

CHANGE EFFECTIVE FROM: 07-16-93 (DATE) TO: Rev. 1 (DATE)

SAMPLES OR PROJECTS AFFECTED:

None.

CHANGE OR ADDITION (SPECIFY SECTION, USE ADDITIONAL SHEETS IF NECESSARY):

5.8.1.14 Record calibration information in the LB4000 Calibration Log, and retain all calibration data in the counting room files.

5.8.2.7 Record calibration information in the LB4000 Calibration Log, and retain all calibration data in the counting room files.

5.8.3.13 Record calibration information in the LB4000 Calibration Log, and retain all calibration data in the counting room files.

SUBMITTED BY: Patricia A Haworth DATE: 07-16-93

Roxanne Patterson 07-19-93 TECHNICAL DIRECTOR/SPECIALIST

Frank Yoke 08-13-93 LABORATORY MANAGER

07-19-93 QUALITY CONTROL COORDINATOR

7/29/93 DIRECTOR, QUALITY ASSURANCE & COMPLIANCE

SL-91-QA-0001

Title: Calibration of the Low Background Gas Flow Proportional Counting System

1. Purpose, Application & Responsibility

1.1 This procedure provides instructions for the calibration of the Low Background Gas Flow Proportional Counting instrumentation.

1.2 These instructions are applicable to all Low Background Gas Flow Proportional Counting instruments.

1.3 Responsibilities:

Group Leader for the Radiochemistry Counting Lab: to confirm that this procedure is followed whenever the calibration of the Low Background Proportional Counting instruments is performed.

Radiochemistry Laboratory Manager: (or designee) to delegate the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

Laboratory Technician: to follow the instructions and to report any abnormalities, immediately, to the Group Leader for the Radiochemistry Counting Lab. To confirm that all equipment used is working properly prior starting this procedure.

2. References

2.1 U.S. Nuclear Regulatory Commission, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, Regulatory Guide 4.15.

2.2 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

2.3 ITAS Quality Assurance Manual.

2.4 ITAS-St. Louis Quality Assurance Manual, Laboratory Specific Attachment.

2.5 "Handbook for Analytical Quality Control in Radioanalytical Laboratories", L.G. Kanipe, EPA-600/7-77-088, August 1977.

2.6 "LB4000 Instruction Manual", Tennelec Rev. 9/90.

3. Associated SOPs

3.1 St. Louis Laboratory, Standards Preparation, SL0001, Standards Preparation Procedures.

3.2 St. Louis Laboratory, Nonconformance and Corrective Action, SL0004, Quality Control Procedures.

3.3 St. Louis Laboratory, Daily Calibration Verification and Maintenance of the Low Background Proportional Counting Instrumentation, SL13020, Radiochemistry Procedures.

3.4 St. Louis Laboratory, Operation of the Low Background Proportional Counting Instrumentation, SL13021, Radiochemistry Procedures.

4. Definitions

4.1 αLL - discriminator setting indicating the alpha lower voltage limit.

4.2 Alpha Voltage Only - detector voltage capable of collecting ions created by alpha radiation only. Ion pairs created by beta radiation are not collected.

4.3 αUL - discriminator setting indicating the alpha upper voltage limit.

4.4 βLL - discriminator setting indicating the beta lower voltage limit.

4.5 βUL - discriminator setting indicating the beta upper voltage limit.

4.6 Crosstalk - a measure of the amount of beta radiation that is collected in the alpha radiation channel; it is also a measure of alpha radiation collected in the beta channel.

4.7 Plateau - a point on a graph of count rate vs. detector bias voltage where further increases in bias will not result in an increase in measured counting rate.

5. *Procedure*

5.1 Summary

5.1.1 This procedure provides instructions for the calibration of the Low Background Gas Flow Proportional Counting Instrumentation.

5.1.1.1 Instrument calibration consists of selecting a detector voltage plateau to establish the operating voltage for both alpha and beta counting, setting upper and lower discriminators for both alpha and beta to minimize crosstalk, and an efficiency calibration for each detector.

5.1.1.2 A plateau is a point on a graph of counting rate vs. detector bias voltage. This is determined by counting a SR-90 and Am-241 in each detector. The count is started at a setting of 900 V and increased in steps of 30 V up to 1800 V, each step voltage is counted for approximately 5 minutes. The count rate vs. voltage is graphed indicating a rise in count rate to a plateau where the count rate is stable, then another rise in count rate. The optimum operating voltage is selected according to two criteria: 1) the upper end of the spectrum must fall into the linear range of the system 0 to 8 volts in the LB4000 and 2) the LLD setting for that same spectrum must be on the plateau such that drifts in the system do not move the signal level below the plateau knee. The point at which the count rate levels off is called the knee.

5.1.1.3 Minimization of α,β crosstalk is determined by the βUL and αLL settings. The detector voltage is set as described in 5.8.1, the βUL is set to 1000, and the αLL to 1001. A Sr-90 source is counted then the α counts and α + β counts are recorded. The process is repeated using a Po-210 source. The β into α crosstalk is the fraction α1/(α + β1) from the first measurement, and the α into β crosstalk is the fraction β2/(α2 + β2) from the second measurement. Moving the βUL/αLL thresholds up or down will change the crosstalk ratios. The discriminator should be adjusted to minimize the alpha:beta crosstalk ratio to less than 1:67 (< 1.5%). The discriminator should be adjusted to minimize the beta:alpha crosstalk ratio to less than 0.1%.

5.1.1.4 The detector efficiencies are determined by counting Sr-90 and Th-230 on each detector. Each source is counted 5 times for a time sufficient to accumulate at least 20,000 counts. The results are recorded, averaged, decay corrected, and the efficiencies calculated.

5.1.1.5 This procedure is performed every three years or as indicated by SOP SL13020.

5.1.2 The group/team leader has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience. The analyst must be given two blind performance samples to analyze or process for analysis. Upon successful completion of the performance evaluation (PE) samples, these analyses will be documented as initial qualification. Requalification must be performed annually thereafter for this procedure. The group/team leader must document the training and PE performance and submit the results to the QA/QC Coordinator for inclusion in associate training files.

5.2 Safety

5.2.1 Procedures shall be carried out in a manner that protects the health and safety of all IT associates. The following requirements must be met:

5.2.1.1 Eye protection that satisfies ANSI Z87.1 (as per the Chemical Hygiene Plan), laboratory coat, and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated will be removed and discarded, other gloves will be cleaned immediately.

5.2.2 No hazardous chemicals are used in this procedure.

5.2.3 All work must be stopped in the event of a known or potential compromise to the health or safety of any ITAS Associate. The situation must be reported immediately to a laboratory supervisor.

5.2.4 Waste generated in the procedure will be segregated, and disposed according to the facility hazardous waste procedures. The Health and Safety Coordinator should be contacted if additional information is required.

5.3 Interferences

5.3.1 None

5.4 Preservation and Holding Time

5.4.1 None

5.5 Required Equipment

5.5.1 Low background Gas Flow Proportional Counter, equivalent to Tennelec LB4000.

5.5.2 P-10 gas mixture - 90% Argon, 10% methane.

5.5.3 Blank planchets - clean, 2" diameter.

5.5.4 PC based data acquisition system.

5.6 Reagents/Standards

5.6.1 Sources listed below shall be traceable to the National Institute of Standards and Technology:

5.6.1.1 Sr-90 sources.

5.6.1.2 Am-241 sources.

5.6.1.3 SrY-90 source.

5.6.1.4 Th-230 source.

5.6.1.5 Po-210 source.

5.7 Calibration

5.7.1 This procedure gives instructions for performing the necessary calibrations for the LB4000 and therefore, requires no prior calibration to be performed.

5.7.2 The gas flow proportional counter shall be calibrated initially and at least 3 years thereafter. Calibration may be required if indicated during the operation of the instrument. Acceptance Criteria are specified in SOP SL13020.

5.8 Analysis/Operation

5.8.1 Voltage Calibration

5.8.1.1 Confirm that the printer is properly connected.

5.8.1.2 Place the Am-241 sources in drawers A and B, and Sr-90 in drawers C and D.

5.8.1.3 Confirm that all the commands in the Automatic Sequence field (page 3 on the screen) are filled. The repeat command is ignored.

5.8.1.4 Page down to Page 4, type in the start, stop, and step voltages.

NOTE: Gating must be set to No for plateau generation.

5.8.1.5 Enter the preset time, it shall be long enough to accumulate at least 10,000 counts per point, and at least-squares fit shall be used on the accumulated data.

5.8.1.6 Start the count by pressing "F1". The plateau measurements can be terminated by pressing "ALT D".

NOTE: A plateau measurement can be initiated only from Page 4, and while a plateau is running, Page 4 cannot be exited, nor can the preset time be changed.

5.8.1.7 When the plateau measurement is complete, SAVE to file (ex. Am-241). This will allow retrieval of the data for graph generation. Record filename and date in the calibration log.

5.8.1.8 Print the results, sign and date.

5.8.1.9 Place the Am-241 source(s) in drawers C and D, and Sr-90 source(s) in drawers A and B. Repeat steps 5.8.1.3 through 5.8.1.9.

5.8.1.10 Graph the results from the printouts generated in step 5.8.1.8, sign and date.

5.8.1.11 From the graphs identify the plateaus for both alpha and beta and choose a point that falls on both plateaus the associated voltage will be the operating voltage for combined mode counting.

5.8.1.12 Repeat steps 5.8.1.3 through 5.8.1.8 for the Alpha Only counting mode using the Am-241 source(s) only.

NOTE: Select the Alpha Only Voltage counting mode by Paging down to page 3 and pressing "ALT T", then page down until page 1 appears on the screen.

5.8.1.13 Repeat steps 5.8.1.10 and 5.8.1.11 for the Alpha Only counting mode.

5.8.1.14 Retain all calibration data in the counting room files.

5.8.2 Crosstalk Calibration

5.8.2.1 Set the detector bias to approximately 1425V or the voltage as determined in section 5.8.1, the βUL to 1000, and the αLL to 1001.

5.8.2.2 Place a Sr-90 source in the detector channel for which the crosstalk is to be set, and count the source.

NOTE: The total number of counts must be at least 125,000. It is permissible to use a source having an intensity of 100,000 CPM or more.

5.8.2.3 Record the α counts and the $\alpha + \beta$ counts.

5.8.2.4 Calculate the crosstalk ratio for $\alpha:\beta$ and $\beta:\alpha$ (see 5.9.1).

5.8.2.5 Repeat steps 5.8.2.2 and 5.8.2.4 using the Po-210 source.

5.8.2.6 The crosstalk ratio can be adjusted by moving the αLL and βUL thresholds up and down.

NOTE: The crosstalk ratio should be as low as possible and ideally the α into β crosstalk should be less than 1.5% and the β into α crosstalk should be less than 0.1%. Continue to adjust the thresholds to get the lowest possible ratio.

5.8.2.7 Retain all data in the counting room files.

5.8.3 Efficiency Calibration

5.8.3.1 Select the Alpha/Beta Combined Voltage counting mode.

5.8.3.2 Place a Th-230 source in the detector for which the efficiency is to be determined. Count the source for a time adequate to collect a minimum of 20,000 counts.

5.8.3.3 Print the screen and record the count rate of the source.

5.8.3.4 Repeat steps 5.8.3.1 through 5.8.3.3 five (5) times for each detector.

5.8.3.5 Calculate the mean and standard deviation of the five (5) counts (see 5.9.2 and 5.9.3).

5.8.3.6 Correct the activity of the source for decay and calculate the detector efficiency (see 5.9.4 and 5.9.5).

5.8.3.7 Place a Sr-90 source in the detector for which the efficiency is to be determined. Count the source for a time adequate to collect a minimum of 20,000 counts.

5.8.3.8 Print the screen and record the count rate of the source.

5.8.3.9 Repeat steps 5.8.3.4 and 5.8.3.5 five (5) times for each detector.

5.8.3.10 Repeat step 5.8.3.6.

5.8.3.11 Select the Alpha Only Voltage counting mode by Paging down to page 3 and pressing "ALT T", then page down until page 1 appears on the screen.

5.8.3.12 Repeat steps 5.8.3.2 through 5.8.3.6.

5.8.3.13 Retain all data in the counting room files.

5.9 Calculations

5.9.1 Calculate the crosstalk percentage for

section 5.8.2 as follows:

$$r1 = \frac{\alpha 1}{\alpha 1 + \beta 1} \times 100$$

$$r2 = \frac{\beta 2}{\alpha 2 + \beta 2} \times 100$$

r1 = β into α ratio
r2 = α into β ratio
$\alpha 1$ = alpha value from first measurement
$\beta 1$ = beta value from first measurement
$\alpha 2$ = alpha value from second measurement
$\beta 2$ = beta value from second measurement

5.9.2 Calculate the mean for section 5.8.3 as follows:

$$X = \frac{\sum x_i}{n}$$

X = the mean
x_i = the ith x data value
n = number of data values

5.9.3 Calculate the standard deviation for section 5.8.3 as follows:

$$s = \sqrt{\frac{\sum (x_i - x)^2}{n - 1}}$$

5.9.4 Calculate for decay correction for section 5.8.3 as follows:

$$A = A_o \cdot e^{-0.693 \cdot t/T1/2}$$

A = activity remaining after a time interval, t
A_o = activity of sample at some original time
e = base of natural log; 2.718
t = elapsed time
$T_{\frac{1}{2}}$ = halflife of a particular radioactive element

5.9.5 Calculate the detector efficiency for section 5.8.3 as follows:

$$C.E. = \frac{cpm}{dpm}$$

C.E. = detector efficiency
cpm = source count rate
dpm = source activity

5.10 Quality Control

5.10.1 Quality Control (QC) checks are performed daily to document the operating conditions of the proportional counter. Acceptance criteria for the QC checks are specified on procedure SOP SL13020, Daily Calibration Verification and Maintenance of the Low Background Proportional Counting Instrumentation.

5.10.2 Check the expiration date of the radioactive standards to confirm the material is current and certified. The expiration of a standard is specified in SOP SL0001, Standards Preparation.

5.10.3 This procedure shall be approved by the Quality Assurance staff for completeness and concurrence with the calibration criterion prior to issue.

6. *Nonconformance and Corrective Action*

6.1 One time procedural variations are allowed only if deemed necessary in the professional judgement of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall be completely documented using a Nonconformance Memo and approved by the Technical Director and QA/QC coordinator. If contractually required the client will be notified. The

Nonconformance Memo will be filed in the project file.

6.2 Any unauthorized deviations from this procedure must be documented as a nonconformance, with a cause and corrective action described. An ITAS Nonconformance Memo shall be used for this documentation. The original Nonconformance Memo will be filed in the project file.

7. *Records Management/Documentation*

7.1 A compilation of calibration data must be maintained in the counting lab and QC files, and be available to analysts at all times.

7.2 Maintain at a minimum a hard copy of the Low Background Gas Flow Proportional Counter Calibration Data Package.

7.3 Out dated Calibration data shall be released to Document Control.

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: DAILY CALIBRATION VERIFICATION AND MAINTENANCE OF THE LOW BACKGROUND GAS FLOW PROPORTIONAL COUNTING SYSTEM

Prepared By: Patricia A Haworth **Date:** 05/22/92

Reviewed By: B. Thomas **Date:** 11/11/92
Technical Specialist

Margaret Winter **Date:** 11/11/92
Quality Control Coordinator

Date: 11/18/92
Director Quality and Compliance, ITAS

Approved By: R. C. Stiltz **Date:** 11/20/92
Laboratory Director

UNCONTROLLED COPY

Controlled Copy No: _____

Key Words: LOW BACKGROUND, DAILY CALIBRATION, GAS FLOW

Revision #	0						
Date	5/22/92						

CONTROLLED COPY NO.:

ITAS ST. LOUIS LABORATORY

PROCEDURE/DOCUMENT CHANGE

PROCEDURE/DOCUMENT TITLE AND NUMBER:

Daily Calibration Verification and Maintenance of the Low Background GAS Flow Proportional Counting System - SL 13020.

PROCEDURE/DOCUMENT SECTION(S) AFFECTED BY CHANGE:

5.8.2.7, 5.8.1.3

REASON FOR ADDITION OR CHANGE:

Changed sources used, (5.8.2.7)

5.8.1.3 (not necessary)

CHANGE EFFECTIVE FROM: 07-16-93 (DATE) TO: REV 1 (DATE)

SAMPLES OR PROJECTS AFFECTED:

None.

CHANGE OR ADDITION (SPECIFY SECTION, USE ADDITIONAL SHEETS IF NECESSARY):

5.8.2.7 Measure the detector background for 30 minutes. At the completion of the count, print the data using "Print Screen".

5.8.1.3 Delete.

SUBMITTED BY: Patricia A Haworth DATE: 07-16-93

Roxanne Patterson 07-19-93, TECHNICAL DIRECTOR/SPECIALIST

[signature] 08-13-93, LABORATORY MANAGER

[signature] 07-19-93, QUALITY CONTROL COORDINATOR

[signature] 7/28/93, DIRECTOR, QUALITY ASSURANCE & COMPLIANCE

SL-91-QA-0001

Title: *Daily Calibration Verification and Maintenance of the Low Background Gas Flow Proportional Counting System*

1. *Purpose, Application & Responsibility*

1.1 This procedure provides instructions for the daily calibration and maintenance of the Low Background Proportional Counting instrumentation.

1.2 These instructions are applicable to all Low Background Proportional Counting instruments.

1.3 Responsibility: for the purpose of this procedure the following responsibilities apply:

Radiochemistry Counting Lab Group Leader: to confirm that this procedure is followed whenever the daily calibration and maintenance of the Low Background Proportional Counting instruments is performed.

Radiochemistry Laboratory Manager, or designee: to delegate the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

Laboratory Technician: to follow the instructions and to report any abnormalities to the Group Leader for the Radiochemistry Counting Lab, immediately. Shall be responsible for confirming that all equipment used is working properly prior to starting this procedure.

2. *References*

2.1 U.S. Nuclear Regulatory Commission, Quality Assurance for Radiological Monitoring Programs (Normal Operations) -Effluent Streams and the Environment, Regulatory Guide 4.15.

2.2 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

2.3 ITAS Quality Assurance Manual.

2.4 ITAS-St.Louis Quality Assurance Manual, Laboratory Specific Attachment.

2.5 "Handbook for Analytical Quality Control in Radioanalytical Laboratories", L.G. Kanipe, EPA-600/7-77-088, August 1977.

3. *Associated SOPs*

3.1 St. Louis Laboratory, Calibration of the Low Background Gas Flow Proportional Counting System, SL13019, Radiochemistry Procedures.

3.2 St. Louis Laboratory, Operation of the Low Background Gas Flow Proportional Counting System, SL13021, Radiochemistry Procedures.

3.3 St. Louis Laboratory, Nonconformance and Corrective Action, SL10004, Quality Control Procedures.

4. *Definitions*

4.1 IQC - a computerized Quality Control Program where the counting results of Radioactive check sources are entered and compared to calculated averages. A measurement within ± 3 standard deviations indicates the detector is operating within acceptable parameters.

4.2 Out of Service - a detector or piece of equipment is not to be used for sample analysis until problems have been corrected.

5. *Procedure*

5.1 Summary

5.1.1 This procedure provides instructions for the daily calibration and maintenance of the Low Background Proportional Counting Instrumentation.

5.2 Safety

5.2.1 All applicable safety and compliance guidelines set forth by IT Corporation, and by federal, state and local regulations must be followed during performance of this procedure. All work must be stopped in the event of a known or potential compromise to the health or safety of any ITAS Associate, and must be reported immediately to a laboratory supervisor.

5.3 Interferences

5.3.1 A detector contaminated with radioactive material will result in a high background and interfere with the correct measurement of a sample.

5.4 Preservation and Holding Time

5.4.1 Not Applicable.

5.5 Required Equipment

5.5.1 Low Background Proportional Counter, equivalent to a Tennelec LB4000

5.5.2 P-10 gas mixture, 90% argon,10% Methane

5.5.3 Blank planchets

5.5.4 PC based data acquisition system

5.6 Reagents/Standards

5.6.1 Radioactive check sources to measure total beta radiation, approximately 1000 dpm Sr-90.

5.6.2 Radioactive check sources to measure total alpha radiation, approximately 1000 dpm of Am-241 or Pu-239.

5.7 Calibration

5.7.1 Each detector calibration shall be checked before analysis. The methods to check the calibration of the detectors are described in this procedure.

5.8 Analysis/Operation

5.8.1 Initial Setup

5.8.1.1 Establish the normal instrument settings for all controls as described below:

Tank Flow 8 psi

Flow Cells >.2 SCFH

High Voltage As indicated in the LB4000 parameter setting file located in the count lab file cabinet.

5.8.1.2 If counting gas has just been changed or turned on, allow a minimum purge time of 30 minutes prior to operation.

5.8.1.3 Record the status of gas, flow, high voltage, and counting mode in the Alpha/Beta Calibration Log Book.

5.8.2 Data Acquisition

5.8.2.1 Place the Alpha check sources in drawers A and B, and the beta check sources in drawers C and D.

CONTROLLED COPY NO.:

ITAS ST. LOUIS LABORATORY

PROCEDURE/DOCUMENT CHANGE

PROCEDURE/DOCUMENT TITLE AND NUMBER: ITAS-St. Louis Standard Operating Procedure:
SL13020, Daily Calibration, Verification and Maintenance of the Low Background Gas Flow Proportional Counting System

PROCEDURE/DOCUMENT SECTION(S) AFFECTED BY CHANGE:

Section 5.10.4

REASON FOR ADDITION OR CHANGE:

Rather than performing a weekly visual review of all IQC data, we will use a daily report feature offered by IQC.

CHANGE EFFECTIVE FROM: 01-22-93 (DATE) TO: Rev 1 (DATE)

SAMPLES OR PROJECTS AFFECTED:

All detectors will be evaluated using SOP 13020.

CHANGE OR ADDITION (SPECIFY SECTION, USE ADDITIONAL SHEETS IF NECESSARY):

The group leader for the Radiochemistry Counting Lab shall perform a daily review of the IQC statistical data report, and document the review by signing the report sheet. The reports will be kept in counting lab files.

SUBMITTED BY: Patricia A Lawrence DATE: 01-22-93

P.R. Thomas 01-22-93 TECHNICAL DIRECTOR/SPECIALIST

W.S. Stone 1/29/93 LABORATORY MANAGER

James M. Flynn 01-22-93 QUALITY CONTROL COORDINATOR

Gerald Hall 1/29/93 DIRECTOR, QUALITY ASSURANCE & COMPLIANCE

SL-91-QA-0001

5.8.2.2 Initiate a count of sufficient time to collect a minimum of 10,000 counts for both Alpha and Beta per SL13021. Print the data using "Print Screen".

5.8.2.3 Place the beta check sources in drawers A and B, and the Alpha check sources in drawers C and D.

5.8.2.4 Initiate a count of sufficient time to collect a minimum of 10,000 counts for both Alpha and Beta per SL13021. Print the data using "Print Screen".

5.8.2.5 Remove check sources and store in the desiccator.

5.8.2.6 Place clean empty planchets in drawers A, B, C, and D.

5.8.2.7 Measure the detector background for the same duration as the check sources. At the completion of the count, print the data using "Print Screen".

5.8.2.8 Document the Alpha, Beta, and background count rate in the Instrument Quality Control Program (IQC).

5.8.2.9 If IQC identifies any parameter to be outside the established range proceed to section 6.0.

5.8.3 Maintenance

5.8.3.1 Change out the counting gas when the gage reads under 500 psi. This usually occurs every 8 to 14 days. Record the Lot Number of the new gas cylinder in the LB4000 Maintenance Log Book.

5.8.3.2 Allow gas to purge a minimum of 30 minutes prior to operation.

5.8.3.3 At least once a month wash the planchet holder, and clean the drawers with a glass cleaner.

5.8.3.4 Do not spray cleaner directly onto the drawers. Spray cleaner into a Kimwipe and wipe out the drawers.

5.9 Calculations

5.9.1 None.

5.10 Quality Control

5.10.1 Backgrounds shall be < 0.7 cpm for alpha and < 3.0 cpm for beta, detectors that exceed these limits shall be taken out of service.

5.10.2 The data reports for the check sources and background shall be maintained in the daily Quality Control file. This file shall be maintained in the operations files in the count lab for easy retrieval.

5.10.3 The IQC program shall be used to identify quality control data that falls outside the specified range.

5.10.4 The Group Leader for the Radiochemistry Counting Lab shall perform a weekly visual review of the IQC statistical plots for undesirable trends, and document the review in the IQC Log Book.

5.10.5 The Group Leader for the Radiochemistry Counting Lab shall generate hard copies of the IQC statistical plots, file them in the counting lab, and document the activity in the IQC Log Book.

6. *Nonconformance and Corrective Action*

6.1 Check source positioning and all instrument settings.

6.2 Check all cables for any apparent damage and to confirm that all cables are routed to proper connectors and are in good working order.

6.3 Perform a recount of any parameter that fell outside the specified range.

6.4 If the instrument fails to meet the acceptance criteria outlined by IQC, and the corrective actions above do not resolve the problem, the instrument must be declared "Out of Service". Note this action in the LB4000 Maintenance Log Book, and on the display screen of the LB4000 monitor. Notify the Radiochemistry Laboratory Manager, or his designee, of the status.

6.5 The instrument may be returned to service once the malfunction has been corrected and the above acceptance criteria have been met. Note this action in the LB4000 Maintenance Log Book and clear the LB4000 monitor display screen.

6.6 Any deviation from this procedure must be approved by the Quality Control Coordinator and documented in the QC file.

6.7 Any unauthorized deviation from this procedure shall be documented as a Nonconformance with a cause and corrective action described.

7. *Records Management and Documentation*

7.1 Raw data associated with the current IQC series shall be maintained in the Radiochemistry Counting Lab for easy retrieval.

7.2 At the completion of an IQC series the raw data shall be released to Document Control.

7.3 When applicable, copies of the raw data shall be maintained in the associated project file.

7.4 All manufacturer-supplied documentation, including Standard Certificates, shall be retained as quality documents in the Quality and Operations Files.

7.5 All laboratory documentation generated in sections 5.0 and 8.0 shall be retained as quality documents in the Quality and Operations Files.

INTERNATIONAL TECHNOLOGY CORPORATION

IT Analytical Services

St Louis Laboratory
Standard Operating Procedure

Title: OPERATION OF THE LOW BACKGROUND GAS FLOW PROPORTIONAL COUNTING SYSTEM

Prepared By: Patricia A Haworth Date: 01-21-93

Reviewed By: BR Thomas Date: 01-22-93
Technical Specialist

Margaret C. Krutis Date: 01-25-93
Quality Control Coordinator

[signature] Date: 1/25/93
Director Quality and Compliance, ITAS

Approved By: R.O. Stites Date: 1/29/93
Laboratory Director

Controlled Copy No: UNCONTROLLED COPY

Key Words: GAS PROPORTIONAL, OPERATION, RADIOCHEMISTRY

Revision #	0						
Date	05/08/92						

Regional Office
13715 Rider Trail North • Earth City, Missouri 63045 • 314-298-8566

5.8.2.2 To change the counting mode (simultaneous or alpha only) page down to page 3 and press "ALT T", then back to page 1.

5.8.2.3 Position the cursor in the box displaying the drawer to be counted. Press "F8" to clear the previous data. Verify that the drawer counting time is correct. If the counting times are to be changed, position the cursor at the time to be changed, type the new time and press "ENTER". Start counting by pressing "F1".

Note: The results of samples being screened for Health Physics classification (SL13016) should be displayed in total counts. All other results are reported in counts per minute (cpm). This can be changed by pressing "F4".

5.8.2.4 Observe counting rate display to verify that counting has started.

5.8.3 Retrieval of Data

5.8.3.1 When counting is complete, press "PRINT SCREEN", record appropriate sample data on the worksheet. Remove samples from counter by rotating the position knob to the "DOWN" position and pull the drawer out slowly.

5.8.3.2 Repeat 5.8.1 through 5.8.3 as necessary to count the remaining samples.

5.9 Calculations

5.9.1 Conversion of raw data from cpm to activity (dpm or pCi) is provided in specific analytical procedures.

5.10 Quality Control

5.10.1 Each detector used shall have successfully passed the daily quality control checks prior to use.

5.10.2 Do not discard any prepared sample until the data have been reviewed by the Radiochemistry Laboratory Manager and the LIMS tracking system has been updated.

6. *Nonconformance and Corrective Action*

6.1 Reanalyze any sample where the ratio of alpha:beta channels exceeds 10:1 and the calculated results exceed the Contract Required Detection Limit (CRDL) by 100x. Analyze the samples a second time using the "Alpha only" voltage. Calculate the alpha activity using the "Alpha only" voltage results.

6.2 Any deviation from this SOP must be approved by the Quality Control Coordinator and documented in the QC file.

6.3 Any unauthorized deviation from this procedure shall be documented as a nonconformance, with a cause and a corrective action described.

7. *Records Management and Documentation*

7.1 Raw data worksheets shall be generated for each sample batch and standard data reports will be attached.

5.7 Calibration

5.7.1 Daily Quality Control checks must have been completed and verified that all are within the required limits before any operations may be performed on the system.

5.8 Analysis/Operation

5.8.1 Initial Setup

5.8.1.1 Confirm the following:

5.8.1.1.1 Gas flow through the detectors.

5.8.1.1.2 Detector voltage set per SL13019

NOTE: DO NOT adjust the voltage on the TC 952 high voltage power supply as the voltage is computer controlled.

5.8.1.1.3 Computer software loaded and operational

5.8.1.1.4 Page up or down to page 3, then press ctrl page up to view the discriminator settings for channels 1 through 4. Compare the settings with those in the LB4000 parameter settings file.

5.8.1.2 Load samples by rotating the position knob to the "DOWN" position and pull the sample drawer out slowly. Place sample planchets on the sample drawer noting on the sample worksheet the detector number and drawer designation.

Note: Segregate samples of expected high counting rates to counting drawers not being used for low level counting.

5.8.1.3 Log the following information into the Run Log:

Date
Detector number
Sample number
Count time
Analysis
Project number

5.8.1.4 Slowly insert sample drawer into the instrument and slowly rotate the positioning knob into the "UP" position.

Note: Before inserting the drawer, confirm that none of the planchets extend above the sample holder. If any planchet does extend above the sample holder, send that sample back to be rerun. Failure to observe this note can result in damage to the detector.

5.8.1.5 Verify that the instrument clock indicates the correct time.

5.8.2 Initiating a Count

5.8.2.1 Individual drawers can be set for varying count times. This can be accomplished by changing the setting on the computer. Position the cursor in the box displaying the drawer of interest, then pressing the "Insert" key to activate the drawer or "Delete" to inactivate the drawer. The activated drawer will display a double yellow line at the beginning of the "I.D." area.

Note: By activating a single drawer, clearing it, initiating a count and then deactivating the drawer; you can operate each drawer independently without disrupting the counting process of the other drawers.

the initial setup and operation of a low background gas flow proportional counting system, equivalent to Tennelec LB4000.

5.2 Safety

Procedure shall be carried out in a manner that protects the health and safety of all IT associates. The following requirements will be met:

5.2.1 Eye protection that satisfies ANSI Z87.1 (as per the Chemical Hygiene Plan), laboratory coat, and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated will be removed and discarded, other gloves will be cleaned immediately.

5.2.2 Exposure to chemicals will be maintained as low as reasonably achievable, therefore, unless they are known to be non-hazardous, all samples will be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation. Solvent, and waste containers will be kept closed unless transfers are being made.

5.2.3 All work must be stopped in the event of a known, or potential compromise to the health or safety of any ITAS associate. The situation must be reported immediately to a laboratory supervisor.

5.2.4 Waste generated in the procedure will be segregated, and disposed according to the facility hazardous waste procedures. The Health and Safety Coordinator should be contacted if additional information is required.

5.3 Interferences

5.3.1 The actual counting efficiency for alpha radiation decreases greatly with a density > 6.0 mg/cm² for a window of 80 µg/cm² density thickness. Therefore, the maximum acceptable mass density is 5 mg/cm² or less than 100 mg for a 2" planchet.

5.3.2 For beta radiation, reliable data may be obtained counting samples with a density as high as 10 mg/cm² or greater.

5.3.3 Sample thickness as well as moisture content may impact the alpha and/or beta results.

5.3.4 High background countrate will interfere with the detection of low quantities of radioactive material.

5.3.5 Samples containing beta radiation of sufficient energy may cause excessive cross talk into the alpha channel. Samples with beta counts greater than 10 times counter background should be counted on the ALPHA only voltage then on the combined voltage for beta. This eliminates the cross talk.

5.4 Preservation and Holding Time

5.4.1 Not Applicable

5.5 Required Equipment

5.5.1 Low Background Gas Flow Proportional Counting System, equivalent to the Tennelec LB4000.

5.5.2 P-10 gas mixture, 90% argon, 10% Methane

5.5.3 PC based data acquisition system

5.6 Reagents/Standards

5.6.1 None.

Title: ***Operation of the Low Background Gas Flow Proportional Counting System***

1. ***Purpose, Application & Responsibility***

1.1 This procedure provides instructions for the operation of the Low Background Proportional Counting instrumentation.

1.2 This procedure applies to the routine operation of all low background counting instrumentation with gas flow proportional detectors.

1.3 Responsibilities: for the purpose of this procedure the following responsibilities apply:

Radiochemistry Counting Lab Group Leader: to confirm that this procedure is followed during the operation of the Low Background Proportional Counting instruments.

Radiochemistry Laboratory Manager, or designee: to delegate the performance of this procedure to personnel who are experienced with this procedure and with the equipment associated with the implementation of this procedure.

Laboratory Technician: to operate the instrument in accordance with this procedure and to report any abnormalities to the Group Leader for the Radiochemistry Counting Lab, immediately. Shall be responsible for confirming that all equipment used is working properly, all instrument settings are set to the proper value or position, and all test equipment is calibrated. Shall inspect worksheets and logs for accuracy and completeness.

2. *References*

2.1 Nuclear Regulatory Commission, Guidance for Radiological Monitoring Programs (Normal Operations) -Effluent Streams and the Environment, Regulatory Guide 4.15.

2.2 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

2.3 ITAS Quality Assurance Manual.

2.4 ITAS-St.Louis Quality Assurance Manual, Laboratory Specific Attachment.

2.5 "Handbook for Analytical Quality Control in Radioanalytical Laboratories", L.G. Kanipe, EPA-600/7-77-088, August 1977.

2.6 "LB4000 Instruction Manual", Tennelec, Inc., Oak Ridge, TN, Revision 9/90.

3. ***Associated SOPs***

3.1 St. Louis Laboratory, Calibration of the Low Background Gas Flow Proportional Counting System, SL13019, Radiochemistry Procedures.

3.2 St. Louis Laboratory, Daily Calibration Verification and Maintenance of the Low Background Gas Flow Proportional Counting System, SL13020, Radiochemistry Procedures.

3.3 St. Louis Laboratory, Nonconformance and Corrective Action, SL10004, Quality Control Procedures.

4. ***Definitions***

4.1 None.

5. ***Procedure***

5.1 Summary

5.1.1 This procedure provides instructions for

(Ronald Alan Duff)

- Health Physics Supervisor for a transuranic (TRU) waste repackaging project. Supervised the characterization, repackaging and shipment of 130 drums and boxes of high-level americium-241 and plutonium-238 hot cell waste. Waste was packaged to meet the WIPP waste acceptance criteria and was transported to the Idaho National Engineering Laboratory (INEL) for storage.

- Health and Safety Manger for the DOE Fernald K-65 Silo sampling project, developed H&S and sampling plans,. The silos contain up to 0.5 uCi/g radium-226 and are the largest single source of radon gas in the U.S.

- D&D Technical Manager for the decommissioning of DOE's LEHR facility at the University of California, Davis. Developed project D&D plans and field procedures.

- Health Physics Supervisor for the excavation of waste materials for a commercial client which included mixtures of uranium and explosives.

- Technical writer for the Fernald Remedial Investigation/Feasibility Study (RI/FS). Provided technical guidance to engineering staff, generated reports on radioactive and mixed waste packaging, transport and disposal.

- Technical writer for the development of a logic flow diagram for identifying radioactive and mixed wastes at DOE's Portsmouth, OH facility.

- Proposal coordinator for over 40 business proposals for nuclear D&D projects including job walks, cost estimation, scheduling, and technical content of proposals.

1978 to 1987: Engineering Laboratory Technician (ELT), Leading Petty Officer, Radiological Controls Shift Supervisor
U.S. Navy

Responsibilities included:

- Leading Petty Officer at Trident Submarine Base, Radiological Control Division. Supervised a division of 40 personnel , provided support for nuclear powered subs. Performed over 1250 error-free shipments of radioactive materials. Received Navy Achievement Medal for conducting the first Trident Class submarine ion exchange resin discharge and solidification. Served ad Leading ELT and Engine Room Supervisor on the USS Grayling, SSN 646.

(Ronald Alan Duff)

- Project Manager for the D&D of three facilities at Sandia National Laboratory contaminated with radioactive and mixed waste. Responsible for the coordination of resources for the development of project plans, development of Project Work Plan, maintaining project budget and schedule commitments.

- Project Manager for the excavation and disposal of radium waste cells for the Corps of Engineers at Bergstrom AFB in Austin, TX. Developed all project plans, supervised field efforts, and coordinated waste disposal efforts.

- Project Manager for the D&D of IT's Oak Ridge Mixed Waste Analytical Laboratory. Developed D&D Plan for submittal to the state agency, supervised field crew during decontamination of the laboratory.

- Project Manager for the D&D of a Magnesium-Thorium waterfall grinding booth at Tinker AFB in Oklahoma. Responsible for the development of project plans, schedule and budget management, and disposal of radioactive and mixed wastes.

- Project Manager for the decommissioning of a commercial facility which previously processed ores containing uranium and thorium. The facility was listed on the NRC's Site Decommissioning Management Plan (SDMP) list. Generated the D&D plan submitted to the NRC, responsible for budget, schedule and on site activities.

- Project Manager for the removal of a 22 MeV particle accelerator from a major university medical center. Developed State approved D&D plans, arranged for waste disposal, responsible for budget, schedule and all on-site activities.

- Project Manager for the D&D of two radioactive source manufacturing laboratories at Chevron Research & Technology. Labs contained a neutron generator and were contaminated with tritium, carbon-14, cesium-134, and cobalt-60. Negotiated plan approvals with State agency, responsible for budget, schedule, and all on-site activities.

- Health and Safety Manager/Project Manger at DOE's Fernald site thorium silo and bins D&D project. Developed project-specific H&S plan, interfaced with client on health physics and H&S issues. Project received safety and quality awards from the client.

- Health Physics Supervisor responsible for the sampling of underground storage tanks with radioactive and mixed wastes at Brookhaven National Laboratory.

SENIOR ENVIRONMENTAL SPECIALIST

RONALD ALAN DUFF
SENIOR ENVIRONMENTAL SPECIALIST
AWK CONSULTING ENGINEERS, INC.

EDUCATION

Advanced Radioactive Material Transportation and Disposal Class, 1989 & 1993
IT Corporation Project Management Course (40 hours), 1992
40-Hour OSHA HAZWOPER (29 CFR 1910.120) training, 1987
8-Hour Supervisor training, 1990
8-hour OSHA Annual Refresher, 1994
Canberra Multichannel Analyzer Operations Class, 1988
Operational Water Chemistry and Radiological Controls, U.S. Navy, 1982
Engineering Laboratory Technician School, U.S. Navy, 1980
Nuclear Power Training Unit (prototype), U.S. Navy, 1980
Naval Nuclear Power School, U.S. Navy, 1978

AFFILIATIONS

National Registry of Radiation Protection Technologies
Health Physics Society
American Nuclear Society
Conference of Radiation Control Program Director
- Advisor, Radioactive Waste Management (E-5) committee
- Advisor, D&D (E-24) committee
IT Corporation Project Management Associate

EXPERIENCE AND BACKGROUND

1994 to present: Senior Environmental Specialist
AWK Consulting Engineers, Inc., Pittsburgh, Pennsylvania

At AWK, Mr. Duff is assigned to our Oak Ridge, TN office where he is responsible for performing technical and administrative duties required to satisfy customer needs on site characterization and pre-remedial design support projects and for all aspects of D & D projects. He is responsible for preparing project plans, project work plans, task specific Health & Safety Plans and budgets and schedules for these projects. He is also responsible for identifying and implementing D & D methods for these projects.

1987 to 1994: Project Manager, Health Physics Supervisor-Nuclear/Mixed Waste Engineering Services,
IT Corporation, Knoxville, Tennessee

Responsibilities included:

ATTACHMENT 6 - QUALIFICATIONS OF PROJECT MANAGER

City of Cleveland

MICHAEL R. WHITE, MAYOR

DEPARTMENT OF PUBLIC HEALTH
JUDITH A. ZIMOMRA
DIRECTOR
KAREN K. BUTLER, COMMISSIONER
DIVISION OF HEALTH
ROBERT STAIB, ACTING COMMISSIONER
DIVISION OF ENVIRONMENT

Division of Health
(216) 664-2324
Division of the Environment
(216) 664-2360
1925 St. Clair Avenue
Cleveland, Ohio 44114
(216) 664-2324 Fax: (216) 664-2187

NOTICE

THE NEXT MEETING OF THE AD HOC TASK FORCE ON ADVANCED MEDICAL SYSTEMS HAS BEEN RE-SCHEDULED FOR:

DATE: FRIDAY FEBRUARY 3, 1995

TIME: 1:00 PM TO 3:00 PM

LOCATION: FIRE TRAINING ACADEMY
3101 Lakeside Ave.
Cleveland, OH 44114
(Free parking available on site)

PLEASE MAKE NOTE OF NEW DATE

FOR MORE INFORMATION: Robert Staib
Commissioner of Environment
664-2359

DISTRIBUTION:
Law Department
Division of Water Pollution Control
EMS
Fire Prevention
Police
Division of Streets
Toxic Sweep Task Force
County Emergency Management
Northeast Ohio Regional Sewer District (NEORSD)
OEPA
NOACA
Ohio Department of Health
Ohio Emergency Management Agency
Nuclear Regulatory Commission, Region III
Advanced Medical Systems

cc: Judith Zimomra, Executive Assistant
Mike Konicek, Director, Public Utilities
William Denihan, Director, Public Safety
Sharon Sobol Jordan, Director, Law Department
Henry Guzman, Director, Public Service

B/45

Grobe

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of	)	
	)	Docket No. 30-16055-ML-REN
ADVANCED MEDICAL SYSTEMS, INC.	)	
	)	ASLBP No. 95-707-02-ML-REN
	)	
(Cleveland, Ohio)	)	(Material License
	)	No. 34-19089-01)

NRC STAFF NOTICE OF PARTICIPATION
AND RESPONSE TO REQUESTS FOR HEARING

INTRODUCTION

The staff of the Nuclear Regulatory Commission (Staff) hereby notifies the Presiding Officer in the above-captioned proceeding that it desires to participate as a party to the adjudication pursuant to 10 C.F.R. § 2.1213 of the Commission's regulations. The Staff also hereby responds, pursuant to 10 C.F.R. § 2.1205(f), to the requests for hearing filed by the Northeast Ohio Regional Sewer District (NEORSD), the City of Cleveland, Ohio (City) and the Earth Day Coalition (EDC) with respect to the license renewal application for Material License No. 34-19089-01 filed by Advanced Medical Systems (AMS or Licensee). For the reasons set forth below, the NEORSD's and the City's hearing requests satisfy the NRC's requirements and they should be admitted as parties in this proceeding. However, for the reason set forth below, the EDC's hearing request should be denied.

BACKGROUND

On November 29, 1994, the Licensee filed a timely "Application for Renewal" (Renewal Application) of its Material License No. 34-19089-01. This license authorizes possession of radioactive materials, including Cobalt-60, at the Licensee's facility located at 1020 London Road, Cleveland, Ohio. On December 29, 1994, the NEORSD filed a request for hearing on the Renewal Application.[1] On January 13, 1995, the City filed its hearing request, and the EDC's hearing request was dated December 28, 1994. On January 12, 1995, the Licensee filed an Answer to the NEORSD hearing request.

On December 22, 1994, the Staff sent a letter to the Licensee requesting that the Licensee provide additional information and to address nine specific subject areas. Letter to Advanced Medical Systems, Inc., Attn: David Cesar, Treasurer, from John A. Grobe, Nuclear Materials Inspection, Section 2, U.S. Nuclear Regulatory Commission

---

[1] The NEORSD has also filed three petitions for enforcement action pursuant to 10 C.F.R. § 2.206. *Advanced Medical Systems, Inc. (Byproduct License No. 34-19089-01); Receipt of Petition for Director's Decision Under 10 CFR 2.206*, 59 Fed. Reg. 47959 (September 19, 1994); *Receipt of Petition for Director's Decision Under 10 CFR 2.206; Advanced Medical Systems, Inc.* 58 Fed. Reg. 64341 (December 6, 1993); *Advanced Medical System, Inc., Receipt of Petition for Director's Decision*, 58 Fed. Reg. 19282 (April 13, 1993). NEORSD's petition, dated August 2, 1993 and noticed on December 6, 1993, has been denied by the Staff. *Advanced Medical Systems, Inc.*, DD-94-6, 39 NRC 373 (1994). This decision became final agency action on July 11, 1994. Letter to William B. Schatz, Esq., General Counsel, Northeast Ohio Regional Sewer District, from John C. Hoyle, Acting Secretary of the Commission, dated July 15, 1994. Although some of the issues raised in these petitions are similar to the areas of concern expressed by NEORSD in its hearing request, the filing of these petitions does not necessarily preclude the NEORSD from requesting a hearing with respect to the Licensee's Renewal Application. *See Georgia Power Co.*, (Vogtle Elec. Generating Plant, Units 1 and 2), LBP-93-5, 37 NRC 96, 98 n.2 *aff'd* CLI-93-26, 38 NRC 25 (1993) ("That a petition concerning Georgia Power may be pending does not preclude intervention in this license amendment case.").

(December 22 Letter). A copy of this letter is attached hereto as Exhibit 1. On January 31, 1995, the Licensee responded to the December 22 Letter. The Staff is currently reviewing the Licensee's submission.

DISCUSSION

A. General Principles

Any person whose interest may be affected by a proceeding for the grant, transfer, renewal, or licensee-initiated amendment of a license subject to 10 C.F.R. Part 2, Subpart L may file a request for a hearing. 10 C.F.R. § 2.1205(a). A request for a hearing filed by a person, other than the applicant, must describe in detail: the interest of the requestor in the proceeding; how that interest may be affected by the results of the proceeding; the requestor's areas of concern about the licensing activity that is the subject matter of the proceeding; and the circumstances establishing that the request for a hearing is timely in accordance with 10 C.F.R. § 2.1205(c). 10 C.F.R. § 2.1205(d).

In ruling on a request for a hearing filed under 10 C.F.R. § 2.1205(c), the presiding officer shall determine whether the specified areas of concern are "germane" to the subject matter of the proceeding. 10 C.F.R. § 2.1205(g). The presiding officer also shall determine whether the requestor meets the judicial standards for standing and shall consider, among other factors, the nature of the requestor's right under the Atomic Energy Act to be made a party to the proceeding; the nature and extent of the requestor's property, financial, or other interest in the proceeding; and the possible effect of any

order that may be entered in the proceeding upon the requestor's interests. 10 C.F.R. § 2.1205(g).

With respect to standing, the rule in 10 C.F.R. § 2.1205(g) "is simply a restatement of long-standing Commission requirements that a prospective intervenor, who believes that his or her interests may be affected by a proceeding, must, as if in a court of law, show 'a concrete and particularized injury that is fairly traceable to the challenged action.'" *Babcock and Wilcox Company* (Pennsylvania Nuclear Services Operations, Parks Township, Pennsylvania), LBP-94-4, 39 NRC 47, 49 (1994), *citing Transnuclear, Inc.* (Export of 93.15% Enriched Uranium), CLI-94-01, 39 NRC 1, 5 (1994). To satisfy these judicial standards for standing, a prospective party must show 1) that it could suffer an actual "injury in fact" because of the licensing proceeding, and 2) that its interest arguably is within the "zone of interests" to be protected by the pertinent statutes under which the petitioner seeks to challenge the licensing action. *Sacramento Mun. Utility Dist.* (Rancho Seco Nuclear Generating Station), CLI-92-2, 35 NRC 47, 56 (1992); *Babcock and Wilcox* (Apollo, Pennsylvania Fuel Fabrication Facility - Decommissioning Plan), LBP-93-4, 37 NRC 72, 80, *appeal dismissed*, CLI-93-9, 37 NRC 190 (1993). To be admitted as a party in an NRC proceeding, a petitioner must allege an "injury in fact" that is within the zone of interests protected by the Atomic Energy Act (AEA) of 1954, as amended, or the National Environmental Policy Act (NEPA) of 1969, as amended. *Apollo*, LBP-93-4, 37 NRC at 81; *Niagara Mohawk Power Corp.* (Nine Mile Point Nuclear Station, Unit 2), LBP-83-45, 18 NRC 213, 215 (1983).

The three components of the "injury in fact" requirement are injury, cause, and remedial benefit. *Apollo*, LBP-93-4, 37 NRC at 81. The showing necessary to satisfy these elements has been characterized as follows:

> Although variously described, the asserted injury must be "distinct and palpable" and "particular [and] concrete" as opposed to being "'conjectural . . . [,] hypothetical,'" or "abstract." The injury need not already have occurred but when future harm is asserted, it must be "threatened," "'certainly impending,'" and "'real and immediate.'" Additionally, there must be a causal nexus between the asserted injury and the challenged action. In other words, the alleged harm must have "resulted" in a "concretely demonstrable way" from the claimed infractions. There must also be a sufficient causal connection between the alleged harm and the requested remedy so that the complaining party "stand[s] to profit in some personal interest."

Id., *citing Cleveland Elec. Illuminating Co.* (Perry Nuclear Power Plant, Unit 1), LBP-92-4, 35 NRC 114, 121 (1992). To establish the requisite "injury in fact," the petitioner bears the burden of establishing that the various injuries it alleges will occur to its AEA-protected health and safety interests, or its NEPA-protected environmental interests. *Id.*

In addition to establishing the petitioner's standing or interest in the proceeding and providing a brief statement of how the petitioner's interest may be affected by the outcome of the proceeding, a request for a hearing in a materials licensing proceeding also must provide a concise statement of the petitioner's areas of concern sufficient to establish that the issues sought to be raised are "germane" to the proceeding. *See Combustion Eng'g., Inc.* (Hematite Fuel Fabrication Facility), LBP-89-23, 30 NRC 140, 143 (1989), *citing* 10 C.F.R. § 2.1205(d). A petitioner's statement of concerns must provide the presiding officer with the minimal information needed to ensure that the

issues sought to be litigated are germane to the proceeding pursuant to 10 C.F.R. § 2.1205(g). *Sequoyah Fuels Corp.*, LBP-91-5, 33 NRC 163, 166-67 (1991); *Curators of the Univ. of Missouri*, LBP-90-18, 31 NRC 559, 568 (1990); *Northern States Power Co.* (Pathfinder Atomic Plant), LBP-90-3, 31 NRC 40, 47 (1990). "This statement of concerns *need not be extensive*, but must be sufficient to establish that the issues the requestor wants to raise regarding the licensing action *fall generally* within the range of the matters that properly are subject to challenge in such a proceeding." *Statement of Considerations, Informal Hearing Procedures for Materials Licensing Adjudications*, 54 Fed. Reg. 8269, 8272 (February 28, 1989) (emphasis added); *Combustion Eng'g.*, LBP-89-23, 30 NRC at 143. Against this backdrop the Staff evaluates the three hearing requests.

B. The NEORSD and the City Should Be Admitted as Parties to this Proceeding

The Staff does not oppose the admission of the NEORSD and the City as parties to this proceeding. Both have demonstrated standing as provided in 10 C.F.R. § 2.1205(g) and their requests were timely filed. Further, both the NEORSD and the City have identified areas of concern which are germane to this proceeding.

The NEORSD has standing by virtue of the fact that the Licensee's facility is within the service area of the NEORSD's wastewater collection and treatment system. NEORSD's Hearing Request at 1. The NEORSD has expressed concern that an accident or natural disaster at the Licensee's facility could result in a release of radioactive material which threatens the safety of its employees as well as the general public. *Id.* at 2. The NEORSD further claims that it has a property interest in this proceeding

in that any release of radioactive material from the Licensee's facility could result in the contamination of the NEORSD's waste treatment plants. *Id.* at 3. The NEORSD has identified interests which could be affected by the outcome of this proceeding. Further, the NEORSD's interests are within the scope of the Atomic Energy Act. The NEORSD, therefore, has standing in this proceeding.

The NEORSD has identified three areas of concern which are germane to the Licensee's Renewal Application. These areas are, the control of radioactive material at the Licensee's facility, the lack of a "realistic" emergency plan, and the failure of the Licensee to provide adequate financial assurance for decommissioning. NEORSD's Hearing Request at 4-5. All of these issues were identified by the Staff's December 22 Letter to the Licensee as issues within the scope of the Staff's review of the Licensee's Renewal Application. They are, therefore, germane to this proceeding. However, the NEORSD also raises a concern with respect to the necessity for the Licensee to provide financial protection to cover public liability claims. *Id.* at 5. Although this concern was not expressed as an issue for the Staff's review of the Licensee's Renewal Application, it is arguably germane to this proceeding in that it would be within the scope of the Commission's authority to impose such a condition on the Licensee's renewed license. *See AMS*, DD-94-6, 39 NRC 373. Since the NEORSD has established standing and has identified areas of concern germane to this proceeding, it should be admitted as a party to this proceeding.

Similarly, the City has also established standing. The Licensee's facility is located in the City and, thus, the City has an interest in ensuring the health and safety of its

citizens. *See* City's Hearing Request at 2. The City also has an interest in the safety and well-being of its employees whose job would encompass responding to any emergencies or accidents at the Licensee's facilities. *Id.* The City's stated interests could be affected by the outcome of this proceeding and its interests are within the scope of the Atomic Energy Act. The City, therefore, has established standing to intervene in this proceeding.

The City has also identified areas of concern which are germane to this proceeding. The City asserts that its areas of concern are identical to the nine issues listed in the December 22 Letter, as well as those concerns outlined by the NEORSD in its hearing request.[2] *Id.* at 5. Although the City claims to raise the same areas of concern as the issues raised by the Staff in the December 22, 1994 letter, the City only discusses in detail two areas of concern, the Licensee's Emergency Plan, and the Decommission Funding Plan and Financial Assurance Mechanism. *Id.* at 5-7. Since the City wishes to raise issues which are the same as those issues raised by the Staff with respect to the Licensee's Renewal Application, the City has identified concerns which are germane to the proceeding. The City, therefore, should be admitted as a party to this proceeding.

---

[2] With respect to the City's assertion that it also wishes to raise the same areas of concern as the NEORSD, the City also asserts the concern that AMS should be required to maintain financial protection to cover public liability claims. City's Hearing Request at 6. The Staff's views with respect to this concern have already been presented in its discussion of NEORSD's areas of concern and are, thus, applicable to the City's asserted areas of concern.

D. The EDC Should Not Be Admitted as a Party

1. The EDC Fails to Establish Standing

The EDC fails to establish standing. Organizations such as EDC can intervene in NRC proceedings in their own right or derive standing as the representative of their members. *Houston Lighting and Power Co.* (South Texas Project, Units 1 and 2), ALAB-549, 9 NRC 644 (1979); *Arizona Pub. Serv. Co.* (Palo Verde Nuclear Generating Station, Units 1, 2, and 3), LBP-91-4, 33 NRC 153, 158 (1991). However, the petitioning organization must explain why it or its members have standing. *Palo Verde*, LBP-91-4, 33 NRC at 158.

At the outset, nowhere in its request in the instant proceeding does the EDC allege any injury, actual or abstract, present or future, that may accrue to it as a result of the pending license renewal application. Under the portion of its one page request which addresses the EDC's areas of concern, the EDC does not make any showing of a harm from the proposed amendment to any of the activities in which it might engage.

Under the section of its request in which its interests are discussed, the EDC states that it is a non-profit environmental education and advocacy organization whose interest is not commercial or financial but is interested strictly in public information and environmental interests. The Commission has long held that institutional interest in providing information to the public is insufficient for standing. *Transnuclear*, CLI-94-01, 39 NRC at 5.

If a petitioning organization seeks to meet the injury in fact test for standing on behalf of its members, it must allege that at least one member is suffering injury as a

result of the challenged action. *South Texas Project*, ALAB-549, 9 NRC at 646-47. Further, the petitioning organization must describe the nature of the injury and provide an authorization from the member for the organization to represent the member in the proceeding. *Northern States Power Co.* (Pathfinder Atomic Plant), LBP-89-30, 30 NRC 311, 314 (1989). In the instant proceeding, the EDC fails to identify any citizen injured by the activities that would be authorized in the requested license renewal. Thus, the EDC lacks standing as a representative of residents near the Licensee's facility because it fails to identify at least one resident who will suffer an "injury in fact" because of the renewal of Material License No. 34-19089-01 and has authorized the EDC to represent him or her.

In sum, because the EDC's request for a hearing fails to show a possibility of injury to the organization or to any member of the organization from the renewal of Material License No. 34-19089-01, the EDC fails to demonstrate an "injury in fact" caused by the proposed action. A petitioner's failure to explain how it will suffer any injury from alleged concerns places an insurmountable hurdle in the path of its efforts to establish its standing to litigate any of those concerns. *See Apollo*, LBP-93-4, 37 NRC at 92-93. Consequently, the EDC's request for a hearing in the above-captioned proceeding should be denied.

The EDC has failed to establish standing and further failed to address the circumstances establishing that its request for a hearing is timely. *See* 10 C.F.R. § 2.1205(d)(4). It does appear, however, that the EDC has arguably raised issues which are germane to this proceeding. These concerns relate to emergency

planning and the possibility for the release off site of radioactive materials. Since these areas have been identified by the Staff as issues within the scope of its review of the license renewal application, there is sufficient information to establish that the EDC's concerns fall generally within the range of the matters which are properly subject to challenge in this proceeding.

CONCLUSION

The NEORSD and the City have established standing to intervene in this proceeding and have identified concerns which are germane to this proceeding. Accordingly, their requests for hearing should be granted. The EDC has failed to demonstrate an "injury in fact" caused by the renewal of Material License No. 30-16055. The EDC's hearing request should, therefore, be denied.

Respectfully submitted,

Marian L. Zobler
Counsel for NRC Staff

Bernard M. Bordenick
Counsel for NRC Staff

Dated at Rockville, Maryland
this 6th day of February, 1995

DEC 2 2 1994

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

RE: APPLICATION FOR RENEWAL OF NRC LICENSE 34-19089-01

Dear Mr. Cesar:

The renewal process enables NRC to reevaluate licensed programs which have been in operation for a five year period. During this five year period many licensees find that their programs have changed along with their business goals and operations and that NRC regulations and policy have also changed. Therefore, we require that licensees provide us with a complete license renewal application, describing all aspects of their licensed operations and radiation safety program and procedures as if they were applying for an NRC license for the first time, without reference to previously submitted documents. This renewal process was discussed with you by Roy Caniano and John Madera during a management visit to your facility in April 1994.

We have reviewed your application dated November 29, 1994, and are disappointed to find that you did not provide sufficient information to evaluate your program activities and procedures. Consequently, you will need to resubmit your application with the following subject areas appropriately addressed without any reference to previous correspondence:

1. Radioactive Material

Your application provided the appropriate elements, mass numbers, chemical and physical forms, and maximum amount of the material you will possess at any one time. However, you did not provide the necessary information concerning the disposition of the materials and activity which you have eliminated from previously licensed authorization. Therefore, in order for us to evaluate your request for a reduction in possession limits, please provide appropriate documentation which will account for the material you have transferred and/or disposed of.

Also, please indicate/approximate the type and quantity (activity) of radioactive material currently possessed at your facility. Specifically, provide information concerning your current inventory of radioactive material to include the quantities of material you possess in the form of sealed sources, bulk sources, facility contamination and both liquid and solid radwaste. This should be added to your radioactive material possession limits in items 6., 7., and 8. of your NRC license.

2. Intended Use of Radioactive Material

Your application did not provide any information concerning intended use of the materials requested. Please provide information concerning the use of radioactive materials at your London Road facility, including possession incident to decommissioning and/or transfer to an authorized individual or entity. Specifically, you will need to provide detailed information concerning service operations (procedures, etc.).

3. Management Control and Responsibility

a. Senior Management

Resubmit a copy of your organizational chart illustrating the reporting path of the Radiation Safety Committee and/or Chairman of the Committee to Senior Management.

Submit a statement, signed by upper management, empowering the Radiation Safety Officer (RSO). The statement must describe the RSO's authority to oversee the licensed program, the responsibility for control and direction of the radiation safety program, and the authority to terminate licensed activities which pose a health and safety risk.

b. Radiation Safety Officer Staff (RSOS)

Provide an assessment regarding the adequacy of staff (including both numbers and qualifications) to support and maintain your radiation safety program. The assessment may be general, however, enough information should be provided to relate required services (e.g., audits, retraining, bioassay, response to emergencies, etc.), to facilities covered (e.g., number of laboratories, users, special uses, etc.).

c. Radiation Safety Officer

Submit a description of the duties and responsibilities of your RSO. The typical duties of a RSO would be:

(1) To ensure that the use of radioactive materials is by or under the direct supervision of individuals specifically listed on your license.

(2) To ensure that all users (where appropriate) wear personnel monitoring equipment when using radioactive materials.

(3) To ensure that radioactive materials are properly secured against unauthorized removal at all times when not in use.

(4) To perform routine inspections of all areas using or storing radioactive materials.

(5) To ensure that the terms and conditions of your license are met, and that all required records are maintained.

(6) To immediately halt any activity judged to be a threat to health, safety, the environment or a violation of the conditions of your license or the regulations.

d. Audit Program

Radiation Safety Officer and Staff Audits

Describe the audit mechanism implemented by the RSO and his staff to determine compliance with the terms and conditions of the NRC license. Your audit program should include: (1) routine unannounced inspections of each area where material is used and stored; (2) evaluation of worker/technician training through discussion and observation of work practices, and; (3) performance of independent surveys of work and storage area.

4. Training Program:

Confirm that training provided pursuant to 10 CFR 19.12 will include all occupational workers and ancillary personnel whose duties may require them to work in the vicinity of radioactive material. In addition, please commit to providing this training before new personnel assume their duties with, or in the vicinity of radioactive material, during annual refresher training, and whenever there is a significant change in duties, regulations, or the terms of the license. Also, confirm that you will maintain records of this training. Records should include the names of the attendees, topics, and date of training.

Your formal training program for authorized users (sealed source handlers) and service personnel must be provided. This program can be as previously submitted, however, it should be re-submitted to reflect all pertinent changes, e.g. management structure, administration, technical aspects, etc.

5. Facilities and Equipment

Submit a detailed diagram of the facilities for each location where radioactive material will be used. Include a description of area(s) assigned for receipt and storage (including waste). Your diagram(s) should show:

a. Adjacent areas across the walls from use and storage areas.

b. Descriptions of the ventilation system with pertinent airflow rates for locations where radioactive material may become airborne.

c. A specified scale with indicated dimensions.

d. Appropriate postings/labels to identify laboratories, work areas, and equipment e.g., fume hoods, special sinks, preparation areas, protective clothing change areas, etc.

6. Radiation Safety Program:

Your radiation safety program must outline the formal requirements necessary to maintain control of your licensed activities. These controls and provisions are related to organization and management, procedures, recordkeeping, material control and accounting, and management review to ensure safe operations under the license. Your radiation safety program description should be in narrative form, and should follow the subject matter presented in Section 10 of the enclosed Regulatory Guide 10.5 Revision 3, as it relates to your program. Specifically, please respond to the following Items:

a. 10.2: Administrative Procedures;
b. 10.2.1: Control of Procurement and Use;
c. 10.2.3: Emergency Procedures;
d. 10.2.4: Operating and Handling Procedures;
e. 10.2.5: Other Procedures (i.e., Standard Operating Procedures);
f. 10.3: Inventory and Accountability;
g. 10.4: Audits and Appraisals;
h. 10.4.1: Management and Radiation Safety Committee Audits;
i. 10.4.2: Radiation Safety Officer and Staff Audits
j. 10.6: Exposure Control and Monitoring;
k. 10.6.1: External
l. 10.6.2: Internal
m. Facility Survey Program (ISP procedures);
n. Survey Instrument Calibration Program (ISP procedure);
o. Leak Test Program (ISP procedure); and
p. 11: Waste Management

The areas addressed in Regulatory Guide 10.5, as outlined above, can also be addressed by referencing specific AMS ISP procedures (your SOP) and/or other procedures that you have instituted to manage your radiation safety program. However, these manuals/procedures must be submitted in their entirety for our review. This was discussed with you and Mr. Meschter on December 6, 1994, during a telephone conference.

7. Emergency Plan:

10 CFR 30.32(i)(3) requires that you provide an Emergency Plan in accordance with the guidance provided in Regulatory Guide 3.67, which has been previously provided to you. This is a requirement for new licensees as well as those who are up for renewal. Your application failed to provide an updated copy of your Emergency Plan. The updated version must reflect changes in management control, administration, technical aspects, etc. that have occurred since initial acceptance of your Emergency Plan by the NRC. Please follow the guidance in Regulatory Guide 3.67, and submit your plan for our review.

8. Decommissioning Funding Plan and Financial Assurance Mechanism:

In order for us to complete our review of your renewal application and issue a renewed license, we need to review and accept your Decommissioning Funding Plan (DFP) and financial assurance mechanism. Pursuant to 10 CFR 30.35(c)(2), you were required to submit your DFP with your license renewal application which was required to be submitted by December 1, 1994 (10 CFR 30.36). While you failed to comply with these requirements, you indicated in your renewal application dated November 29, 1994 that your DFP will be submitted by December 31, 1994. Should your DFP not be submitted by December 31, 1994, this matter will be reviewed for appropriate enforcement action.

9. Waste Management:

You should describe your methods for disposal of radioactive waste. Your application should include, where appropriate for the types of waste involved, provisions for monitoring and segregating waste (radioactive from nonradioactive, short half-life from long, liquid from solid waste). The following items should be considered and addressed in your application:

a. Transfers to a recipient (usually a waste disposal service company or the original supplier) properly licensed to receive such waste in accordance with paragraph 20.2001(a)(1) of 10 CFR Part 20. State the name and license number of the receiving company.

b. Storage of radioactive material with half-lives greater than 65 days should be characterized regarding volume and anticipated time in residence at your facility prior to disposal. The NRC does not consider storage as a substitute for final disposal of radioactive waste. Other than storage for radioactive decay, low level radioactive waste (LLW) should be stored only when disposal capacity is unavailable and for no longer than is necessary, e.g., no longer than 2 years. NRC Information Notice No. 90-09, "Extended Interim Storage of Low-Level Radioactive Waste For Fuel

Cycle and Material Licensees", outlines the provisions and requirements for interim storage. If you find that the interim storage provision applies to your program, it will be necessary for you to address in your application the information outlined in the Information Notice.

c. Release into air or water pursuant to 20.2003(a)(1) of 10 CFR Part 20. You should discuss the monitoring and control mechanisms in place to ensure compliance with the appropriate requirements.

We will continue our review of your application upon receipt of this information. Please reply in duplicate, within 30 days, and refer to Control Number 397891.

If you have any questions or require clarification on any of the information stated above, you may contact me at (708) 829-9834.

Sincerely,

Original Signed By
John A. Grobe, Chief
Nuclear Materials Inspection
Section 2

Enclosures:
1. Regulatory Guide 10.5, Rev.3
2. Regulatory Guide 3.67
3. IN 90-09

cc/w enclosures: Robert Meschter, RSO
1020 London Rd.
Cleveland, OH 44110

Mayor Michael White, Cleveland
Lisa Mehringer, Cleveland
Irv Ball, Cuyahoga County
Robert Owen, Ohio
Erwin Odeal, NEORSD

DOCUMENT NAME: M:\03016055.DF4
To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	DRSS/RIII	C	DRSS/RIII	C	DRSS/RIII	E	DRSS/RIII	E
NAME	KNull:bt		DRMader		WJSlawinski		JAGrobe	
DATE	12/21/94		12/ /94		12/22/94		12/ /94	

OFFICIAL RECORD COPY

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of	)	Docket No. 30-16055-ML-REN
ADVANCED MEDICAL SYSTEMS, INC.	)	ASLBP No. 95-707-02-ML-REN
(Cleveland, Ohio)	)	(Material License No. 34-19089-01)

CERTIFICATE OF SERVICE

I hereby certify that copies of the "NRC STAFF'S NOTICE OF PARTICIPATION AND RESPONSE TO REQUESTS FOR HEARING" in the above-captioned matter have been served on the following by deposit in the United States mail, first class, as indicated by asterisk or through deposit in the Nuclear Regulatory Commission's internal mail system this 6th day of February, 1995:

Marshall E. Miller*
Presiding Officer
1920 South Creek Boulevard
Spruce Creek Fly-In
Daytona Beach, FL 32124

Dr. Harry Foreman*
Special Assistant
1564 Burton Avenue
St. Paul. MN 55108

Adjudicatory File (2)
Atomic Safety and Licensing Board
Mail Stop: T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Office of Commission Appellate Adjudication
Mail Stop: 16-G-15 OWFN
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Office of the Secretary
ATTN: Docketing and Service
Mail Stop: 16-G-15 OWFN
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Atomic Safety and Licensing Board
Panel
Mail Stop: T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Chris Trepal*
Earth Day Coalition
3606 Bridge Avenue
Cleveland, Ohio 44113

Thomas E. Lenhart, Esq.*
Assistant General Counsel
Northeast Ohio Regional Sewer
District
3826 Euclid Avenue
Cleveland, Ohio 44115-2504

Sharon Sobol Jordan, Esq.*
Martha R. McCorkle, Esq.
Department of Land
City of Cleveland
Room 106-City Hall
601 Lakeside Avenue
Cleveland, Ohio 44114

Henry E. Billingsley, II, Esq.*
Arter & Hadden
1100 Huntington Building
925 Euclid Avenue
Cleveland, Ohio 44115-1475

Marian L. Zobler
Counsel for NRC Staff

COUNTY OF CUYAHOGA

Cuyahoga Emergency Management Assistance Center (CEMAC)

February 7, 1995

Jane Harf
Ohio State Emergency Response Commission
P.O. Box 163669
1800 WaterMark Dr.
Columbus, Ohio 43216-3669

Re: Designation of Advanced Medical Systems as an additional facility under O.R.C. 3750.05 and .08

Dear Ms. Harf:

Pursuant to O.R.C. 3750.02, .04, 05, .08 and .11(B), the Cuyahoga County Local Emergency Planning Committee ("LEPC") requests that the Ohio State Emergency Response Commission grant a variance designating the Advanced Medical Systems, Inc. ("AMS") facility at 1020 London Road, Cleveland, Ohio ("Facility") as an "additional facility", subject to O.R.C. sections 3750.05 and 3750.08. This Facility satisfies the criteria to be made an "additional facility" for the reasons set forth below.

Size of Facility

The Facility is not large for an industrial facility. However, in this case the quantity of loose radioactive material that is stored at the Facility, the degree of radioactive contamination at the Facility, and the prior history of releases of radioactive material from the Facility make the size of the building essentially irrelevant. The key consideration with regard to this Facility is the amount of radioactive material that would be released as the result of various disasters or emergencies.

Nature of Operations

Historically, the Facility has housed a Cobalt-60 source manufacturing operation. This operation involved purchasing large quantities of loose, metallic Cobalt-60 and incorporating the Cobalt into sealed sources for medical and industrial applications. The Facility is licensed by the Nuclear Regulatory Commission ("NRC"), and the current license allows the possession of up to

B/4

CECOMS CENTER 443-3196 CRIS CENTER 443-7940 EMERGENCY MANAGEMENT 443-5700
1255 Euclid Avenue, Room 102 FAX (216) 443-7268 Cleveland, Ohio 44115-1807

300,000 curies of Cobalt-60 (and lesser quantities of Cesium and Uranium) at the Facility. According to the NRC, the actual quantity of Cobalt-60 currently in the Facility is approximately 50,000 curies. This figure has been estimated as a result of a prior history of poor inventory practices and difficulty in physically taking inventory of certain highly contaminated areas of the Facility.

Based on NRC documents, the process of manufacturing sealed Cobalt sources resulted in the generation of considerable quantities of waste Cobalt-60, mostly in the form of a metallic oxide with a consistency of a fine powder. Much of this waste Cobalt has accumulated in the waste-holdup room ("WHUT") in the basement of the Facility. Hundreds of curies of this material apparently remain in the WHUT today, and the quantity must be estimated again as part of the current license renewal process. In 1988, when this room was sealed because it was too "hot" to decontaminate, a person entering the room would have received a radiation dose of 2000 rems per hour, from the estimated 400-600 curies of Cobalt that were in the room. A lethal dose of 500 rems, which would have been received in about 15 minutes, will generally cause death from acute radiation sickness within a few weeks. It has been aledged that discharges to the sanitary sewer were previously made by AMS from this room. NRC documents confirm that the discharge from the Facility is the only known source of Cobalt-60 within the service area of the Northeast Ohio Regional Sewer District ("NEORSD") and therefore is the probable source of contamination at the Southerly Wastewater Treatment Center ("Southerly"). NEORSD has reportedly spent over one million dollars related to the Southerly situation and continues to possess over four million cubic feet of Cobalt-60 contaminated incinerator ash, which NEORSD estimates would cost over 40 million dollars to take off-site. This huge volume of ash is believed to contain less than one curie of Cobalt-60. This information, while the subject of litigation, is presented only to emphasize how little Cobalt-60 in the form present at the Facility, need be released to cause major consequences.

Presently, neither AMS nor the NRC have information regarding the survivability of the Facility, the hot cell (where the bulk of the Cobalt inventory is believed to be stored), or the WHUT in the event of flood, fire, tornado, or other disaster. The Facility does have an emergency plan, but based on recent LEPC participation in emergency planning activities with the NRC, AMS, OEMA, and City of Cleveland representatives, the plan is inadequate and its implementation has been grossly deficient. Furthermore, neither the NRC nor AMS has been fully supportive of the efforts of local agencies to become involved in the emergency planning process. As further stated below, the historical lack of attention to emergency planning at the Facility and the apparent lack of commitment to correct the situation by the NRC and AMS is the key reason for this

request.

Proximity to Significant Population

The Facility at 1020 London Road is located within the Collinwood area of Cleveland, which is primarily a residential neighborhood. On one side of the Facility, directly across the street (Mandaly) is a public playground and swimming pool. There are other industrial facilities in the area, including one located directly across London Road. In the event of a significant release of Cobalt-60 during an emergency at the Facility, it is clear that a large number of neighboring people and facilities would be immediately impacted. The extent of the threat to the public's health and safety in such an event is unknown due to the lack of any credible hazard assessment and exposure model for this Facility. As stated above, it is known that when the WHUT was last surveyed in 1988, an emergency responder that entered that area would have received an acutely lethal radiation dose in less than half an hour.

Necessity of LEPC Participation

Traditionally, local emergency planning committees have not sought direct jurisdiction with regard to radioactive hazards at industrial facilities. Even the NRC, however, recognizes a formal role for the local emergency planning committee as set forth in NRC Regulatory Guide 3.67. This guide provides guidance to NRC licensees with regard to emergency planning and mentions the local emergency planning committee in several capacities. One such capacity is that of a key local agency in planning and coordinating the response of local emergency units in a radiological emergency. AMS, despite this NRC guidance, has never attempted to involve the LEPC in emergency planning for the Facility. In fact, AMS has made very little attempt to involve any local agencies, including the Cleveland Division of Fire, in its planning. Only very recently, after local agencies began seriously questioning the emergency preparedness at this Facility, did the NRC commence steps to address some of these deficiencies. In a letter dated November 29, 1994, the NRC cites AMS for three violations all related to emergency preparedness, including failure to conduct training exercises with offsite emergency personnel as required by the AMS license. Given the NRC's willingness to allow gross inadequacies at this Facility to go uncorrected for years, the LEPC is not convinced that the NRC will follow through and require the implementation of emergency planning appropriate for this Facility. In summary, it appears that the Facility poses a significant threat to the neighborhood in the event of a Cobalt release . The degree of risk has never been properly assessed and a hazards analysis

should be completed as quickly as possible. In addition, emergency planning at this Facility appears to be grossly inadequate. Although the NRC has recently taken some steps to address these problems, the LEPC is unconvinced that the NRC will adequately address these issues if the NRC continues to be the sole regulatory agency involved. This belief is based on the NRC's dismal prior history regarding this Facility. It is therefore essential that local agencies assume a significant role in the emergency planning for the Facility. The LEPC is, of course, an appropriate agency for this task, because it has undertaken similar measures for over 300 facilities storing Extremely Hazardous Substances. AMS would be asked to do no more than these facilities. To assure that the LEPC will have the authority to accomplish this goal, it is necessary that the Facility be designated an "additional facility" under O.R.C. sections 3750.05 and 3750.08.

Summary of Reporting Requirements

1. Submit an Annual Inventory of Cobalt-60 and other radioactive materials pursuant to O.R.C. 3750.08.

2. Complete a hazards analysis for worst case, credible case and predictable case releases of Cobalt-60 and other radioactive materials per the LEPC's Chemical Accident Prevention and Chemical Emergency Planning Program ("CAPCEP") pursuant to O.R.C. 3750.05.

Please call me at 216-443-7597 to discuss this request. As this is a matter of some urgency, the LEPC requests that the Emergency Response Commission consider this request as quickly as possible.

Sincerely,

Michael S. Kalstrom

Michael Kalstrom, Secretary
Cuyahoga County LEPC

cc: David Cesar, AMS (Via Certified Mail)
Richard Connelly, Cuyahoga County LEPC
John Grobe, U.S. Nuclear Regulatory Commission
Martha McCorkle, Cleveland Law Department
Edmund Mecklenburg, Cuyahoga County Emergency Management Div.
Patrick Murphy, Cuyahoga County Prosecutor
Robert J. Patton, Chairman, Cuyahoga County LEPC
Edwin C. Price, Cuyahoga County Dept. of Community Services
Chief Thomas Root, Cleveland Fire Department
Robert Staib, Commissioner of Environment, City of Cleveland

COUNTY OF
CUYAHOGA

SARA LOCAL
EMERGENCY PLANNING COMMITTEE

RESOLUTION NO. SARA 941114-08

Authorizing a request for a variance from the SERC

WHEREAS, Resolution No. SARA 94114-07 established a need for an improved emergency plan for Advanced Medical Systems; and

WHEREAS, the Cuyahoga is required by Section 3750 of the Ohio Revised to complete and annual update a comprehensive emergency response plan for hazardous materials; and

WHEREAS, the community hazards present at Advanced Medical Systems at 1020 London Rd., Cleveland, Ohio are similar to the hazards found at facilities storing storing Extremely Hazardous Substances; and

WHEREAS, Division (B) of Section 3750.11 of the Ohio Revised Code authorizes requests for variances from the Ohio State Emergency Response Commission (SERC) for the purpose of adding a facility or facilities to its aforementioned emergency plan.

NOW, THEREFORE BE IT RESOLVED that the Cuyahoga County LEPC request a variance from the SERC for the purpose of adding Advance Medical Systems to its emergency plan under Section 3750.05 of the Ohio Revised Code and for the purpose of receiving an annual Chemical Inventory under Section 3750.08 of the Ohio Revised Code.

BE IT FURTHER RESOLVED that the Secretary of the Cuyahoga County LEPC is directed to carry out the aforementioned objectives.

On motion of Captain Root, seconded by Chief Fisher, the foregoing resolution was duly adopted.

AYES: Brown, Connelly, Rubin (for Dell), Chief Fisher, Greenberg, Hermes, Kalstrom, Chief Kancler, Matson, Mecklenburg, Passalacqua, Patton, Rolan, Captain Root, Chief Sanders, Stapf, Gahr (for Vamos)

NAYES:

ABSTAIN:

Northeast Ohio Regional Sewer District

3826 Euclid Avenue • Cleveland, Ohio 44115-2504 216 • 881 • 6600 FAX: 216 • 881 • 9709

February 9, 1995

John Grobe, Chief
Nuclear Materials Inspection Section 2
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, Illinois 60532-4351

Re: Interagency Cooperation

Dear Mr. Grobe:

Over the course of the last month, the Northeast Ohio Regional Sewer District ("District") has been attempting to convey its concerns to the NRC regarding the remediation plans and future discharge plans at the Advanced Medical Systems' London Road facility . These concerns have been expressed in telephone conversations, in person, and in a number of letters. The complaint that the correspondence may have taken on a harsh tone is primarily a reflection of the District's underlying frustration with the NRC's failure to recognize and/or include the District in this planning process as a co-regulatory agency.

In the District's opinion, it does not make sense for the NRC and Advanced Medical Systems to devote time and effort to a process that may ultimately not be acceptable to other agencies with regulatory responsibilities. Such wasted time and effort could be eliminated by including the co-regulatory agencies in the preliminary planning and evaluation stages themselves, leading to a more timely resolution of the Advanced Medical Systems contamination problems. The District is not interested in creating any unnecessary delays in the remediation of this facility. In fact, the District is extremely interested in remediation progressing as rapidly as possible. It is for this very reason that the District remains available to cooperate with the NRC and Advanced Medical on an acceptable plan.

The District is concerned that it will be placed in the position of being forced to disapprove either an industrial pretreatment system or a specified cobalt-60 discharge limit very late in the process. At that point, the finger will undoubtedly be pointed at the District as the "bad guy" that is holding up the entire process. The District will not be put

B148

9502210328 [illegible]

in that position. Therefore, the District wishes to make certain that all interested parties understand that at this time no cobalt-60 can be accepted in any sanitary discharge. The District has no choice but to refuse such discharges until such time as technically justifiable discharge limits are developed which adequately protect wastewater treatment works from interference.

The NRC has asked us to clarify the statement in the letter dated January 31, 1995 that indicates the District has not been presented with an opportunity to discuss these matters with the NRC "despite numerous requests." This sentence refers to our offers to cooperatively participate as one of the regulatory agencies necessary for the ultimate implementation of the plans currently under consideration by the NRC. The District has not formally requested in writing a meeting on these matters. This offer has been communuicated to both the NRC and Advanced Medical Systems on numerous occassions. Until such time as the NRC and Advanced Medical Systems actively seek the input and cooperation of the District, conducting such a meeting would be pointless.

The District remains committed to the development and implementation of more effective regulation of the release of radionuclides. Consistent with that commitment, District staff are available to cooperate with the NRC on every level; from the local situation at London Road to the development and implementation of new sanitary disposal regulations.

If you wish to discuss this matter, please call me at (216) 881-6600. You may of course reach members of my staff at the same number.

Sincerely,

Erwin S. Odeal
Executive Director

cc: John Kwolek
Martha McCorkle
Robert Staib
Michael Kalstrom
Tom Lenhart
Sara Fagnilli
Richard Connelly
Dwight Miller

1:00 THURSDAY Conf Call 2:00 EST

2/9/95?

{Cool, Brach, DeCicco, Guerra, Johnson, Weber, Truby, Harris, Stein, Zobler, Forner} Harris, Nottingham →

1) Can we order NETRSD to take water? No.
2) Can we order AMC to treat the water? Yes.
   Well, not really -- we would order the three prong water control system (lateral isolation / groundwater withdrawal water treatment) and recognize the potential for tanks
3) DWM: 8 pCi/g average ≤ 24 pCi/g hot spots
4) Sewer District playing hard ball because we're playing hard ball
* 5) If they take [20 pCi/l ≤ X l/day] -- no restrictions on ash   no hot spot (Permanent Limit)
6) [Burner available Friday afternoon]
7) Lateral
   - Must clean up pipe - Grouting not acceptable?
   - Can we issue an Order - Probably not.
* - Grouting OK

Mechanics

- Submit commitment of [≤20 pCi/l; X l/day]
  • Anything over that would be have further processing or treatment
- Letter Burner → Oakal - no action regarding sludge or ash

30.14

B/49

5 Questions

- Should we attend DEPA/AMS/NEORSD/NRC meeting?
- If we attend, what LLD do we establish for Co-60 in water (20pCi/l)
- If we attend, how do we respond to the NEORSD question about reconcentration and our 8pCi/g unrestricted release guidelines
- If we have a meeting and it looks like additional negotiations are necessary, are we prepared to pursue AMS to pump to tanks?
- AMS still [illegible] granting an [illegible] for us prepared to pursue [illegible] to remediate the bedrock and manhole.

Bka

- NEORSD - Post Co-60 problem
  - TRO / Comment
  - [illegible]
  - no distributable risk
- DEPA - Supports NEORSD
  - Wants to get together and talk
  - PTI
- AMS - Does not want to tank - wants to discharge
  - Does not want to dig
- NRC - Absolutely must move water very soon

- NEORSD & AMS are in litigation sparring

- 8pCi/g issue directly impacts on Easterly Meeting