INTERNATIONAL TECHNOLOGY CORPORATION

Analytical Data Package Prepared For

Westinghouse Hanford

Radiochemical Analysis By

IT Analytical Services
Richland Laboratory

Sample Delivery Group Number: W0077

WHC IDENTIFICATION NUMBER	ITAS RICHLAND ID NUMBER
B0BYF8	40558601
B0BYG3	40558602

Regional Office
2800 George Washington Way • Richland, Washington 99352-1613 • 509-375-3131 • FAX: 509-375-5590

INTERNATIONAL TECHNOLOGY CORPORATION

CERTIFICATE OF ANALYSIS

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352

July 25, 1994

Attention: J.A.Lerch

SAF Number	:	94-130
Date SDG Closed	:	June 10, 1994
Number of Samples	:	Two (2)
Sample Type	:	Water
SDG Number	:	W0077
Data Deliverable	:	Stand Alone

I. Introduction

On May 27, 1994, two water samples were received by ITAS-Richland for radiochemical analysis. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the WHC specific IDs:

ITAS-Richland ID	WHC ID	Matrix	Date of Receipt
405586-01A	B0BYF8	Water	5/27/94
405586-02A	B0BYG3	Water	5/27/94

II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were:

Gamma Spectroscopy
Gamma Scan by method ITAS-RD-3219
Liquid Scintillation Counting
Technetium-99 by method ITAS-IT-RS-0001

III. Quality Control

The analytical results for each analysis performed under SDG W0077 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV. Comments

Results from the initial radioactivity screening of these samples classified them as Category I.

Gamma Spectroscopy

Gamma Scan by method ITAS-RD-3219
The LCS was recounted twice because of a low bias on the Co-60 result which resulted from the gamma spectroscopy software splitting the uneven Co-60 peak. The third count of the LCS is accepted and reported. Pb-212 was detected in the duplicate of sample B0BYF8 at an activity of less than two times the error and is not reported. The LCS, batch blank, sample and sample duplicate (duplicate of sample B0BYF8) results are within contractual requirements.

Liquid Scintillation Counting

Technetium-99 by method ITAS-IT-RS-0001
The matrix spikes, LCS, batch blank, sample and sample duplicate (duplicate of sample B0BYG3) results are within contractual requirements.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:

Suzanne Gaines

Suzanne Gaines
Project Manager

9613477.2964

IT ANALYTICAL SERVICES
RICHLAND, WA
(509) 375-3131

SAMPLE RESULTS

LAB NAME:	ITAS-RICHLAND	SDG:	W0077
LAB SAMPLE ID:	40558601	MATRIX:	WATER
CLIENT ID:	B0BYF8	DATE RECEIVED:	5/27/94

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	2.54E-01	4.72E+00	4.72E+00	9.22E+00	pCi/L	N/A	RD3219
CO-60	8.60E-01	4.42E+00	4.42E+00	8.99E+00	pCi/L	N/A	RD3219
CS-137DA	2.40E+00	3.29E+00	3.30E+00	6.93E+00	pCi/L	N/A	RD3219
EU-152	3.00E+00	9.67E+00	9.67E+00	1.82E+01	pCi/L	N/A	RD3219
EU-154	-2.32E+00	1.03E+01	1.03E+01	1.91E+01	pCi/L	N/A	RD3219
EU-155	-2.95E-01	8.62E+00	8.62E+00	1.51E+01	pCi/L	N/A	RD3219
FE-59	-1.37E+01	1.62E+01	1.62E+01	2.61E+01	pCi/L	N/A	RD3219
RU-106DA	-1.29E+01	4.14E+01	4.15E+01	7.14E+01	pCi/L	N/A	RD3219
TC-99	4.07E-01	9.23E-01	4.07E+00	2.12E+00	pCi/L	95.10%	ITAS-IT-RS-0001

Number of Results: 9

IT ANALYTICAL SERVICES
RICHLAND, WA
(509) 375-3131

SAMPLE RESULTS

LAB NAME:	ITAS-RICHLAND	**SDG:**	W0077
LAB SAMPLE ID:	40558602	**MATRIX:**	WATER
CLIENT ID:	B0BYG3	**DATE RECEIVED:**	5/27/94

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-3.60E-01	5.37E+00	5.37E+00	1.01E+01	pCi/L	N/A	RD3219
CO-60	2.50E+00	3.77E+00	3.78E+00	8.82E+00	pCi/L	N/A	RD3219
CS-137DA	9.77E-01	3.85E+00	3.85E+00	7.47E+00	pCi/L	N/A	RD3219
EU-152	3.04E+00	9.02E+00	9.03E+00	1.70E+01	pCi/L	N/A	RD3219
EU-154	-1.12E+01	1.10E+01	1.11E+01	1.61E+01	pCi/L	N/A	RD3219
EU-155	8.09E-01	7.23E+00	7.23E+00	1.29E+01	pCi/L	N/A	RD3219
FE-59	-7.99E-01	1.45E+01	1.45E+01	2.71E+01	pCi/L	N/A	RD3219
RU-106DA	-2.29E+01	4.04E+01	4.04E+01	6.87E+01	pCi/L	N/A	RD3219
TC-99	2.14E+00	9.68E-01	4.21E+00	2.12E+00	pCi/L	95.10%	ITAS-IT-RS-0001

Number of Results: 9

9613477.2966

0285

INTERNATIONAL TECHNOLOGY CORPORATION

LOG #: RD-94-_____ page 1 of 2

LABORATORY NONCONFORMANCE MEMO (NCM) ITAS-Richland

PROJECT ID (Name/Number): WHC W0077

NCM INITIATED BY (Name/Date): Joe I T Kempema 7-7-94

PARAMETER(S): Gamma

SAMPLE NUMBER(S) AFFECTED: L0558615 , F0558601

MATRIX: Water

AREA: ☐ SHIP/REC ☒ RADIOCHEM ☐ COUNTING ☐ BIOASSAY ☐ DATA VERIF ☐ REPORTING ☐ OTHER:

NONCONFORMANCE [check appropriate item(s)]:

1. ☐ Not enough sample received for proper analysis.
2. ☐ Holding time exceeded by _____ days due to:
   - 2.1. ☐ CATEGORY I: Out of Laboratory Control
     - ☐ Holding time expired at receipt.
   - 2.2. ☐ CATEGORY II: Laboratory Dependent
     - ☐ work backlog ☐ instrument failure
     - ☐ communication ☐ other (see #10)
   - 2.3. ☒ CATEGORY III: Laboratory Reruns
     - 2.3.1. ☒ QA/QC:
       - ☐ surrogates ☐ internal standards
       - ☒ spike recoveries ☐ blank contamination
     - 2.3.2. ☒ CONFIRMATION:
       - ☐ second column ☐ contamination check
       - ☒ other (see #10)
     - 2.3.3. ☐ DILUTION:
       - ☐ over calibration ☐ under calibration
       - ☐ other (see #10)
     - 2.3.4. ☐ OTHER: (see #10)
3. ☐ Sample lost during extraction/analysis; no re-prep or re-analysis possible.
4. ☐ QC data reported to client outside of:
   - ☐ method limits ☐ internal limits
   - ☐ QAPP limits ☐ contract limits
   - ☐ regulatory limits ☐ blank criteria
5. ☐ Incorrect procedure(s) used. (See #10)
6. ☐ Invalid instrument calibration. (See #10)
7. ☐ Incorrect/incomplete data reported to client. (See #10)
8. ☐ Reported detection limit(s) higher than:
   - ☐ method limits ☐ QAPP limits
   - ☐ contract limits ☐ other (see #10)

   Due to:
   - ☐ sample matrix ☐ insufficient sample
   - ☐ instrumentation ☐ other (see #10)

9. ☒ Other (specify): F0558601 Pb212 detected 2X error > result do not report - discuss in case narrative

10. ☒ Comments/Explanation: L0558615 - counted 3 times peaksearch split Ac228 peak

NOTIFICATION [check appropriate item(s)]:

1. ☐ Client notified by (name and date):_____
   - ☐ in writing ☐ by FAX
   - ☐ by phone ☐ Other (explain)
2. ☐ Client's name _____ and response:
   - ☐ process "as is" ☐ resample
   - ☐ on hold til ___ ☐ Other (explain)

PROJECT MANAGER (signature & date): Susy Davies 7/25/94

FURTHER ACTION REQUIRED, SEE PAGE 2 OF 2

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IT CORPORATION LOG #: RD-94-_____ page 2 of 2

CORRECTIVE ACTION

☒ **ROOT CAUSE:** INITIALS/DATE JK 7-7-94

LO558615 - peak search split peak due to unevenness of peak

☒ **CORRECTIVE ACTION:** INITIALS/DATE JK 7-7-94

Recounted twice accepted data from 3rd count

☐ **RESPONSIBILITY FOR PERFORMING CORRECTIVE ACTION ASSIGNED TO:**

☒ **ACTIONS TO PREVENT RECURRENCE:** INITIALS/DATE JK 7-7-94

Consult with Technical Director & CCG concerning 1) increasing spike activity for Co 60 2) increasing count time

FIRST LEVEL SUPERVISOR: Jol Kempema DATE: 7-7-94

RESPONSIBLE MANAGER: Madeline McEvoy DATE: 7-25-94

QC REVIEW

☐ NONCONFORMANCE ☐ DEFICIENCY ☒ RERUN

☐ FURTHER ACTION REQUIRED:

ASSIGNED TO:

QC COORDINATOR: Jodi Cox DATE: 7/25/94

CORRECTIVE ACTION VERIFICATION

☒ VERIFIED ☐ CANNOT VERIFY (specify reason)

REASON:

NCM CLOSURE

QC COORDINATOR: Jodi Cox DATE: 7/25/94

6016

SIGNED ORIGINAL MUST BE RETAINED IN FILE: ☐ QUALITY/OPERATIONS FILE ☒ PROJECT FILE

9613477.2968

Surveyed : Yes ✓ No ____? Less than 200 counts/minute: Yes ✓ No ____? By (initials) [redacted]

Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352

CHAIN OF CUSTODY

Test User ID:

C-of-C: WHC CONTRACT

Company Contact: _____ Telephone: _____

Samples Collected by: HANKEL / MACKLIET Date: 5-17-94 Time: 1015

ID/Sample No.: _____

Ice Chest No.: _____ Field Logbook Page No.: _____

Remarks: SAF 94-130 E6807

Possible Sample Hazard Identification: _____ Contract No.: MPV-SVV-239-000

Destination: HASM IT CONTRACT Carrier/Waybill No.: _____

Ground-Water X Soil _____ Other _____

Shipping container internal temperature when samples sealed in it _____. Shipping container internal temperature when opened in laboratory _____.

Sample Identification

B0BYF8 (2) 1000 1P - TC99

B0BYF8 (8) 1000 1P - GAMMA

40558601

SDG W0077

Chain of Possession

Hankel PNL Relinquished by:	Kathy L. Farmer PNL Received by:	5/17/94 1125 Date/Time:
S Sweeney PNL for KLF Relinquished by:	L Sweeney L Sweeney WHC Received by:	5/23/94 1410 Date/Time:
L Sweeney L Sweeney WHC Relinquished by: 5/27/94 1010	W.V. Setzer / W.V. SETZER Received by:	5/27/94 1010 Date/Time:
Relinquished by:	C Lenitz IT Received by: @ 1100 CPM	5-27-94 1145 Date/Time:
Disposed by:	Disposal Method:	Date/Time: 0019

PNL-MA-567, AD2

BD-1200-345 (12/92)

9613477.2969

SAMPLE ANALYSIS ORDER
BATTELLE, PNL

~~Data Chem~~ ITAS yw 5/16/94

CONTRACT MPV-SVV-239-000
CHAIN OF CUSTODY #: WHC CONTRACT
SAMPLE ID(S): BØBYF8
SAMPLE SCHEDULE DATE: 5/01/94
USER ID _____

E # 6807

SAMPLE RECEIVER INITIAL / DATE:
_____ / DATE _____

WATER X SOIL __ OTHER __

INTERNAL TEMPERATURE OF SHIPPING CONTAINER
UPON OPENING IN LABORATORY _____

BOTT#	BOTT TYPE	BOTT SIZE	# of BOTT	PRESERVAT	NOTES	# of SAMP	ANA_1	ANA_2	ANA_3	ANA_4	ANA_5	ANA_6	Filtered
	P	1000	8	HNO_3		1	GAMMA						
	P	1000	2	HNO_3		1	TC99						

SAF 94-130

9613477.2970

SAMPLE STATUS REPORT FOR E 6807. E-BLANK 2-E34-2 TIME: 5/18/94 9: 0
DISPATCHED: 4/13/94 11:27 SAMPLE HAS NOT BEEN SLURPED
RECEIVED: 5/18/94 8: 3

EXT.	DETER.	RESULTS OR STATUS	OUT OF RANGE?	GOOD ANS?	CHARGE CODE
****	********	**********	***	***	******
4271	TOT-ACT	< 5.00000E 01 pCi/G	N	Y	VOGEL

END OF REPORT

BOBYF8
BOBYF9
BOBYG0
BOBYG1
LCS
5/23/94

BOBYF8
LCS
5/23/94

0021

9613477.2971

Surveyed : Yes L No ____? Less than 200 counts/minute: Yes ✓ No ____? By (initials) [illegible]

5-16-94 Pacific Northwest Laboratories Battelle Boulevard Richland, Washington 99352	**CHAIN OF CUSTODY**	Test User ID: C-of-C: WHC CONTRACT

Company Contact: _____ Telephone: _____

Samples Collected by: HANKEL/MACKLEY Date: 5-17-94 Time: 930

ID/Sample No.: _____

Ice Chest No.: _____ Field Logbook Page No.: _____

Remarks: SAF 94-130 E#6809

Possible Sample Hazard Identification: _____ Contract No.: MPV-SVV-233-000

Destination: 495M IT CONTRACT Carrier/Waybill No.: _____

Ground-Water X Soil _____ Other _____

Shipping container internal temperature when samples sealed in it _____. Shipping container internal temperature when opened in laboratory _____.

5-16-94

G3 (2) 300BYF5 1000mlP - TC99

G3 (8) 300BYF5 1000mlP - GAMMA

5-16-94

Sample Identification

40558602

SDGW0077

Chain of Possession

S Hankel PNL Relinquished by:	Kathy L. Farmer PNL Received by:	5/17/94 1125 Date/Time:
S Mackley PNL for KLF Relinquished by:	L Sweeney L Sweeney WHC Received by:	5/23/94 1410 Date/Time:
L Sweeney L Sweeney WHC Relinquished by: 5/27/94 1010	W.V. Setzer / W.V. SETZER Received by:	5/27/94 1010 Date/Time:
Relinquished by:	Received by:	5-27-94 1145 Date/Time:
Disposed by:	Disposal Method:	Date/Time: 0022

SAMPLE ANALYSIS ORDER
BATTELLE, PNL

~~Date Chgd~~ 5/2/94
ITAS
SAMPLE RECEIVER INITIAL / DATE:
_____ / DATE_____

CONTRACT MAJ-SUV-239-000
CHAIN OF CUSTODY #: W1TC CONTRACT
SAMPLE ID(S): B0B4G3
SAMPLE SCHEDULE DATE: 5/01/94
USER ID _____

E-6809

WATER X SOIL__ OTHER__

INTERNAL TEMPERATURE OF SHIPPING CONTAINER
UPON OPENING IN LABORATORY_____

BOTT#	BOTT TYPE	BOTT SIZE	# of BOTT	PRESERVAT	NOTES	# of SAMP	ANA_1	ANA_2	ANA_3	ANA_4	ANA_5	ANA_6	Filtered
	P	1000	8	HNO_3		1	GAMMA						
	P	1000	2	HNO_3		1	TC99						

SAF 94-130

9613477.2973

SAMPLE STATUS REPORT FOR E 6809. E-BLANK 2-E34-5 TIME: 5/18/94 9: 0
DISPATCHED: 4/13/94 11:32 SAMPLE HAS NOT BEEN SLURPED
RECEIVED: 5/18/94 8: 4

EXT.	DETER.	RESULTS OR STATUS	OUT OF RANGE?	GOOD ANS?	CHARGE CODE
****	********	**********	***	***	******
4271	TOT-ACT	< 5.00000E 01 pCi/G	N	Y	VOGEL

END OF REPORT

BOBYG3
BOBYG4
BOBYG5
BOBYG6

LCS
5/23/94

BOBYG3
~~BOBY~~
LCS 5/23/94

0024

9613477.2974

SAMPLE RECEIPT VARIANCE REPORT
ITAS-RICHLAND LABORATORY

WORK ORDER NUMBER: 4-05-586 (1+2) DATE INITIATED: 5-27-94

INITIATED BY: C. Veritzel

DATE/TIME OF SAMPLE (AND/OR RFA & COC) RECEIPT: 5-27-94 1145

CLIENT SAMPLE NUMBER	RFA/COC NUMBERS	ANALYSIS REQUESTED
BCBVF8	~~B.B.V.F8~~ CK 5-27-94	TC99 X
BCBVG3		TC99 X

Samples were received with the following deficiencies:

- ☐ 1. Not enough sample received for proper analysis.
- ☐ 2. Sample received without proper preservative.
- ☐ 3. No sample received in container.
- ☐ 4. Sample received without a RFA/COC form.
- ☐ 5. No sample ID on container.
- ☐ 6. Sample received broken or leaking.
- ☐ 7. Holding time exceeded at receipt.
- ☐ 8. Custody tape broken.
- ☒ 9. COC not relinquished by client.
- ☐ 10. Sample information on container does not match sample information on the paper work (Explain below).
- ☐ 11. All shipping containers (coolers) on waybill not received with shipment.
  - ☐ RFA/COC received
  - ☐ RFA/COC not received
- ☐ 12. Other (Explain below).

NOTES: _____

SUPERVISOR REVIEW: Jami Heidelberg

PROJECT MANAGER REVIEW: _____

TELEPHONED TO: _____ ON _____ BY _____

TELEFAXED TO: _____ ON _____ BY _____

SIGNED ORIGINAL MUST BE RETAINED IN WORK ORDER FILE

FORM NO. LS-023, 3/92, Rev. 0

0025

TENNELEC #1

SCREENING CALCULATION SPREADSHEET

O.K. JRM
27 may 94

Customer Code	Recieved Date	Time	Screening Prep Date	Time	Count Date	Mnts. Cntd	BACKGROUND Alpha	Beta	Mnts
WHC			52794		527	10	6	51	60

Customer ID WHC/LIQ	pH <2 Rcvd/Reiq	RESIDUE Wght (mGrms)	Vol. Anal. mG mL	Sample Size Gm L	SMPLE CNT DATA Hldr Num.	Total Counts Alpha	Beta	Net Sample Counts/Minute Alpha	Beta	DPM / Aliqout Alpha	Beta	uCi per Sample Alpha	Beta	2 Sigma Error uCi per Sample Alpha	Beta	pCi/(Gm or L) Alpha	Beta	Catagory 1 Yes/No	Aliquot to Cat 1 Gm or Ltr Alpha	Beta
B0C009		86.1	86	550.0	12	0	14	-0.10	0.55	-1E+00	1.5E+00	-3E-03	4.2E-03	-6E-06	3.5E-06	-5E+00	7.7E+00	Yes	-2E+03	1.3E+04
B0BYF8		2.7	5	1.0	13	2	16	0.10	0.75	3.8E-01	1.5E+00	3.4E-05	1.4E-04	7.6E-08	1.1E-07	3.4E+01	1.4E+02	Yes	2.9E+02	7.2E+02
B0BYG3		3.1	5	1.0	14	0	16	-0.10	0.75	-4E-01	1.7E+00	-4E-05	1.5E-04	-8E-08	4.2E-07	-4E+01	1.5E+02	Yes	-3E+02	6.6E+02
TOTAL	uCi							-0.10	-0.65	-4E-01	-2E+00	-3E-03	4.5E-03	ERR	ERR	ERR	ERR	Yes	ERR	ERR

9615477.2975

C026

9613477 2976

HAZARDOUS MATERIAL SHIPMENT RECORD (HMSR)

SHIPPING INST.

SHIP TO: IT Analytical
Company
2800 George Washington Way
Address
Richland, WA 99352
City, State, Zip
Tammy Riedelberg
Attention:

Originating Facility: Nell 699-93-93
Building:
Area: North Slope

Originator Signature: W.J. SETZER

Date: May 27, 1994

FROM: ☒ WHC ☐ KEH ☐ PNL ☐ OTHER

OFFSITE ONLY: SHIP: ☐ PREPAID ☐ COLLECT Via Govt. vehicle

VIA: ☐ Parcel Post ☐ Air Parcel Post ☐ Freight (Rail/Truck) ☐ Air (Passenger) ☐ Air (Cargo)

Cost Code:

SHIPMENT DESCRIPTION

CONTAINERS / PACKAGING						CONTENT DESCRIPTION
Number of Containers	Type	DOT Spec	Package Dimensions	Quantity Pkg	Gross Wt Each Pkg	See 49 CFR 172.101(c) Hazardous Material Table
1	Poly Cooler (strong tight)	N/A		(4)40ml (4)125ml (3)250ml (9)500ml 5870ml total		Proper Ship Name: Flammable Liquid, N.O.S., (Samples for Analysis 127.101(f)11)Ltd.Qty. Hazard Class: 3 PG1 UN/NA No.: UN 1993 List Secondary Hazards: None List Labels Req'd/Applied None
						Proper Ship Name: Hazard Class: UN/NA No.: List Secondary Hazards: List Labels Req'd/Applied
						Proper Ship Name: Hazard Class: UN/NA No.: List Secondary Hazards: List Labels Req'd/Applied

Total No. Containers	Gross Wt of Shipment	Identify Placards Required:	Identify Property Control or Return Order No.: (if applicable)
		1. None 2. 3. 4.	N/A

Material in manufacturers original container: ☐ Yes ☒ No
Container free of deterioration or damage: ☐ Yes N/A
Container acceptability documented: ☐ Yes N/A
Material is packaged, sealed, marked and labelled to meet DOT requirements ☒ Yes

Describe Internal Packaging: Flammable Liquid Samples in glass bottles, wrapped in bubble wrap, double bagged, packed in wet ice, surrounded by absorbent vermiculite.

RADIATION RELEASE	Survey No.	Date	RM Signature	Print Name

CERTIFICATION

CONTRACTORS CERTIFICATION

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transport according to the applicable regulations of the Department of Transportation:

This shipment is within the Limitations prescribed for: ☐ Passenger Aircraft ☐ Cargo Aircraft ☒ NA

Authorizing Signature: W.J. Setzer Print Name W.J. SETZER Date: 5-27-94

FOR OFFSITE SHIPMENTS – ADDITIONAL APPROVAL REQUIRED

WHC TRAFFIC	B.L. No.	Date Shipped	ETA	Routing	Special Considerations
WHC		5/27/94	5/27/94	DOE Vol.	10° BL 0027

WHC Traffic: WHC Shipping:

54-3000-596 (10-87)

9613477.2977

INTERNATIONAL TECHNOLOGY CORPORATION

Regional Office
2800 George Washington Way
Richland, Washington 99352

SAMPLE CHECK-IN LIST

(1 Per Shipping Container)

Date/Time Received 5-27-94 11:45 AM Client Name WHC

Project/Client # 94-130 Batch or Case #

Cooler ID (if noted on the outside of cooler) GWS058

1. Condition of shipping container? O.K.
2. Custody Seals on cooler intact? Yes ☒ No ☐
3. Custody Seals dated and signed? Yes ☒ No ☐
4. Chain of Custody record is taped on inside of cooler lid? Yes ☐ No ☒
5. Vermiculite/packing material is: Wet ☐ Dry ☒
6. Each sample is in a plastic bag? Yes ☒ No ☐
7. Number of sample containers in cooler: 20
8. Samples have: X tape ____ hazard labels
   X custody seals ____ appropriate sample labels
9. Samples are: X in good condition ____ leaking
   ____ broken ____ have air bubbles
   ____ other
10. Coolant present? Yes ☒ No ☐
    Sample temperature 4°C
11. The following paperwork should be accounted for (N/A if not applicable):
    Chain of Custody #'(s) N/A
    Request for analysis #(s) N/A
    Airbill # N/A Carrier N/A
12. Have any anomalies been identified above? Yes ☐ No ☒
13. Memos have been initiated for all anomalies identified above? Yes ☒

Printed Name/Signature Karen Ashtenburg Karen Ashtenburg Date/Time 5-27-94 11:45

FORM NO. LS-042, Rev.0, 2/94

9613477.2978

SAF 94-130

7/1/94

*** GAMMA ***

CHAIN OF CUSTODY BATCH ANALYSIS RECORD 27-May-1994
Page 1

CUSTOMER: WHC SAMPLE DELIVERY GROUP ____W0077_____

MATRIX : WATER BATCH NUMBER __5-586_____

	ITAS ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
	L0558618 ✓				
	L0558615 ✓		QCAM035		
1)	40550601 ✓		WHC	BODYF8	
	F0558601 ✓				
2)	40550602		WHC	BODYG3	

ACTIONS (Initial & Date)

1) INITIATED @5/27/94

2) PREP LAB RECEIVED 6-28-94 JW

3) SAMPLE REMAINDER STORED 6-28-94 JW

4) SEPARATION LAB RECEIVED NA

5) COUNTING/MEASUREMENT LAB KC 6-28-94

6) DATA REVIEWED AND ANALYTICAL PREP STORED JK 6-30-94

0029

9613477.2979

INTERNATIONAL TECHNOLOGY CORPORATION

DUE DATE 7/1/94

REANALYSIS / RECOUNT

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

ANALYSIS Gamma

NAME/DATE JK / 7-1-94

CUSTOMER WHC

SAMPLE DELIVERY GROUP W0077

MATRIX Water

BATCH NUMBER 070K7-5-94

ITAS ID	CUSTOMER ID	COMMENTS
1) L0558615		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		

REANALYSIS

REFERENCED QC

ITAS ID - BLANK _____

ITAS ID - SPIKE _____

CLIENT CODE _____

ACTIONS (Initial & Date)

PREP LAB RECEIVED _____

SAMPLE REMAINDER
RETURNED TO SCG ☐ (CHECK ONE)
NO SAMPLE REMAINING ☐

SEPARATION LAB _____

COUNTING/MEASUREMENT _____

DATA REVIEWED _____

ANALYTICAL PREP STORED _____

RECOUNT

ACTIONS ~~(Initial~~ & Date)

COUNTING/MEASUREMENT KC7-2-94

DATA REVIEWED JK 7-5-94

ANALYTICAL PREP STORED _____

ADDITIONAL COMMENTS:

JK 7-1-94

RC-048 12/92 REV 2

0030

9613477.2980

INTERNATIONAL TECHNOLOGY CORPORATION

DUE DATE 7/1/94

REANALYSIS / RECOUNT

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

ANALYSIS Gamma

NAME/DATE JK / 7-5-94

CUSTOMER WHC

SAMPLE DELIVERY GROUP _____

MATRIX Water

BATCH NUMBER _____

	ITAS ID	CUSTOMER ID	COMMENTS
1)	L0558615		100 ml
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			

JK 7-5-94

REANALYSIS

REFERENCED QC

ITAS ID - BLANK _____

ITAS ID - SPIKE _____

CLIENT CODE _____

ACTIONS (Initial & Date)

PREP LAB RECEIVED _____

SAMPLE REMAINDER RETURNED TO SCG _____ ☐ (CHECK ONE)

NO SAMPLE REMAINING ☐

SEPARATION LAB _____

COUNTING/MEASUREMENT _____

DATA REVIEWED _____

ANALYTICAL PREP STORED _____

RECOUNT

ACTIONS (Initial & Date)

COUNTING/MEASUREMENT OD 7/6/94

DATA REVIEWED JK 7-7-94

ANALYTICAL PREP STORED _____

ADDITIONAL COMMENTS:

Peak search split pack for C_{60} resulting in low bias

Transfer this result

JK 7-7-94

RC-048 12/92 REV 2

0031

9613477.2981

7/1/94

SAF 94-130

*** TC 99 ***

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD 27-May-1994
Page 1

CUSTOMER: WHC SAMPLE DELIVERY GROUP W0077

MATRIX : WATER BATCH NUMBER 5-586

	ITAS ID	DUP	ACCOUNT	CUSTOMER ID	COMMENTS
	L055861N	L055861B	W0558601	L055861N	instrument
	L055862N	L055861M	F055 8602	2N	Blanks
MM 6/24	~~1) 40558601~~	40558601	WHC	BODYFD	
MM 6/24	~~2) 40558602~~	40558602	WHC	BODYC3	

ACTIONS (Initial & Date)

1) INITIATED S 5/27/94

2) PREP LAB RECEIVED 6/20/94 MM

3) SAMPLE REMAINDER STORED 6/21/94 MM

4) SEPARATION LAB RECEIVED 6/20/94 MM

5) COUNTING/MEASUREMENT LAB S/C 6-24-94

6) DATA REVIEWED AND ANALYTICAL PREP STORED SB 6/29/94

W0558601 - EQN# 183 = 100.26 ± 1.2389 DPM

L055861M - EQN# 184 = 100.42 ± 1.2408 DPM

Los Alamos Technical Associates, Inc.

8633 Gage Blvd. / Kennewick, WA 99336 / Telephone (509) 783-4369 / FAX (509) 783-9661

August 24, 1994

Karl Pool
Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352

Dear Karl,

Attached is the data validation report for analytical results for 200-BP-5 Groundwater Operable Unit (SDG W0077-ITC-089). The package was received by Los Alamos Technical Associates on August 3, 1994. Validation of this package began on August 17, and was completed on August 23, 1994.

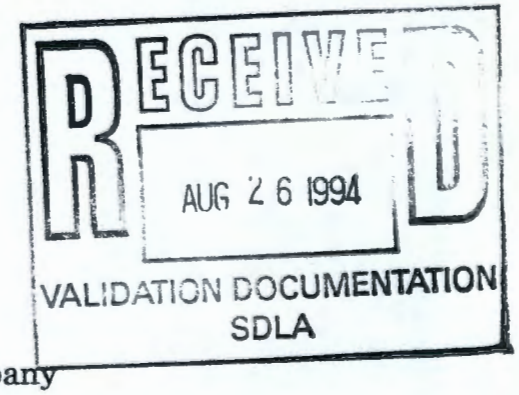
If you have any questions, please let me know.

Sincerely,

Janet M. Jones
Senior Environmental Engineer

cc: Chris Haecker, LATA
VW4012.63 file

DATA VALIDATION REPORT
for
200-BP-5 Groundwater Operable Unit
SDG W0077-ITC-089
LATA VW402.63



Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

August 23, 1994

Table of Contents

200-BP-5 Groundwater Operable Unit
Data Validation Narrative

INTRODUCTION

All samples in Sample Delivery Group (SDG) W0077-ITC-089 were validated at level "D" as defined in the Data Validation Procedures for Radiochemical Analyses (WHC-SD-EN-SPP-001).

The data package was received by Los Alamos Technical Associates (LATA) on August 3, 1994. Validation began on August 17, 1994 and was completed on August 23, 1994.

The radiochemical analyses were performed by International Technology Corporation, ITAS.

ANALYSES REQUESTED

Two (2) water samples numbered BOBYF8 and BOBYG3 were collected on May 17, 1994 by WHC and transferred to International Technology Corporation (ITC) for analysis. The following determinations were conducted on all of the samples in this SDG:

Gamma Spectroscopy:
Gamma Scan Method ITAS-RD-3219

Liquid Scintillation Counting:
Technetium-99 Method ITAS-IT-RS-0001

DATA QUALITY OBJECTIVES

The data quality objectives for 200-BP-5 Groundwater Operable Unit are specified in the *Quality Assurance Program Plan for the 200-BP-5 Groundwater Operable Unit* (DOE/RL 88-32, Rev. 1). Precision, accuracy, and detection limit requirements for the project have been derived from the laboratory SOW.

The primary objective of the data validation effort was to ensure these data quality objectives were met, and that the data are usable and defensible. This was accomplished through a detailed examination of the data package to recreate the analytical process and verify that proper and acceptable analytical techniques had been applied. The data package was checked for correct submission of required deliverables, correct transcription of raw data to the summary forms, and for proper calculation of a number of parameters.

Precision. Goals for precision were met with the exception of those items discussed under "**MINOR DEFICIENCIES**".

Accuracy. Goals for accuracy were met.

Sample Result Verification. All sample results were supported in the raw data.

Detection Limits. Detection limits goals were met for all sample results except for Ru-106 in BOBYF8, BOBYG3 or the QC associated with the batch.

Completeness. The data package was complete for all requested analyses.

Data qualifiers are assigned to any results that have been determined to be deficient. These are discussed below.

MAJOR DEFICIENCIES (REJECTED DATA)

* No major deficiencies were identified during validation which required qualification of data as unusable.

MINOR DEFICIENCIES

The following minor deficiencies were discovered. These minor shortcomings are not expected to significantly affect the overall quality of the data.

* No minor deficiencies were identified during validation which required qualification of data.

COMMENTS

* There was no evidence that the pH is being checked before the analysis of the samples.

* The matrix spike recovery for Tc99 was not calculated correctly. The Form I is edited.

* The gamma scan (GEA) spike had to be counted 3 times before getting an acceptable spike recovery. No qualifier was necessary.

* The Ru106 MDA from the QAPP is 3 pCi/L. This was not met for BOBYF8, BOBYG3, or the QC associated with the batch.

* There is no VEDD (Validation Electronic Data Deliverable) included with this package due to the fact that no qualifications were made or changed by the validator.

REFERENCES

EPA *USEPA Contract Laboratory Program Statement of Work for Inorganic Analyses*, EPA 1989a, U.S. Environmental Protection Agency, Washington, D.C.

WHC 1993, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

WHC 1993, *Data Validation Procedures for Radiochemical Analyses*, WHC-SD-EN-SPP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

WHC 1994, *Quality Assurance Program Plan for the 200-BP-5 Groundwater Operable Unit*, DOE/RL 88-32, Rev. 1, Department of Energy-Hanford, Richland, Washington.

DATA VALIDATION APPLIED QUALIFIERS

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

U- Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.

UJ- Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate.

J- Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision making purposes.

BJ- Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.

R- Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency the data are unusable.

UR- Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data are unusable due to an identified QC deficiency.

JN- Indicates a tentatively identified compound (TIC) that has been determined to be valid in terms of identification and quantitation.

UJN- Indicates a tentatively identified compound (TIC) that has been determined to be presumptive and valid (JN) in terms of identification and quantitation and has been qualified as undetected (U) due to associated blank contamination.

NJ- Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific application (i.e., usable for decision making purposes).

N- Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision making purposes).

LABORATORY APPLIED QUALIFIERS

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Organic Data Qualifiers

U- Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.

J- Indicates an estimated value. This flag is used when estimating concentrations of tentatively identified compounds (TICs) or when the presence of a TCL compound is confirmed at a concentration of less than the CRQL but greater than the IDL.

N- Indicates presumptive evidence of a compound. This flag is used only by the laboratory for TIC results when the identification is based on a mass spectral library search.

P- This flag is used for pesticide/Aroclor target analytes when there is greater than 25% difference for detected values between the quantitation and confirmation GC columns. The lower of the two concentrations is reported on the report form and the result is flagged with a "P".

C- This flag applies to pesticide results where the identification has been confirmed by GC/MS. This flag should not be used by the laboratory if GC/MS confirmation was attempted but unsuccessful, in which case, the laboratory should use an "X" flag as defined below. The "X" flag is then defined in the SDG narrative.

B- This flag applies to results in which the analyte was detected in both the sample and the associated blank. The combination of the "B" flag with the "U" flag ("BU" or "UB") is expressly prohibited in the analytical SOW.

E- This flag identifies compounds whose concentrations exceed the calibrated range of the GC/MS instrument.

D- This flag identifies compounds identified in an analysis at a secondary dilution factor.

A- Indicates a TIC which is a suspected aldol-condensate product.

X- This is a non-specific flag used to properly define the results. If used, this flag must be properly defined within the body of the SDG.

LABORATORY APPLIED QUALIFIERS

Inorganic Qualifiers

U- Indicates the analyte was analyzed for but not detected in the sample.

B- Indicates the analyte concentration is less than the CRDL but greater than the IDL.

E- Indicates the value reported is estimated due to the presence of interference.

M- Indicates duplicate injection precision criteria were not met during graphite furnace (GFAA) analysis.

N- Indicates spiked sample recovery was not within the control limits.

S- Indicates the reported value was determined by the Method of Standard Additions (MSA).

W- Indicates post-digestion spike for GFAA analysis is outside control limits and the sample absorbance is less than 50% of the spike absorbance.

*- Indicates duplicate analysis was not within control limits.

+- Indicates the correlation coefficient (r) for the MSA was less than 0.995.

Data Summary Tables

9613477.2992

RADCHEMISTRY DATA SUMMARY TABLE

FILE #:VW402.63		HEIS #:	B0BYF8			B0BYG3		
		Date:	27-May-94			27-May-94		
		Matrix:	WATER			WATER		
Constituent	CAS #	Units	Results	Q	MDA	Results	Q	MDA
Cobalt-58	13981-38-9	pCi/L	0.254	U	9.22	-0.360	U	10.1
Cobalt-60	10198-40-0	pCi/L	0.860	U	8.99	2.50	U	8.82
Cesium-137DA	10045-97-3	pCi/L	2.40	U	6.93	0.977	U	7.47
Europium-152	14683-23-9	pCi/L	3.00	U	18.2	3.04	U	17.0
Europium-154	15585-10-1	pCi/L	-2.32	U	19.1	-11.2	U	16.1
Europium-155	14391-16-3	pCi/L	-0.295	U	15.1	0.809	U	12.9
Iron-59	14596-12-4	pCi/L	-13.7	U	26.1	-0.799	U	27.1
Ruthenium-106DA	13967-48-1	pCi/L	-12.9	U	71.4	-22.9	U	68.7
Technetium-99	15133-76-7	pCi/L	0.407	U	2.12	2.14		2.12

entered by: C.S.
date: 8/24/94

Shaded areas indicate changes by the validator
ITC089

checked by: JM
date: 8/23/

Sample Results (Form I's)

9613477.2994

IT ANALYTICAL SERVICES
RICHLAND, WA
(509) 375-3131

SAMPLE RESULTS

LAB NAME:	ITAS-RICHLAND	SDG:	W0077
LAB SAMPLE ID:	40558601	MATRIX:	WATER
CLIENT ID:	B0BYF8	DATE RECEIVED:	5/27/94

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	2.54E-01	4.72E+00	4.72E+00	9.22E+00	pCi/L	N/A	RD3219
CO-60	8.60E-01	4.42E+00	4.42E+00	8.99E+00	pCi/L	N/A	RD3219
CS-137DA	2.40E+00	3.29E+00	3.30E+00	6.93E+00	pCi/L	N/A	RD3219
EU-152	3.00E+00	9.67E+00	9.67E+00	1.82E+01	pCi/L	N/A	RD3219
EU-154	-2.32E+00	1.03E+01	1.03E+01	1.91E+01	pCi/L	N/A	RD3219
EU-155	-2.95E-01	8.62E+00	8.62E+00	1.51E+01	pCi/L	N/A	RD3219
FE-59	-1.37E+01	1.62E+01	1.62E+01	2.61E+01	pCi/L	N/A	RD3219
RU-106DA	-1.29E+01	4.14E+01	4.15E+01	7.14E+01	pCi/L	N/A	RD3219
TC-99	4.07E-01	9.23E-01	4.07E+00	2.12E+00	pCi/L	95.10%	ITAS-IT-RS-0001

Number of Results: 9

MW 8-17-94

9613477.2995

IT ANALYTICAL SERVICES
RICHLAND, WA
(509) 375-3131

SAMPLE RESULTS

LAB NAME:	ITAS-RICHLAND	**SDG:**	W0077
LAB SAMPLE ID:	40558602	**MATRIX:**	WATER
CLIENT ID:	B0BYG3	**DATE RECEIVED:**	5/27/94

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-3.60E-01	5.37E+00	5.37E+00	1.01E+01	pCi/L	N/A	RD3219
CO-60	2.50E+00	3.77E+00	3.78E+00	8.82E+00	pCi/L	N/A	RD3219
CS-137DA	9.77E-01	3.85E+00	3.85E+00	7.47E+00	pCi/L	N/A	RD3219
EU-152	3.04E+00	9.02E+00	9.03E+00	1.70E+01	pCi/L	N/A	RD3219
EU-154	-1.12E+01	1.10E+01	1.11E+01	1.61E+01	pCi/L	N/A	RD3219
EU-155	8.09E-01	7.23E+00	7.23E+00	1.29E+01	pCi/L	N/A	RD3219
FE-59	-7.99E-01	1.45E+01	1.45E+01	2.71E+01	pCi/L	N/A	RD3219
RU-106DA	-2.29E+01	4.04E+01	4.04E+01	6.87E+01	pCi/L	N/A	RD3219
TC-99	2.14E+00	9.68E-01	4.21E+00	2.12E+00	pCi/L	95.10%	ITAS-IT-RS-0001

Number of Results: 9

6-17-94

000012

~~6007~~

Checklists

9613477.2997

VW402 63

LATA RADIOCHEMISTRY DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	(D)	E

PROJECT: 200-BP-5		DATA PACKAGE: W0077-ITC-089	
VALIDATOR: MWebb	LAB: ITC		DATE: 8-17-94
CASE: SAF 94-130		SDG: W0077-ITC-089	
QAPP REFERENCE:		SAP REFERENCE:	

If there is no QAPP or SAP reference, contact the WHC Technical Representative.
If the document(s) are not provided, default to the Method acceptance criteria.

ANALYSES PERFORMED

☐ Gross Alpha ☐ Gross Beta	☐ Strontium-89 ☐ Strontium-90	☒ Technetium-99	☐ Isotopic Anal. Alpha Spec.	☒ Gamma Spectroscopy	☐ Iodine-129
☐ Total Uranium (KPA)	☐ Radium-226 ☐ Radium-228	☐ (LSC) Liquid Scintillation	☐	☐	☐

SAMPLES/MATRIX BOBYF8, BOBYG3 (waters)

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification forms present? . . . . . (Yes) No N/A
Compliance screening form present? . . . . . (Yes) No N/A
Is a case narrative present? . . . . . (Yes) No N/A
Were all analyses requested reported? . . . . . (Yes) No N/A
Are all results supported in the raw data? . . . . . (Yes) No N/A
Comments: _____

2. CHAIN-OF-CUSTODY/HOLDING TIMES

Are sample holding times acceptable? . . . . . (Yes) No N/A
Are samples preserved correctly? . . . . . (Yes) No N/A
Was the pH of the sample checked prior to analysis? . . . . . Yes No (N/A)
Comments: No evidence of the pH being checked before analysis.

8/23/94 MW

LATA RADIOCHEMISTRY DATA VALIDATION CHECKLIST

3. INITIAL CALIBRATION

Instruments/detectors calibrated within one year of sample analysis?	Yes	(No)	N/A
Initial calibration acceptable?	(Yes)	No	N/A
Standards NIST traceable?	(Yes)	No	N/A
Standards Expired?	Yes	(No)	N/A

Comments: Act. Calibration acceptable. No effect on the data 9-8-94

4. CONTINUING CALIBRATION

Background checked at proper frequency?	(Yes)	No	N/A
Background check acceptable?	(Yes)	No	N/A
Efficiency checked at proper frequency?	(Yes)	No	N/A
Efficiency check acceptable?	(Yes)	No	N/A
Calibration check standards NIST traceable?	(Yes)	No	N/A
Calibration check standards expired?	Yes	(No)	N/A

Comments:

5. BLANKS *(see BLANK AND SAMPLE DATA SUMMARY form)*

Method blank analyzed?	(Yes)	No	N/A
Method blank results acceptable?	(Yes)	No	N/A
Analytes detected in method blank?	Yes	(No)	N/A
Transcription/Calculation Errors?	Yes	(No)	N/A

Comments:

8/23/94 C

6. MATRIX SPIKES *(see ACCURACY DATA SUMMARY form)*

Matrix spike analyzed?	(Yes)	No	N/A
Spike recoveries acceptable?	(Yes)	No	N/A
Spike source traceable?	(Yes)	No	N/A
Spike source expired?	Yes	(No)	N/A
Transcription/Calculation Errors?	(Yes)	No	N/A

★

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Spike Recovery

where:
SSR = spiked sample result
SR = sample result
SA = spike added

Comments: Re MS was not calculated on the benchsheet correctly. Nor was it entered into the Form 1 correctly. (299)

$$100 \times \frac{89.56 - .4073}{90.3243} = 98.7\%$$

Form 1's is corrected

7. LABORATORY CONTROL SAMPLES *(see ACCURACY DATA SUMMARY form)*

LCS analyzed?	(Yes)	No	N/A
LCS recoveries acceptable?	(Yes)	No	N/A
LCS traceable?	(Yes)	No	N/A
Transcription/Calculation Errors?	Yes	(No)	N/A

★

$$\%R = \frac{observed\ value}{true\ value} \times 100$$

Recovery

Comments: Re gamma LCS had to be recounted two times before acceptable results were obtained

8/23/96

8. CHEMICAL RECOVERY *(see ACCURACY DATA SUMMARY form)*

Chemical carrier added?	Yes	No	(N/A)
Chemical recovery acceptable?	Yes	No	(N/A)
Tracer added?	Yes	No	(N/A)
Tracer recovery acceptable?	Yes	No	(N/A)
Standards traceable?	Yes	No	(N/A)
Standards expired?	Yes	No	(N/A)
Transcription/Calculation errors?	Yes	No	(N/A)

★

Alpha Spec Tracer Recovery

$$\frac{A - B}{(2.22)(E)(T)}$$

where:

A = *gross counts per minute*
B = *background counts per minute of tracer*
2.22 = *conversion factor, dpm/pCi*
E = *detector efficiency*
T = *activity (pCi) of tracer added to sample (can be determined by taking dpm of tracer added divided by 2.22)*

Comments:_____

9. DUPLICATES *(see PRECISION DATA SUMMARY form)*

Duplicates Analyzed?	(Yes)	No	N/A
RPD Values Acceptable?	(Yes)	No	N/A
Transcription/Calculation Errors?	Yes	(No)	N/A

★

Relative Percent Difference

$$RPD = \frac{|S - D|}{\left(\frac{S + D}{2}\right)} \times 100$$

where:

S = *sample concentration (original sample/MS)*
D = *duplicate concentration (duplicate sample/MSD)*

Comments: Both results < 5* CRDL

8/23/94 mc

10. FIELD QC SAMPLES

Field blank(s) identified?	Yes	(No)	N/A
Field blank results acceptable?	Yes	No	(N/A)
Analytes detected in field blank(s)?	Yes	No	(N/A)
Field duplicate sample(s) identified?	Yes	(No)	N/A
Field duplicate RPD values acceptable?	Yes	No	(N/A)
Field split sample(s) identified?	Yes	(No)	N/A
Field split RPD values acceptable?	Yes	No	(N/A)
Performance audit sample(s) identified?	Yes	(No)	N/A
Performance audit sample results acceptable?	Yes	No	(N/A)

Comments:

11. DETECTION LIMITS (LEVELS D & E)

MDA's meet required detection limits?	Yes	(No)	N/A
Transcription/calculation errors?	Yes	(No)	N/A

★

Minimum Detectable Activity (MDA)

$$\frac{4.66 \times \sqrt{(B)(T)}}{2.22(E)(I)(R)(D)(V)(Y)(T)}$$

where:

- B = *background counts per minute (cpm) or the reported standard deviation of the background (S) cpm*
- T = *counting time for associated sample*
- 2.22 = *conversion dpm/pCi*
- E = *detector efficiency*
- I = *ingrowth correction factor (if applicable or 1)*
- R = *carrier recovery factor (if applicable or 1)*
- D = *decay factor (if applicable or 1)*
- Y = *chemical yield factor (if applicable or 1)*
- V = *sample volume in liters or grams*

Comments: Ru 106 MDA from QAPP 200-BP-5 is 3 pc./L
the was not met for the samples B0B3Y8 & B0B3Y3 and the QC.
No qualifiers

8/23/94 mg

Results Calculation Equations

Gross α/β and Tritium

$$\frac{(A - B) \times C}{(2.22)(E)(V)}$$

where:

A = *gross counts per minute*
B = *background counts per minute*
C = *activity of α fraction in β channel**
2.22 = *conversion factor, dpm/pCi*
E = *detector efficiency*
V = *sample volume, liters or grams*

**if for calculation of gross β, otherwise substitute* 1

Strontium (total)

$$\frac{A - B}{(2.22)(E)(I)(D)(R)(V)}$$

where:

A = *gross counts per minute*
B = *background counts per minute*
2.22 = *conversion factor, dpm/pCi*
E = *detector efficiency*
I = *ingrowth correction factor*
R = *carrier recovery factor*
D = *strontium decay factor*
V = *sample volume, liters or grams*

Strontium-90 (corrected for Sr-89)

$$\frac{A - B}{(2.22)(Y)(E)(I)(D)(R)(V)}$$

where:

A = *gross counts per minute*
B = *background counts per minute*
Y = *yttrium-90 yield factor*
2.22 = *conversion factor, dpm/pCi*
E = *detector efficiency*
I = *ingrowth correction factor*
R = *strontium-89 yield factor*
D = *strontium decay factor*
V = *sample volume, liters or grams*

8/23/94 MG

Results Calculation Equations, continued

Technetium-99

$$\frac{A - B}{(2.22)(E)(R)(V)}$$

where:

A = *gross counts per minute*
B = *background counts per minute*
2.22 = *conversion factor, dpm/pCi*
E = *detector efficiency*
R = *carrier recovery factor*
V = *sample volume, liters or grams*

Alpha Spec Isotopes

$$\frac{A - B}{(2.22)(E)(R)(V)}$$

where:

A = *gross counts per minute for isotope*
B = *background counts per minute for detector*
2.22 = *conversion factor, dpm/pCi*
E = *detector efficiency*
R = *tracer recovery factor*
V = *sample amount, liters or grams*

Gamma Spec Isotopes

$$\frac{A}{(2.22)(B)(D)(E)(V)(T)}$$

where:

A = *peak area for isotope*
D = *decay factor for isotope*
2.22 = *conversion factor, dpm/pCi*
B = *abundance factor for isotope*
E = *efficiency factor for isotope*
V = *sample amount, liters or grams*
T = *live time (minutes)*

8/23/94 MK

Results Calculation Equations, continued

Total Uranium by Laser Fluorometry

$$\frac{(WF - I)(R)(D)}{WU - WF}$$

where:

WF = *sample reading with Fluran*
I = *initial sample reading*
R = *concentration of uranium standard after dilution with sample* ($\mu g/L$)
D = *dilution factor*
WU = *sample reading with uranium standard*

Radium-226 by Radon Emanation

$$D = \frac{C}{(2.22)(E)(V)} \times \frac{1}{1 - e^{-\lambda t_1}} \times \frac{1}{e^{-\lambda t_2}} \times \frac{t_3}{1 - e^{-\lambda t_3}}$$

where:

C = *net count rate, cpm*
E = *calibration constant of the de-emanation system and the scintillation cell in counts per minutes/disintigrations per minute of radon-222*
V = *sample aliquot in liters*
t_1 = *the elapsed time in days between the first and second de-emanations, and* λ *is the decay constant for radon-222* ($0.181\ d^{-1}$)
t_2 = *the time interval in hours between the second de-emanation and counting, and* λ *is the decay constant of radon-222* ($0.00755 hr^{-1}$)
t_3 = *the counting time in minutes, and* λ *is the decay constant of radon-222* ($1.26 \times 10^{-4}\ \text{min}^{-1}$)
2.22 = *conversion factor, dpm/pCi*

8/23/94

9613477.3005

DATE 28-Jun-94 CALCULATED RESULTS SUMMARY dir$era_caldat:405586-TC99 PAGE 1

(NUM)	IT #	ISOTOPE	RESULT	ERROR*	COUNT ERROR*	YIELD	CALC MDA	UNITS	COMMENTS	DIAGNOSTICS
(1)	L055861N	TC99	2.557E+03	1.464E+02	4.515E+01	0.951		PCI/L		No Contr Values
(2)	L055861N	TC99	2.557E+03	1.464E+02	4.515E+01	0.951		PCI/L	AVER	No Contr Values
(3)	L055862N	TC99	-7.863E+01	1.990E+02	4.449E+01	0.951		PCI/L		No Contr Values
(4)	L055862N	TC99	-7.863E+01	1.990E+02	4.449E+01	0.951		PCI/L	AVER	No Contr Values
(5)	L055861B	TC99	1.857E+00	2.089E+00	4.725E-01	0.951		PCI/L		No Contr Values
(6)	L055861B	TC99	1.857E+00	2.089E+00	4.725E-01	0.951		PCI/L	AVER	No Contr Values
(7)	W0558601	TC99	8.956E+01	6.417E+00	9.705E-01	0.951		PCI/L		No Contr Values
(8)	W0558601	TC99	8.956E+01	6.417E+00	9.705E-01	0.951		PCI/L	AVER 99.2 %	No Contr Values
			90.3243 ± 1.1161 EQN 183							
(9)	L055861M	TC99	8.971E+01	6.427E+00	9.824E-01	0.951		PCI/L		No Contr Values
(10)	L055861M	TC99	8.971E+01	6.427E+00	9.824E-01	0.951		PCI/L	AVER 99.2 %	No Contr Values
			90.4685 ± 1.1178 EQN 184							
(11)	40558601	TC99	4.073E-01	2.035E+00	4.615E-01	0.951		PCI/L		No Contr Values
(12)	40558601	TC99	4.073E-01	2.035E+00	4.615E-01	0.951		PCI/L	AVER	No Contr Values
(13)	40558602	TC99	2.141E+00	2.102E+00	4.841E-01	0.951		PCI/L		No Contr Values
(14)	40558602	TC99	2.141E+00	2.102E+00	4.841E-01	0.951		PCI/L	AVER	No Contr Values
(15)	F0558602	TC99	6.063E-01	2.043E+00	4.629E-01	0.951		PCI/L		No Contr Values
(16)	F0558602	TC99	6.063E-01	2.043E+00	4.629E-01	0.951		PCI/L	AVER dup: of	No Contr Values

OK SB 6/28/94

```
********************** MDA, Uncertainty Calculations **********************
*     Calculations are based on the average background counts (bkg) and    *
*     average sample count times (Ts).  Results are in Act/Unit.           *
*                                                                          *
*          MDA = [(4.65 * sqrt((bkg c/m)/Ts)) + 2.71/Ts] * K,              *
*                where K is the factor that converts the                   *
*                associated result from CPM/Aliquot to Act/Unit.           *
*                                                                          *
*     The calculated MDA value may be lower than the True MDA.             *
*     The MDA is the activity level that can be detected above the mean blank *
*     value, Xo (Xo is not included)!  In addition, only the Poisson counting *
*     uncertainty is used to estimated the background variability!         *
*                                                                          *
*      * Uncertainty estimates (errors) are one standard deviation (1s) !  *
*                                                                          *
*     The average error is calculated as follows:                          *
*     SQR(SUM(Random var) / N + SUM(Sym var) / N)                          *
****************************************************************************
```

SB 6/28/94

(4.65√ x 125 (

MDA =

MS $\frac{89.56 - .4073}{90.3243} = 98.7$

~~90.46~~ 90.3243

pw 8-18-94

JW 6/29/94 JW

$$MDA = \frac{(4.65\sqrt{25.66 \times 125} + 2.71)(1.052)}{2.22(.5)(125)(.951)} = 2.12$$

000022

~~1.116~~

Table 1. Analytical Method Detection Limit, Precision, and Accuracy Guidelines for the 200-BP-1 Operable Unit. (sheet 1 of 8)

Category of analysis	Analyte of interest	Standard or reference method[a]	Soil[b]			Water[b]		
			MDC[c]	Precision (RPD)	Accuracy (%)	MDL[d]	Precision (RPD)	Accuracy (%)
Radionuclide	Strontium-90	905.0[e]	0.15 pCi/g	± 30	± 25	0.8 pCi/L	± 10	± 25
	Tritium	906.0[e]	1 pCi/g	± 30	± 25	500 pCi/L	± 10	± 25
	Uranium	908.0[e]	0.3 pCi/g	± 30	± 25	0.5 pCi/L	± 10	± 25
	Plutonium	901.1[e]	0.0001 pCi/g	± 30	± 25	0.75 pCi/L	± 10	± 25
	Cobalt-60	901.1[e]	0.02 pCi/g	± 30	± 25	10 pCi/L	± 10	± 25
	Ruthenium-106	901.1[e]	0.2 pCi/g	± 30	± 25	3 pCi/L	± 10	± 25
	Technetium-99	901.1[e]	0.5 pCi/g	± 30	± 25	15 pCi/L	± 10	± 25
	Cesium-137	901.0[e]	0.6 pCi/g	± 30	± 25	20 pCi/L	± 10	± 25
Inorganic	Aluminum	CLP[f]	40 mg/kg	± 20	± 25	200 µg/L	± 10	± 20
	Antimony	CLP[f]	12 mg/kg	± 20	± 25	60 µg/L	± 10	± 20
	Barium	CLP[f]	40 mg/kg	± 20	± 25	200 µg/L	± 10	± 20
	Beryllium	CLP[f]	1 mg/kg	± 20	± 25	5 µg/L	± 10	± 20
	Bismuth	303A[g]	12 mg/kg	± 20	± 25	60 µg/L	± 10	± 20
	Cadmium	CLP[f]	1 mg/kg	± 20	± 25	5 µg/L	± 10	± 20
	Calcium	CLP[f]	1,000 mg/kg	± 20	± 25	5,000 µg/L	± 10	± 20
	Chromium	CLP[f]	2 mg/kg	± 20	± 25	10 µg/L	± 10	± 20
	Cobalt	CLP[f]	10 mg/kg	± 20	± 25	50 µg/L	± 10	± 20
	Copper	CLP[f]	5 mg/kg	± 20	± 25	25 µg/L	± 10	± 20
	Iron	CLP[f]	20 mg/kg	± 20	± 25	100 µg/L	± 10	± 20
	Magnesium	CLP[f]	1,000 mg/kg	± 20	± 25	5,000 µg/L	± 10	± 20
	Manganese	CLP[f]	3 mg/kg	± 20	± 25	15 µg/L	± 10	± 20
	Nickel	CLP[f]	8 mg/kg	± 20	± 25	40 µg/L	± 10	± 20

8-18-94

MATRIX SPIKE RECOVERY (MS)

Analysis: Radiochemistry
SDG: W0077-ITC-089
Sample ID: BOBYF8

Date: 17-Aug-94
Validator: MC Webb

Constituent	Spike Sample Result SSR	Sample Result SR	Spike Added SA	%R
Tc99	89.56	0.41	90.32	98.7%
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
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				#DIV/0!
				#DIV/0!

PERCENT RECOVERY (LCS)

Analysis: Radiochemistry
SDG: W0077-ITC-089

Date: 17-Aug-94
Validator: MC Webb

Constituent	Observed value	True value	%R
	OLCS	ALCS	
Tc99	89.71	90.47	99.2%
GEA Co60	64.81	76.99	84.2%
GEA Cs137	57.83	62.62	92.4%
GEA Eu152	124.90	153.64	81.3%
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
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			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!

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000025

RELATIVE PERCENT DIFFERENCE

Analysis: Radiochemistry
SDG: W0077-ITC-089
Sample ID:

Date: 17-Aug-94
Validator: MC Webb

Constituent		Original (Sample) concentration OS	Duplicate concentration D	RPD
Tc99	BOBYG3	2.14	0.61	nc
GEA	BOBYF8	All nuclides undetected	All nuclides undetected	nc
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
				#DIV/0!
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				#DIV/0!

961347.3009

920026

MINIMUM DETECTABLE ACTIVITY (MDA)

Analysis: Radiochemistry
SDG: W0077-ITC-089

Date: 17-Aug-94
Validator: MC Webb

Constituent	Background counts per minute (cpm) or Standard Deviation of background (cpm)	Counting time for associated sample	Detector Efficiency	Ingrowth correction factor	Carrier recovery factor	Decay factor	Chemical yield factor	Sample volume (L or g)	MDA
	B.2	T.2	E.2	I.2	R.2	D.2	Y.2	V.2	
Tc99 BOBYF8	25.66	125	1.052	1.000	0.951	1.000	1.000	0.500	2.126
									#DIV/0!
									#DIV/0!
									#DIV/0!
									#DIV/0!
									#DIV/0!
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									#DIV/0!
									#DIV/0!
									#DIV/0!

RESULTS CALCULATION TECHNETIUM-99

Analysis: Radiochemistry
SDG: W0077-ITC-089

Date: 17-Aug-94
Validator: MC Webb

Constituent	DPM of the sample	DPM of the blank	Detector Efficiency	Carrier recovery factor	Sample volume (L or g)	Result
	A.6	B.6	E.6	R.6	V.6	
Tc99 BOBYF8	27.42	26.99	1.00	0.95	0.50	0.4073
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!
						#DIV/0!

Validator	Date	SDG
MC Webb	8-18-94	W0077-ITC-089

DATA VALIDATION SUMMARY

MAJOR DEFICIENCIES:

1. None

MINOR DEFICIENCIES:

1. None

COMMENTS:

1. There is no evidence that the pH was checked on the samples before analysis.
2. The matrix spike recovery for Tc99 was not calculated correctly. The Form 1 is edited.
3. The gamma scan (GEA) spike had to be counted 3 times before getting an acceptable spike recovery. No qualifier necessary.
4. The Ru106 MDA from the QAPP is 3 pCi/L. This was not met for BOBYF8, BOBYG3, or the QC associated with the batch.

Laboratory Case Narratives

INTERNATIONAL TECHNOLOGY CORPORATION

CERTIFICATE OF ANALYSIS

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352

July 25, 1994

Attention: J.A.Lerch

SAF Number	:	94-130
Date SDG Closed	:	June 10, 1994
Number of Samples	:	Two (2)
Sample Type	:	Water
SDG Number	:	W0077
Data Deliverable	:	Stand Alone

I. Introduction

On May 27, 1994, two water samples were received by ITAS-Richland for radiochemical analysis. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the WHC specific IDs:

ITAS-Richland ID	WHC ID	Matrix	Date of Receipt
405586-01A	B0BYF8	Water	5/27/94
405586-02A	B0BYG3	Water	5/27/94

II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

Regional Office
2800 George Washington Way • Richland, Washington 99352-1613 • 509-375-3131 • FAX: 509-375-5590

The requested analyses were: **Gamma Spectroscopy**
Gamma Scan by method ITAS-RD-3219
Liquid Scintillation Counting
Technetium-99 by method ITAS-IT-RS-0001

III. Quality Control

The analytical results for each analysis performed under SDG W0077 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV. Comments

Results from the initial radioactivity screening of these samples classified them as Category I.

Gamma Spectroscopy

Gamma Scan by method ITAS-RD-3219
The LCS was recounted twice because of a low bias on the Co-60 result which resulted from the gamma spectroscopy software splitting the uneven Co-60 peak. The third count of the LCS is accepted and reported. Pb-212 was detected in the duplicate of sample B0BYF8 at an activity of less than two times the error and is not reported. The LCS, batch blank, sample and sample duplicate (duplicate of sample B0BYF8) results are within contractual requirements.

Liquid Scintillation Counting

Technetium-99 by method ITAS-IT-RS-0001
The matrix spikes, LCS, batch blank, sample and sample duplicate (duplicate of sample B0BYG3) results are within contractual requirements.

Chain-of-Custody Information

9613477.3017

Surveyed : Yes ✓ No ____ ? Less than 200 counts/minute: Yes ✓ No ____ ? By (initials) [redacted]

Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352

CHAIN OF CUSTODY

Test User ID:

C-of-C: WHC CONTRACT

Company Contact: _____ Telephone: _____

Samples Collected by: HANKEL / MACKLIET Date: 5-17-94 Time: 1015

ID/Sample No.: _____

Ice Chest No.: _____ Field Logbook Page No.: _____

Remarks: SAF 94-130 E6807

Possible Sample Hazard Identification: _____ Contract No.: MPV-SVV-239-000

Destination: HASM IT CONTRACT Carrier/Waybill No.: _____

Ground-Water X Soil _____ Other _____

Shipping container internal temperature when samples sealed in it _____. Shipping container internal temperature when opened in laboratory _____.

Sample Identification

B0BYF8 (2) 1000 ml P - TC99

B0BYF8 (8) 1000 ml P - GAMMA

40558601

SDG W0077

Chain of Possession

Relinquished by: [redacted]	Received by: Kathy L. Jaime PNL	Date/Time: 5/17/94 1125
Relinquished by: S Sweeney PNL for KLF	Received by: L Sweeney L Sweeney WHC	Date/Time: 5/23/94 1410
Relinquished by: L Sweeney L Sweeney WHC 5/27/94 1010	Received by: W.V. Setzer / W.V. SETZER	Date/Time: 5/27/94 1010
Relinquished by: _____	Received by: C Lenihan IT 2100 cpm	Date/Time: 5-27-94 1145
Disposed by: _____	Disposal Method: _____	Date/Time: _____ C019

000034

9613477.3018

Surveyed : Yes L No ____? Less than 200 counts/minute: Yes ✓ No ____? By (initials) [illegible]

5-16-94

Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352

CHAIN OF CUSTODY

Test User ID:

C-of-C: WHC CONTRACT

Company Contact: _____ Telephone: _____

Samples Collected by: HANKEL / MACKLIN Date: 5-17-94 Time: 930

ID/Sample No.: _____

Ice Chest No.: _____ Field Logbook Page No.: _____

Remarks: SAF 94-130 E#6809

Possible Sample Hazard Identification: _____ Contract No.: 4PV-SVV-239-000

Destination: HASM IT CONTRACT Carrier/Waybill No.: _____

Ground-Water X Soil _____ Other _____

Shipping container internal temperature when samples sealed in it _____. Shipping container internal temperature when opened in laboratory _____.

5-16-94

G3 (2) 1000mlP - TC99

G3 (8) 1000mlP - GAMMA

5-16-94

Sample Identification

405586 02

SDG W0077

Chain of Possession

Relinquished by: [illegible] PNL	Received by: Kathy L. Jaimes PNL	Date/Time: 5/17/94 1125
Relinquished by: for KLF S. Mourey PNL	Received by: L Sweeney WHC L Sweeney	Date/Time: 5/23/94 1410
Relinquished by: L Sweeney WHC L Sweeney 5/27/94 1010	Received by: W.V. Setzer / W.V. SETZER	Date/Time: 5/27/94 1010
Relinquished by:	Received by: [illegible] 2100	Date/Time: 5-27-94 1145
Disposed by:	Disposal Method:	Date/Time: 0022

PNL-MA-567, AD2

AD12 (12/92)

000035

9613477.3019

SAMPLE ANALYSIS ORDER
BATTELLE, PNL

~~Data Chem~~ ITAS JW 5/16/94

CONTRACT MPV-SVV-239-000
CHAIN OF CUSTODY #: WHC CONTRACT
SAMPLE ID(S): B@BYF8
SAMPLE SCHEDULE DATE: 5/01/94
USER ID _____

E # 6807

SAMPLE RECEIVER INITIAL / DATE:
_____ / DATE _____

WATER X SOIL __ OTHER __

INTERNAL TEMPERATURE OF SHIPPING CONTAINER
UPON OPENING IN LABORATORY _____

BOTT#	BOTT TYPE	BOTT SIZE	# of BOTT	PRESERVAT	NOTES	# of SAMP	ANA_1	ANA_2	ANA_3	ANA_4	ANA_5	ANA_6	Filtered
	P	1000	8	HNO_3		1	GAMMA						
	P	1000	2	HNO_3		1	TC99						

SAF 94-130

000036

~~4/28/94~~ MK
~~0020~~

9613477.3020

SAMPLE ANALYSIS ORDER
BATTELLE, PNL

~~Date Chgd~~ JJW 5/18/94
ITAS

CONTRACT MAV-SUV-239-000
CHAIN OF CUSTODY #: WHC CONTRACT
SAMPLE ID(S): B0B4G3
SAMPLE SCHEDULE DATE: 5/01/94
USER ID _____

E-6809

SAMPLE RECEIVER INITIAL / DATE:
_____ / DATE _____

WATER X SOIL __ OTHER __

INTERNAL TEMPERATURE OF SHIPPING CONTAINER
UPON OPENING IN LABORATORY _____

BOTT#	BOTT TYPE	BOTT SIZE	# of BOTT	PRESERVAT	NOTES	# of SAMP	ANA_1	ANA_2	ANA_3	ANA_4	ANA_5	ANA_6	Filtered
	P	1000	8	HNO_3		1	GAMMA						
	P	1000	2	HNO_3		1	TC99						

SAF 94-130

000037

8/23/94 MMG
~~G025~~

END OF PACKAGE