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7. Abstract

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APPENDIX A

BOVAY NORTHWEST

COMPLETENESS VERIFICATION CHECKLISTS

ACRONYMS

%D	percent difference
BFB	bromofluorobenzene
CLP	contract laboratory program
CRDL	contract required detection limit
CRQL	contract required quantitation limit
DOE	Department of Energy
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatography/mass spectrometry
IDL	instrument detection limit
MDA	minimal detectable amount
MS/MSD	matrix spike/matrix spike duplicate
PQAR	preliminary quality assurance report
QA	quality assurance
QC	quality control
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
SOW	statement of work
TIC	tentatively identified compound
TMA	Thermo Analytical Laboratories
VOC	volatile organic compound
Weston	Roy F. Weston Company
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

Laboratory data for Fifth Round Groundwater samples collected during the 300-FF-5 Operable Unit Remedial Investigation have been reviewed and validated to ensure that they are of sufficient quality to support decisions regarding further actions to be taken at the 300-FF-5 Operable Unit. Table 1-1 is a summary of the validated samples. This report summarizes the results previously presented to Westinghouse Hanford in a series of Preliminary Quality Assurance Reports (PQAR) for the 300-FF-5 Fifth Round Groundwater samples. In some instances, the data qualifiers originally presented in the PQARs have been changed based upon further review of the data; these changes are highlighted in the text.

Throughout this report, various standard abbreviations have been used to note the qualifications associated with sample results. These abbreviations are summarized in Table 1-2.

1.1 CHEMICAL ANALYSES

Data from the chemical analysis of 8 samples from the 300-FF-5 Operable Unit and their related quality assurance (QA) samples were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site. Two analytical cases were analyzed by Thermo Analytical Laboratories (TMA) and two were analyzed by Roy F. Weston (Weston) Laboratories for volatile organic compounds (VOC) using U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) Scope of Work (SOW).

1.2 RADIOCHEMICAL ANALYSES

Data from two radiochemical cases analyzed by TMA and two cases analyzed by Weston/Teledyne were validated. The laboratory used analytical protocols specified in the *Remedial Investigation/Feasibility Study Work Plan for the 300-FF-5 Operable Unit, Hanford Site* (DOE 1990). Sample analyses included the following:

- ▶ Gross alpha and gross beta (25 groundwater samples)
- ▶ Total uranium (25 groundwater samples)
- ▶ Technetium 99 (2 groundwater samples)

1.3 WESTINGHOUSE HANFORD GUIDANCE USED

Data quality was reviewed and analytical results were validated using EPA CLP protocols and guidelines, and related Westinghouse Hanford procedures (WHC 1992a and 1992b). Data were qualified based on their quality and the guidance provided by these sources.

1.4 MAJOR DEFICIENCIES

The following analytical results were rejected due to deficiencies in data quality:

Volatile Organic Analyses. No sample data were rejected due to deficiencies in data quality.

Radiochemical Analysis.

- ▶ Results for all Weston/Teledyne gross alpha/gross beta and total uranium samples were rejected (R), as no chain of custody was provided and standards were nontraceable.
- ▶ Gross alpha results were rejected for one Weston/Teledyne package due to poor accuracy.

1.5 GENERAL QUALITY TRENDS

Several general quality trends, which resulted in data qualification, were observed. These include the following:

- ▶ Methylene chloride was detected in one of the volatile organics method blanks.
- ▶ Trace concentrations of methylene chloride and acetone were detected in several of the samples. Methylene chloride and acetone are common laboratory contaminants and were not detected in all of the method blanks; however, at the low concentrations detected, it is not possible to verify that the site is the source of acetone and methylene chloride.

- ▶ Poor accuracy for gross beta analyses in one Weston/Teledyne package and gross alpha analyses in one TMA package resulted in all results being qualified as estimated (J).
- ▶ Total uranium results for both Weston/Teledyne packages were qualified as estimates (J) due to lack of associated blank analyses.

**Table 1-1. 300-FF-5 Operable Unit Remedial Investigation
Round 5 Groundwater
Summary of Validated Samples**

Sample	Volatile Organic Compounds	Gross Alpha and Beta	Total Uranium	Technetium 99
B086P9	X	X	X	N/A
B086Q0	N/A	X	X	N/A
B086Q1	X	X	X	N/A
B086Q2	—	X	X	N/A
B086Q3	—	X	X	N/A
B086Q4	N/A	X	X	N/A
B086Q5	N/A	X	X	N/A
B086Q7	N/A	X	X	N/A
B086Q8	N/A	X	X	N/A
B086Q9	X	X	X	N/A
B086R1	X	X	X	N/A
B086R2	N/A	X	X	N/A
B086R3	N/A	X	X	N/A
B086R4	X	X	X	N/A
B086R5	N/A	X	X	N/A
B086R7	N/A	X	X	N/A
B086R8	N/A	X	X	N/A
B086R9	N/A	X	X	N/A
B086S0	N/A	X	X	N/A
B086S1	X	X	X	N/A
B086S2	X	X	X	N/A
B086S3	N/A	X	X	N/A
B086S4	N/A	X	X	N/A
B086S7	N/A	X	X	—
B086S8	N/A	X	X	—
B086T6	X	N/A	N/A	N/A

X Validated.

— Analyzed for, but not validated.

N/A Not analyzed.

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Table 1-2. Glossary of Data Qualifiers

- U** Indicates the compound or analyte was analyzed for and not detected. 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. Due to quality control deficiencies identified during data validation the value reported may not accurately reflect the sample quantitation limit.
- J** Indicates the compound or analyte was analyzed for and detected. The associated value is estimated but the data are useable for decision making processes.
- R** Indicates the compound or analyte was analyzed for and due to an identified quality control deficiency the data are not useable.
- JN** Indicates presumptive evidence of a compound at an estimated value.
- UJN** Indicates the compound or analyte was originally identified from presumptive evidence. Due to quality control deficiencies identified during data validation the value reported may not accurately reflect the sample quantitation limit.

2.0 VOLATILE ORGANIC DATA VALIDATION AND LIMITATIONS

2.1 SUMMARY

2.1.1 Four Sample Delivery Groups

Sample results from four volatile organic cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	A303043	4	2
TMA	S303013	4	4
Weston	9303L887	1	1
Weston	9302L748	1	1

Data qualifiers assigned to the sample data for these cases are summarized in Table 2-1.

2.1.2 All Samples Validated

Results for all the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. All of the reported results for quality assurance samples associated with these cases were reviewed. For all cases, one hundred percent of the quality assurance sample results were recalculated and quality control calculations verified. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

2.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with *the Westinghouse Hanford/Data Validation Procedures for Chemical Analyses* (WHC 1992a). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), and the EPA data validation guidelines (EPA 1991).

2.1.4 Samples Analyzed According to CLP Protocols

Eight low level water samples were submitted for analysis. Analyses were performed according to the 1990 CLP protocol (EPA 1990).

The Weston sample analyses were performed using two gas chromatograph/mass spectrometer (GC/MS) systems. One system was outfitted with a packed column, the other with a capillary column. At TMA, the sample analyses were performed using two GC/MSs. Both systems were outfitted with capillary columns. The data were evaluated against equivalent quality control requirements and are comparable. Failure to comply with various technical requirements established by CLP protocols resulted in qualification of the data. The specific problems observed during the quality assurance review are detailed in the sections below.

The analysis was complete and met the method and work plan contract required quantitation limit (CRQL) (DOE 1990) in all cases.

2.1.5 Minor Deficiencies Noted

There were minor deficiencies associated with the analyses, which resulted in the qualification of data. These included: minor blank contamination and sample concentrations reported below the CRQL. These deficiencies and the resulting data qualifications are explained in greater detail below.

2.2 ANALYTICAL METHOD

2.2.1 Gas Chromatography/Mass Spectrometer Tuning Criteria Met

Tuning is performed to ensure that mass resolution, identification, and, to some degree, sensitivity of the GC/MS instrument have been established. When analyzing for volatile organics, instrument tuning is performed with bromofluorobenzene (BFB). Instrument tuning must be performed prior to the analysis of either standards or samples and must meet the criteria established by the analytical protocol. The specific criteria for acceptable GC/MS instrument tuning using BFB are outlined in the Westinghouse Hanford data validation guidelines (WHC 1992a) and in the CLP SOW (EPA 1990).

All tuning and mass calibration summary forms (Form V) were evaluated to verify that tuning criteria were met. In addition, the original tuning data were checked for transcription and calculation errors in one of the packages. Prior to calibration and sample analysis, all tuning criteria were met and no data were qualified based on the tuning results.

2.2.2 Acceptable Calibration

Instrument calibration is performed to establish that the GC/MS instrument is capable of producing acceptable and reliable analytical data over a range of concentrations. The initial and continuing calibrations are to be performed according to CLP protocols. An initial multipoint calibration is performed prior to sample analysis to establish the linear range of the GC/MS instrument. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible during analytical runs.

A detailed description of the results of the initial and continuing calibrations performed is presented below.

2.2.2.1 No Initial Calibration Exceedences

Instrument response is established when the relative response factors (RRFs) for all target compounds are greater than or equal to the minimum criteria specified in the CLP SOW (EPA 1990). Linearity is established when the relative standard deviations (RSDs) of the RRFs are less than or equal to 20.5 percent (EPA 1990). Only some of the compounds are required to meet these criteria, and minor exceedences of common problem compounds do not cause qualification of the data.

For each of the cases, the initial calibrations met the criteria. Therefore, no data were qualified based on the initial calibration results.

2.2.2.2 No Continuing Calibration Exceedences

The criteria for accepting the continuing calibration require that a 50 µg/L standard be analyzed at least once per 12-hour period and that the RRFs of all target compounds be greater than or equal to the minimum criteria specified in the CLP SOW (EPA 1990). In addition, the percent difference (%D) of these RRFs must be less than or equal to 25 percent (EPA 1990) of the average RRFs calculated for the associated initial calibration. Only some of the compounds are required to meet these criteria, and minor exceedences of common problem compounds do not cause qualification of the data.

The required analysis frequency and criteria for continuing calibration were met for these cases, and no data were qualified based on the continuing calibration results.

2.2.3 Blanks

Method blank and field blank analyses are performed to determine the extent of laboratory or field contamination of samples. If the sample concentration for a compound is less than five times the blank concentration (ten times if the compound is a common laboratory contaminant), the sample concentration is qualified as undetected (U).

2.2.3.1 Minor Method Blank Contamination

One method blank was analyzed during each 12-hour period, on each instrument. Methylene chloride was detected in one of the blanks at low concentrations. Associated sample data were qualified as outlined below.

Case S303013. No target compounds were detected in the method blank associated with this case.

Case A303043. No target compounds were detected in the method blank associated with this case.

Case 9302L748. No target compounds were detected in the method blank associated with this case.

Case 9303L887. Methylene chloride was detected in the method blank associated with this case. The methylene chloride concentration for sample B086S1 was less than 10 times the concentration reported for the blank; therefore, methylene chloride was qualified as undetected (U) at the CRQL.

2.2.3.2 Minor Trip Blank Contamination

Methylene chloride was detected in the trip blank associated with this case. Methylene chloride data in sample B086Q9 were qualified as undetected (U) at the CRQL.

2.3 HOLDING TIMES

Analytical holding times were assessed to ascertain whether the CLP holding time requirements for volatile organic analyses were met by the laboratory. The CLP holding time requirements for volatile organic analyses are as follows: water samples must be analyzed within 14 days of the date of sample collection; and all samples must be shipped on ice to the laboratory and stored at 4°C until analysis.

The holding times were acceptable for all of the samples associated with these four cases. Therefore, no qualifiers were assigned based on the holding time.

2.4 ACCURACY

The overall accuracy goal for the four compounds of concern is ± 25 percent. Accuracy was assessed by evaluating the recoveries of stable isotopically labeled surrogate compounds added to all samples and blanks, matrix spikes, and by the analysis of a representative sample, which was spiked with a variety of volatile organic compounds.

2.4.1 Surrogate Compound Recovery Acceptable

Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program (EPA 1990). When a surrogate compound recovery is out of the control window, all positively identified target compounds associated with the unacceptable surrogate recoveries are qualified as estimates (J). Undetected compounds are qualified as having an estimated detection limit (UJ).

The EPA surrogate recovery control windows (EPA 1990) are calculated using the following formula:

$$\text{EPA Control Limit} = \overline{\%R} \pm (\tau * \text{Std. Dev.})$$

Where:

$$\overline{\%R} = \text{average percent recovery}$$

$$\tau = \text{Student } \tau \text{ Value at the 99 Percent Confidence Level}$$

The Fifth Round Groundwater surrogate recovery distribution was calculated in the same manner. Figure 2-1 shows that the Fifth Round Groundwater surrogate recovery distribution is comparable to the EPA general population data for this method. The percent recovery distribution is normal, and there are no adverse trends. The surrogate compound recoveries calculated for the three stable isotopically labeled surrogate compounds were acceptable for each sample. Therefore, no qualifiers were assigned based on surrogate recovery.

Compound	Sample Name		
	□	+	◇
	Toluene-d ₈	Bromofluorobenzene	1,2-Dichloroethane-d ₄
B086P9	96	90	98
B086Q1	107	94	108
B086Q9	98	100	104
B086R1	99	101	101
B086R4	98	99	107
B086T6	99	101	105
B086S1	107	89	104
B086S2	106	109	99
Mean	101.3	97.9	103.3
Variance	18.4	38.1	11.4
Unbiased Std.Dev.	4.6	6.6	3.6
2.998*Std.Dev.	13.8	19.8	10.8
Range	88-115	78-118	93-114
EPA Limit	88-110	86-115	76-114

Figure 2-1. 300-FF-5 Fifth Round Groundwater Volatile Surrogate Recovery

2.4.2 Matrix Spike Recoveries Acceptable

Matrix spike compounds are added to a sample, which is representative of the sample delivery group. Matrix spike analyses are performed in duplicate using five compounds specified by CLP protocols. The recoveries for the five compounds must be within the sample matrix established quality control limits (EPA 1990). The matrix spike analyses estimate the interference with target compounds, either positively or negatively.

Four matrix spike (MS) samples and four matrix spike duplicate (MSD) samples were analyzed with the cases addressed in this report. The matrix spike compound recoveries were acceptable. Therefore, no qualifiers were assigned based on matrix spike percent recoveries.

The EPA matrix spike recovery control windows (EPA 1990) are calculated using the following formula:

$$EPA \text{ Control Limit} = \overline{\%R} \pm (\tau * Std. Dev.)$$

Where:

$$\overline{\%R} = \text{average percent recovery}$$

$$\tau = \text{Student } \tau \text{ Value at the 99 Percent Confidence Level}$$

Although the Fifth Round Groundwater matrix spike population is small (8 matrix spike samples), the matrix spike recovery distribution was calculated in the same manner. Figure 2-2 shows that the matrix spike recovery distribution is comparable to the EPA general population data for this method.

2.5 PRECISION ACCEPTABLE

The overall precision goal for the four compounds of concern is ≤ 10 percent relative percent difference (RPD). Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed MS/MSD analyses, precision may also be assessed using unspiked duplicate sample analyses. Field precision is measured by analyzing duplicate samples taken in the field. Interlaboratory precision is measured by analyzing duplicate samples ("field splits") by two analytical laboratories.

Compound	□ 1,1-dichloroethene	+ trichloroethene	◇ benzene	△ toluene	× chlorobenzene
B086S1 MS	125	109	113	105	106
B086S1 MSD	132	114	117	113	114
B086S2 MS	111	101	101	102	103
B086S2 MSD	106	96	100	101	99
B086T6 MS	103	99	104	101	100
B086T6 MSD	105	102	105	103	102
B086P9 MS	109	95	101	91	89
B086P9 MSD	112	98	104	97	92
Mean	112.875	101.75	105.625	101.625	100.625
Variance	92.35937	37.9375	32.98437	34.73437	53.48437
Unbiased Std. Dev.	10.27392	6.584614	6.139741	6.300510	7.818247
2.998*std. dev	30.80123	19.74067	18.40694	18.88892	23.43910
Range	83-144	82-121	87-124	82-121	77-124
EPA Limit	61-145	71-120	76-127	76-125	75-130

Figure 2-2. 300-FF-5 Fifth Round Groundwater Matrix Spike Recovery

2.5.1 Matrix Spike Duplicates Acceptable

Four soil MSD samples were analyzed with the cases addressed in this report. The MSD RPDs were acceptable for all four cases. Therefore, no qualifiers were assigned based on the MSD precision.

2.5.2 No Field Duplicates Submitted

No field duplicates were submitted for analysis within these cases.

2.5.3 Interlaboratory Precision

Two sets of field split samples (B086S2/B086R1 and B086P9/B086S1) were analyzed. The compounds of concern were not detected or were detected at concentrations less than the CRQL. Therefore, interlaboratory precision could not be quantitatively evaluated. No qualifiers were assigned based on interlaboratory precision data.

2.6 INTERNAL STANDARD PERFORMANCE ACCEPTABLE

Internal standard performance was assessed to determine whether abrupt changes in instrument response and sensitivity occurred that may have affected the reliability of the analytical data. The response (area or height) of the internal standards must not vary by more than +100 percent or -50 percent from the response of the internal standard that was used to calculate the upper and lower bounds. The upper and lower bounds define the range for acceptable internal standard response (area/height) for the sample analyses. The criteria for internal standard performance were met for all samples.

2.7 IDENTIFICATION OF COMPOUNDS

The identity of detected compounds was confirmed by investigating the possibility of false positives. The confirmation of compound identification during the quality assurance review focuses on false positives because only mass spectra for positive identifications are submitted. Confirmation of possible false negatives is addressed by reviewing other factors relating to analytical sensitivity (e.g., relative response factors, detection limits, linearity, analytical recovery).

The validator confirmed the compound identifications. Trace concentrations of acetone, methylene chloride, chloroform, and trichloroethene were reported in several of

the samples. Methylene chloride is a common laboratory contaminant, and affected sample concentrations were qualified due to contamination of one of the blanks. Acetone is a common laboratory contaminant but was not detected in any of the method blanks. Chloroform and trichloroethene were not detected in the method blank associated with the samples; therefore, the data were not qualified as undetected. However, at these low concentrations the source of the methylene chloride, chloroform, and trichloroethene cannot be confirmed to be from the site.

There were no tentatively identified compounds (TICs) detected in these samples.

2.8 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and reported detection limits were recalculated for the samples specified by Westinghouse Hanford for each case to verify that they were accurate and consistent with CLP requirements. The calculations were consistent with the reported results. Therefore, no changes or qualifications were made based on the calculations.

Below the CRQL, instrument precision becomes more variable as the instrument detection limit (IDL) is approached. Therefore, the concentration of any compound that was detected below the CRQL was qualified as an estimate (J).

2.9 SYSTEM PERFORMANCE ACCEPTABLE

A thorough review of ongoing data acquisition and instrument performance criteria was made to assess overall GC/MS instrument performance. No changes in instrument performance were noted that would result in the degradation of data quality. No indications of unacceptable instrument performance (i.e., shifts in baseline stability, retention time shifts, extraneous peaks, sensitivity) were found during the quality assurance review.

2.10 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. For case A303043 sample B086P9, the result for methylene chloride was incorrectly reported on the Data Qualification Summary (Form B-7). This qualification result should be for acetone and not methylene chloride. Therefore, the result for methylene chloride reported on the Form B-7 is changed to acetone. No change on the Form I was necessary.

Table 2-1. 300-FR-5 Operable Unit Remedial Investigation
Round 5 Groundwater Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	*B086S2	*B086S1	*B086P9	*B086Q1	*B086Q9	*B086R1	*B086R4	*B086T6 Trip Blank
300-FR-5 Compounds of Concern:								
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	1 J	10 U	10 U	10 U	10 U	10 UJ	10 U	2 J
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U
Trichloroethene	3 J	10 U	10 U	10 U	3 J	3 J	6 J	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	10 U	NR	9 J	NR	NR	NR	NR	NR
Chloroform	3 J	NR	NR	NR	1 J	3 J	8 J	NR

NR - not reported as detected
♦ - fully validated sample

20853793001W13-1.m41

3.0 GROSS ALPHA AND GROSS BETA DETERMINATION DATA VALIDATION AND LIMITATIONS

3.1 SUMMARY

3.1.1 *Four Sample Delivery Groups*

Sample results for gross alpha and gross beta analyses for four radiochemistry cases are included in this report.

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N3-03-011-7165	14	3
TMA	N3-03-079-7168	9	2
Weston/Teledyne	9302L748	1	1
Weston/Teledyne	9303L887	1	1

Data qualifiers assigned to the gross alpha and gross beta results for these cases are summarized in Table 3-1.

3.1.2 *Quality Assurance Data Validated*

Analytical data for all of the samples in the cases listed above were reviewed, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified for all sample delivery groups. Results for a limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

3.1.3 *Westinghouse Hanford Guidance Used*

Data validation was performed in accordance with the *Westinghouse Hanford Data Validation Procedure for Radiological Analyses* (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

3.1.4 Data Quality Objectives Not Met

Results for all gross alpha/gross beta samples in cases 9302L748 and 9303L887 were rejected (R) due to missing chains of custody and non-traceable standards. In addition, gross alpha results for case 9302L748 were rejected for poor accuracy.

Gross alpha results for case N3-03-011-7165 and gross beta results for case 9303L887 were qualified as estimates (J) due to poor accuracy.

3.2 INSTRUMENT CALIBRATION

Instrument calibration is performed to establish that the gas proportional counter used for gross alpha and gross beta determination is capable of producing acceptable and reliable analytical data. The initial calibration is performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency as a function of alpha or beta particle energy, as well as the mass of material submitted for counting. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No TMA or Weston/Teledyne data were qualified as a result of instrument calibration deficiencies.

3.3 ACCURACY

Accuracy is evaluated by analyzing samples spiked with known activities of alpha or beta emitting radionuclides. The analyzed sample activity is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be acceptable. Data for samples with spiked sample results outside this range are qualified as estimates (J or UJ) or rejected (R).

In case 9302L748, spike recoveries exceeded 120 percent for gross alpha analyses. Spike recoveries were less than 80 percent for gross alpha analysis in case N3-03-011-7165 and for gross beta analyses in case 9303L887. Therefore, all gross alpha results for case 9302L748 were rejected, and gross alpha analyses in case N3-03-011-7165 and gross beta analyses in case 9302L748 were qualified as estimates (J).

3.4 PRECISION

Analytical precision is expressed as the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a single sample. When the laboratory has not performed duplicate spike analyses, precision may be assessed using unspiked samples provided that the analyte activity is greater than the minimum

detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable precision is an RPD of less than 35 percent for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than the MDA, the difference between the two replicate values must be less than 2 times the MDA. Precision was acceptable for all TMA and Weston/Teledyne data packages.

3.5 RADIONUCLIDE QUANTIFICATION AND REPORTED DETECTION LIMITS

Radionuclide quantifications and detection limits were recalculated for all fully validated samples in each data package to verify that they are accurate and consistent with 300-FF-5 requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). Radionuclide quantification and reported detection limits for all validated samples from both TMA and Weston/Teledyne were acceptable.

3.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of instrument continuing calibration information and QA/QC data indicates that instrument performance for both TMA and Weston/Teledyne met established requirements.

3.7 DATA PACKAGES NOT COMPLETE

In addition to validating gross alpha and gross beta results for the four cases discussed above, data for gross alpha and gross beta analyses in each of these cases were reviewed to verify that all deliverables normally supplied by the laboratories were present. Completeness of the TMA and Weston/Teledyne packages was verified by Bovay Northwest under contract to Westinghouse Hanford. The results of Bovay's completeness verification checklists are provided in Appendix A. All necessary data were available in the TMA cases. The Weston/Teledyne cases were missing the chains of custody and traceability information for standards. All of the sample data for these cases were rejected (R) as the result of this missing information.

3.8 TMA QUALIFIER REMOVED

The TMA gross beta sample B086R8 was qualified by the laboratory as estimated (J), as the reported result was less than the CRDL. The WHC *Data Validation Procedure for Radiological Analyses* (WHC-SD-EN-SPP-001) does not identify this criterion for qualification. As a result, the "J" qualifier was removed during validation.

**Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 5 Groundwater Gross Alpha/Gross Beta
Analysis and Qualifier Summary**

Customer I.D. No.	Gross Alpha		Gross Beta	
	Reported Results in pCi/L	Qualifier	Reported Results in pCi/L	Qualifier
TMA Norcal Case N3-03-011-7165				
B086Q4	3.10	J	8.40	
B086Q8	12.00	J	19.00	
*B086Q9	12.00	J	15.00	
*B086R1	20.00	J	17.00	
B086R2	20.00	J	14.00	
*B086R4	13.00	J	9.70	
B086R5	4.50	J	7.40	
B086R7	7.20	J	7.10	
B086R9	2	UJ	2	U
B086S0	2	UJ	2	U
B086S3	14.00	J	20.00	
B086S4	19.00	J	15.00	
B086S7	3.10	J	33.00	
B086S8	1.60	J	8.60	
TMA/Norcal Case N3-03-079-7168				
*B086P9	41.00		29.00	
B086Q0	40.00		22.00	
*B086Q1	43.00		29.00	
B086Q2	3.00		7.80	
B086Q3	2	U	12.00	
B086Q5	23.00		18.00	
B086Q7	6.20		5.40	
B086R3	7.50		8.80	
B086R8	2	U	3.40	
Weston Case 9302L748				
*B086S2	28.00	R	19.00	R
Weston Case 9303L887				
*B086S1	120.00	R	85.00	R

* Fully validated sample.

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4.0 TOTAL URANIUM DETERMINATION DATA VALIDATION AND LIMITATIONS

4.1 SUMMARY

4.1.1 *Four Sample Delivery Groups*

Sample results for total uranium analyses for four radiochemistry cases are included in this report.

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N3-03-011-7165	14	3
TMA	N3-03-079-7168	9	2
Weston/Teledyne	9302L748	1	1
Weston/Teledyne	9303L887	1	1

Data qualifiers assigned to the total uranium results for these cases are summarized in Table 4-1.

4.1.2 *Quality Assurance Data Validated*

Analytical data for all of the samples in the cases listed above were reviewed, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for all sample delivery groups. Results for a limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

4.1.3 *Westinghouse Hanford Guidance Used*

Data validation was performed in accordance with the *Westinghouse Hanford Data Validation Procedure for Radiological Analyses* (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

4.1.4 *Results for Cases 9303L748 and 9303L887 Rejected*

Results for all total uranium samples in cases 9303L748 and 9303L887 were rejected (R) due to missing chains of custody and missing traceability information for the associated standards.

4.2 INSTRUMENT CALIBRATION

Instrument calibration is performed to establish that the method used for total uranium determination is capable of producing acceptable and reliable analytical data. Both TMA and Weston/Teledyne used the kinetic phosphorimetry analysis method. For the kinetic phosphorimetry analysis, calibration is performed on a periodic basis to establish linearity of the comparison between a traceable weight concentration of uranium and the measured intensity of the phosphorescence due to laser excitation of the uranium. This concentration is converted to activity of total uranium based on a uranium 238 conversion factor. The calibration is performed according to the manufacturer's recommendations. The r^2 and other values for each sample are compared to manufacturer's recommendations to ensure that the instrument is continuing to function properly. No TMA or Weston/Teledyne data were qualified as a result of instrument calibration deficiencies.

4.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of uranium. The analyzed sample concentration is compared to the known concentration to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Data for samples with spiked sample results outside this range are qualified as estimates (J or UJ) or rejected (R). The accuracy for all TMA data was considered acceptable.

4.4 PRECISION

Analytical precision is expressed as the RPD between the recoveries of duplicate matrix spike analyses performed on a single sample. When the laboratory has not performed duplicate spike analyses, precision may be assessed using unspiked samples provided that the analyte concentration is greater than the minimum detectable concentration. If the analyte concentration is less than the minimum detectable concentration for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable precision is an RPD of less than 35 percent for replicates with levels 5 times the MDA or greater. If either the replicate sample or the original is less than the minimum detectable concentration, the difference between the two replicate values must be less than 2 times the minimum detectable concentration. Precision was acceptable for all TMA and Weston/Teledyne data packages.

4.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all fully validated samples in each data package to verify that they are accurate and consistent with 300-FF-5 requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the CRDL. In these cases, nondetects were qualified as estimated (UJ). Compound quantification and reported detection limits for all validated samples from both TMA and Weston/Teledyne were generally acceptable; one minor deficiency of the TMA data was noted.

The MDA is not identified in the laboratory results summary report for TMA package N3-03-079-7168 for the total uranium sample results. The sample results are all detects and the method is consistent with previous acceptable TMA packages; therefore no qualifiers were assigned.

The Weston/Teledyne summary report reported total uranium in units of pCi/L, versus $\mu\text{g/L}$ as used by TMA and in Table 4-1. Weston/Teledyne actually determined the total uranium in units of $\mu\text{g/L}$ and converted it to pCi/L using a conversion factor of 0.68. The Weston/Teledyne $\mu\text{g/L}$ value, from the raw data, was used in Table 4-1 for consistency.

4.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of instrument continuing calibration information and QA/QC data indicates that instrument performance for both TMA and Weston/Teledyne met established requirements.

4.7 DATA PACKAGES NOT COMPLETE

In addition to validating total uranium results for the four cases discussed above, data for total uranium analyses in each of these cases were reviewed to verify that all deliverables normally supplied by the laboratories were present. Bovay Northwest verified the completeness of the TMA and Weston/Teledyne packages under contract to Westinghouse Hanford. Copies of Bovay's completeness verification checklists are provided in Appendix A. All necessary data were available in the TMA cases. The Weston/Teledyne cases were missing the chains of custody and traceability for standards. All of the sample results for these cases were rejected (R) as the result of this missing information.

**Table 4-1. 300-FF-5 Operable Unit Remedial Investigation
Round 5 Groundwater Total Uranium
Analysis and Qualifier Summary**

Customer I.D. No.	Total Uranium	
	Reported Results in pCi/L	Qualifier
TMA Norcal Case N3-03-011-7165		
B086Q4	5.80	U
B086Q8	34.00	
*B086Q9	37.00	
*B086R1	48.00	
B086R2	43.00	
*B086R4	25.00	
B086R5	9.10	
B086R7	11.00	
B086R9	0.08	
B086S0	0.08	
B086S3	38.00	
B086S4	43.00	
B086S7	74.00	
B086S8	15.00	
TMA/Norcal Case N3-03-079-7168		
*B086P9	87.00	
B086Q0	81.00	
*B086Q1	110.00	
B086Q2	6.30	
B086Q3	5.50	
B086Q5	46.00	
B086Q7	21.00	
B086R3	17.00	
B086R8	4.60	
Weston Case 9302L748		
*B086S2	51.00	R
Weston Case 9303L887		
*B086S1	110.00	R

* Fully validated sample.

JOBS\297850\GW54-1.mxl

5.0 REFERENCES

- DOE 1990. Remedial Investigation/Feasibility Study Work Plan for the 300-FF-5 Operable Unit, Hanford Site, Richland, Washington, (DOE/RL 89-14), U.S. Department of Energy, June 1990.
- EPA 1990. EPA Contract Laboratory Program Statement of Work for Organic Analyses, Multi-Media, Multi-Concentration. U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991. National Functional Guidelines for Organic Data Review: Multi-Media, Multi-Concentration (OLM01.0) (June 1991 Revision). U.S. Environmental Protection Agency, Washington, D.C.
- WHC 1992a. Data Validation Procedures for Chemical Analyses (WHC-SD-EN-SPP-002, Rev. 1). Westinghouse Hanford Company, April 1992.
- WHC 1992b. Data Validation Procedure for Radiological Analyses. WHC-SD-EN-SPP-001, Westinghouse Hanford Company, 1991.

OW5.FR

Verifical. No. _____

LABORATORY
COPY

A-2

Date: 4/10/93

RADIOCHEMICAL INITIAL CALIBRATION DATA VERIFICATION CHECKLIST															
NASH Calibration Data Package ID: 7778-465															
Laboratory:															
Required Information															
		GAB		Sr-90		Tc-99		GEA		ASP		Ra226			
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Date of Initial Calibration:		7/92													
Detector ID:		X													
Detector Efficiency:		X													
Lucas Cell ID:															
Lucas Cell Efficiency:															
Calibration Standard ID:		X													
NIST Certificates:		X													
Initial Calibration Data:		X													
High Voltage Plateau Determination:		X													
Self-absorption curve:		X													
Preparation weight:		X													
Carrier Standardization:		X													
Alpha cross-talk:		X													
Beta cross-talk:		X													
FHM Values:															
Sample Geometry:															

Comments:

Date: 4/20/93

RADIOCHEMICAL CONTINUING CALIBRATION DATA VERIFICATION CHECKLIST															
Laboratory: <u>Talbot</u>		IIASM Data Package ID: <u>1778-105-1072</u>													
Required Information		GAB		Sr-90		Tc-99		GEA		ASp		Ra226			
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Calibration Time Period, From/To															
Detector ID:															
Detector Efficiency:															
Lucas Cell ID:															
Lucas Cell Efficiency:															
Check Standard ID:															
Check Standard Activity:															
Check Standard Traceability:															
Check Standard Raw Data:															
Control Charts:															
Background Data, CPM:															
Background Count Time:															
Background Control Charts:															
Preparation Weights:															
Carrier Recovery Checks:															
Alpha/Beta Cross Talk:															
FMM Control Charts:															
Sample Geometry:															

Comments:

Package ID: 7778-WES-072

VERIFICATION CHECKLIST FOR BETA AND GAS PROPORTIONAL COUNTING

7303287

Analysis: Gross Alpha Beta

	Yes	No	NA
<u>Analysis Results</u>			
Results and Minimum Detectable Activity (MDA) Report	☒	☐	
for Sample Analyses, Recounts and Reanalyses	☒	☐	
for Blank Analyses, Recounts and Reanalyses	☒	☐	
for Duplicate Analyses, Recounts and Reanalyses	☒	☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Sample Identifications	☒	☐	
Detector Identifications	☒	☐	
Detector Efficiencies	☒	☐	
Dates of Analysis	☒	☐	
<u>Gravimetric/Chemical Yields</u>			
Results Report for Chemical Yields	☐	☐	☒
Raw Data (Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Sample Identifications	☐	☐	
Chemical Yield Source Identification, Traceability	☐	☐	
and Dilution Log	☐	☐	
Calculated Recoveries	☐	☐	
<u>Matrix Spike Recovery</u>			
Results and MDA Reports for Matrix Spike Analyses,	☐	☐	☒
Recounts and Reanalyses	☐	☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Matrix Spike Sample Identifications	☐	☐	
Matrix Spike Source Traceability and Dilution Log	☐	☐	
Detector Identifications	☐	☐	
Detector Efficiencies	☐	☐	
Dates of Analysis	☐	☐	
Calculated Recoveries	☐	☐	
<u>Laboratory Control Samples (LCS)</u>			
Results and MDA Reports for LCS Analyses, Recounts	☒	☐	
and Reanalyses	☒	☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
LCS Identification, Activity and Traceability	☒	☐	
Detector Identifications	☒	☐	
Detector Efficiencies	☒	☐	
Dates of Analysis	☒	☐	
Calculated Recoveries	☐	☐	☒ Sufficient Info for calculation is included

Package ID: 7778-WES-1072

9303447

VERIFICATION CHECKLIST FOR URANIUM ANALYSIS
BY FLUOROMETRY

	Yes	No	NA
<u>Analysis Results</u>			
Results Report			
for Sample Analyses, Reruns, and Reanalyses	☒	☐	
for Blank Analyses, Reruns, and Reanalyses	☒	☒	
for Duplicate Analyses, Reruns and Reanalyses	☒	☐	
Internal Standard Results, Activity and Traceability	☒	☐	
Raw Data (Fluorometer Readings and Printouts			
or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Sample Identifications	☒	☐	
Fluorometer Identifications	☒	☐	
Dates of Analysis	☒	☐	
<u>Initial Calibration</u>			
Instrument Identification	☒	☐	
Calibration Results	☒	☐	
Calibration Standard Identification, Traceability,			
Activity, Dilution Log and Expiration Date	☒	☐	
Raw Data (Fluorometer Readings and Printouts			
or Notebook Pages)	☒	☐	
Fusion Efficiency Determination Method and Results	☒	☐	
<u>Matrix Spike Recovery</u>			
Results Reports for Matrix Spike Analyses,			
Recounts and Reanalyses	☐	☐	
Raw Data (Fluorometer Readings and Printouts or			
Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Matrix Spike Sample Identifications	☐	☐	
Matrix Spike Source Traceability and Dilution Log	☐	☐	
Fluorometer Identifications	☐	☐	
Dates of Analysis	☐	☐	
Calculated Recoveries	☐	☐	
<u>Laboratory Control Samples (LCS)</u>			
Results Reports for LCS Analyses, Recounts			
and Reanalyses	☐	☒	
Raw Data (Fluorometer Readings and Printouts or			
Notebook Pages)	☐	☒	
Sample Preparation Data	☐	☒	
Calculation Sheets	☐	☒	
LCS Identification, Concentration and Traceability	☐	☒	
Fluorometer Identifications	☐	☒	
Dates of Analysis	☐	☒	
Calculated Recoveries	☐	☒	

Project:						Reviewer:					
Laboratory: Tele Dynamic Isotopes						Case:					
IASH Data Package ID: 4-0256											
Beta and Gas Proportional Counting			Alpha Spectroscopy								
GAB	Sr90	Tc99	Iso U	Iso Pu	Iso Am	GEA	Ra-226	LSC	Total U		
X									X		
X									X		
Analyses Performed:											
Case Narrative:											
Batch Sheet:											
HEIS NO.	Sample Matrix	WHC COC	WHC SAR								
BGR652	baet ^{er}										

[illegible]

Date: 15/1/93

RADIOCHEMICAL INITIAL CALIBRATION DATA VERIFICATION CHECKLIST															
Laboratory: Weston / Telechem		IASH Calibration Data Package ID: G2D3-wES-1057													
Required Information		GAD		Sr90		Tc99		GEA		ASp		Ra226			
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Date of Initial Calibration:		7/92													
Detector ID:		X													
Detector Efficiency:		X													
Lucas Cell ID:															
Lucas Cell Efficiency:															
Calibration Standard ID:		X													
NIST Certificates:		X													
Initial Calibration Data:		X													
High Voltage Plateau Determination:		X													
Self-absorption curve:		X													
Preparation weight:		X													
Carrier Standardization:															
Alpha crossstalk:															
Beta crossstalk:															
FMIN Values:															
Sample Geometry:															

Comments:

Date 115/193

RADIOCHEMICAL CONTINUING CALIBRATION DATA VERIFICATION CHECKLIST															
Laboratory: <u>Western / T. J. R. /</u>		IIASH Data Package ID: <u>6203-wes-1057</u>													
Required Information		GAD		Sr-90		Tc-99		GEA		ASp		Ra-226			
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Calibration Time Period, From/To															
Detector ID:															
Detector Efficiency:															
Lucas Cell ID:															
Lucas Cell Efficiency:															
Check Standard ID:															
Check Standard Activity:															
Check Standard Traceability:															
Check Standard Raw Data:															
Control Charts:															
Background Data, CPM:															
Background Count Time:															
Background Control Charts:															
Preparation Weights:															
Carrier Recovery Checks:															
Alpha/Beta Cross Talk:															
FWHM Control Charts:															
Sample Geometry:															

Comments:

Package ID: 6203-WES-1057

VERIFICATION CHECKLIST FOR BETA AND GAS PROPORTIONAL COUNTING

9302 L748

Analysis: Gross Alpha BetaAnalysis Results

Yes No NA

Results and Minimum Detectable Activity (MDA) Report
 for Sample Analyses, Recounts and Reanalyses
 for Blank Analyses, Recounts and Reanalyses
 for Duplicate Analyses, Recounts and Reanalyses
 Raw Data (Counting Logs or Printouts or Notebook Pages)
 Sample Preparation Data
 Calculation Sheets
 Sample Identifications
 Detector Identifications
 Detector Efficiencies
 Dates of Analysis

☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐

Gravimetric/Chemical Yields☒

Results Report for Chemical Yields
 Raw Data (Printouts or Notebook Pages)
 Sample Preparation Data
 Calculation Sheets
 Sample Identifications
 Chemical Yield Source Identification, Traceability
 and Dilution Log
 Calculated Recoveries

☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐

Matrix Spike Recovery☒

Results and MDA Reports for Matrix Spike Analyses,
 Recounts and Reanalyses
 Raw Data (Counting Logs or Printouts or Notebook Pages)
 Sample Preparation Data
 Calculation Sheets
 Matrix Spike Sample Identifications
 Matrix Spike Source Traceability and Dilution Log
 Detector Identifications
 Detector Efficiencies
 Dates of Analysis
 Calculated Recoveries

☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐
☐ ☐

Laboratory Control Samples (LCS)

Results and MDA Reports for LCS Analyses, Recounts
 and Reanalyses
 Raw Data (Counting Logs or Printouts or Notebook Pages)
 Sample Preparation Data
 Calculation Sheets
 LCS Identification, Activity and Traceability
 Detector Identifications
 Detector Efficiencies
 Dates of Analysis
 Calculated Recoveries

☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐
☒ ☐

☒ Sufficient Info.

Package ID: 6103-WES-1057

VERIFICATION CHECKLIST FOR URANIUM ANALYSIS
BY FLUOROMETRY *Laser*

43021748

	Yes	No	NA
<u>Analysis Results</u>			
Results Report			
for Sample Analyses, Reruns, and Reanalyses	☒	☐	
for Blank Analyses, Reruns, and Reanalyses	☐	☐	
for Duplicate Analyses, Reruns and Reanalyses	☐	☐	
Internal Standard Results, Activity and Traceability	☒	☐	
Raw Data (Fluorometer Readings and Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Sample Identifications	☒	☐	
Fluorometer Identifications	☒	☐	
Dates of Analysis	☒	☐	
<u>Initial Calibration</u>			
Instrument Identification	☒	☐	
Calibration Results	☒	☐	
Calibration Standard Identification, Traceability, Activity, Dilution Log and Expiration Date	☒	☐	
Raw Data (Fluorometer Readings and Printouts or Notebook Pages)	☒	☐	
Fusion Efficiency Determination Method and Results	☒	☐	
<u>Matrix Spike Recovery</u> ☒			
Results Reports for Matrix Spike Analyses, Recounts and Reanalyses	☐	☐	
Raw Data (Fluorometer Readings and Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Matrix Spike Sample Identifications	☐	☐	
Matrix Spike Source Traceability and Dilution Log	☐	☐	
Fluorometer Identifications	☐	☐	
Dates of Analysis	☐	☐	
Calculated Recoveries	☐	☐	
<u>Laboratory Control Samples (LCS)</u>			
Results Reports for LCS Analyses, Recounts and Reanalyses	☐	☒	
Raw Data (Fluorometer Readings and Printouts or Notebook Pages)	☐	☒	
Sample Preparation Data	☐	☒	
Calculation Sheets	☐	☒	
LCS Identification, Concentration and Traceability	☐	☒	
Fluorometer Identifications	☐	☒	
Dates of Analysis	☐	☒	
Calculated Recoveries	☐	☒	

Verifical No. T-00000-93		RADIOCHEMICAL DATA PACKA VERIFICATION COVER SHEET		Page - of 1						
Project: 300-FF-S		Reviewer: S. Gledhill		Date: 4/12/93						
Laboratory: TMA		Case: N3-03-079-7168		SDG: P03609						
IASH Data Package ID: B08609-TMA-438										
		Beta and Gas Proportional Counting			Alpha Spectroscopy			LSC	Ra-226	Total U
		GAB	Sr-90	Tc99	Iso U	Iso Pu	Iso Am			
Analyses Performed:		X								X
Case Narrative: U ₂		X								X
Batch Sheet: U ₂		X								X
HEIS NO.	Sample Matrix	WHC COC	WHC SAR							
B08609		X	X							
B08610		X	X							
B08611		X	X							
B08612		X	X							
B08613		X	X							
B08605		X	X							
B08607		X	X							
B08613		X	X							
B08618		X	X							

Date: 1/12/93

RADIOCHEMICAL INITIAL CALIBRATION DATA VERIFICATION CHECKLIST														
IASH Calibration Data Package ID: 88689- TMI-430														
Laboratory: TMA	GAB		Sr90		Tc99		GEA		ASP		Ra226			
Required Information	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Date of Initial Calibration:														
Detector ID:														
Detector Efficiency:														
Lucas Cell ID:														
Lucas Cell Efficiency:														
Calibration Standard ID:														
MIST Certificates:														
Initial Calibration Data:														
High Voltage Plateau Determination:														
Self-absorption curve:														
Preparation weight:														
Carrier Standardization:														
Alpha crosstalk:														
Beta crosstalk:														
FHIM Values:														
Sample Geometry:														

Comments:

Date 1/12/93

RADIOCHEMICAL CONTINUING CALIBRATION DATA VERIFICATION CHECKLIST													
Laboratory: TMA		IASH Data Package ID: 8086P9-TMA-430											
Required Information		GAB		Sr90		Tc99		GEA		ASp		Ra226	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Calibration Time Period, From/To		C											
Detector ID:		X											
Detector Efficiency:		X											
Lucas Cell ID:													
Lucas Cell Efficiency:													
Check Standard ID:		X											
Check Standard Activity:		X											
Check Standard Traceability:		X											
Check Standard Raw Data:		X											
Control Charts:		X											
Background Data, CPM:		X											
Background Count Time:		X											
Background Control Charts:		X											
Preparation Heights:		X											
Carrier Recovery Checks:		X											
Alpha/Beta Cross Talk:		X											
FMM Control Charts:													
Sample Geometry:													

Comments:

Package ID: FOALP9-TMA-438

VERIFICATION CHECKLIST FOR BETA AND GAS PROPORTIONAL COUNTING

N3-03-019-7168

Analysis: Gross Alpha Beta

	Yes	No	NA
<u>Analysis Results</u>			
Results and Minimum Detectable Activity (MDA) Report for Sample Analyses, Recounts and Reanalyses for Blank Analyses, Recounts and Reanalyses for Duplicate Analyses, Recounts and Reanalyses	☒ ☒ ☒ ☒	☐ ☐ ☐ ☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Sample Identifications	☒	☐	
Detector Identifications	☒	☐	
Detector Efficiencies	☒	☐	
Dates of Analysis	☒	☐	
<u>Gravimetric/Chemical Yields</u>			
Results Report for Chemical Yields	☐	☐	☒
Raw Data (Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Sample Identifications	☐	☐	
Chemical Yield Source Identification, Traceability and Dilution Log	☐	☐	
Calculated Recoveries	☐	☐	
<u>Matrix Spike Recovery</u>			
Results and MDA Reports for Matrix Spike Analyses, Recounts and Reanalyses	☐	☐	☒
Raw Data (Counting Logs or Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Matrix Spike Sample Identifications	☐	☐	
Matrix Spike Source Traceability and Dilution Log	☐	☐	
Detector Identifications	☐	☐	
Detector Efficiencies	☐	☐	
Dates of Analysis	☐	☐	
Calculated Recoveries	☐	☐	
<u>Laboratory Control Samples (LCS)</u>			
Results and MDA Reports for LCS Analyses, Recounts and Reanalyses	☒	☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
LCS Identification, Activity and Traceability	☒	☐	
Detector Identifications	☒	☐	
Detector Efficiencies	☒	☐	
Dates of Analysis	☒	☐	
Calculated Recoveries	☒	☐	

Package ID: 80869-TIME-438

~ 3-03 - 079 - 7168

VERIFICATION CHECKLIST FOR TOTAL URANIUM
ANALYSIS BY KINETIC PHOSPHORIMETRY

	Yes	No	NA
<u>Analysis Results</u>			
Results Report			
for Sample Analyses, Reruns, and Reanalyses	☒	☐	
for Blank Analyses, Reruns, and Reanalyses	☒	☐	
for Duplicate Analyses, Reruns and Reanalyses	☒	☐	
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Sample Identifications	☒	☐	
Instrument Identifications	☒	☐	
Dates of Analysis	☒	☐	
<u>Initial and Continuing Calibration</u>			
Instrument Identifications	☒	☐	
Initial Calibration Results and Linearity	☒	☐	
Initial and Continuing Calibration Verification	☒	☐	
Calibration Standard Concentration, Traceability and Dilution Logs	☒	☐	
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Detection Limit Verification	☒	☐	
<u>Matrix Spike Recovery</u>			
Results Reports for Matrix Spike Analyses, Reruns and Reanalyses	☒	☐	
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Matrix Spike Sample Identifications	☒	☐	
Matrix Spike Source Traceability and Dilution Log	☒	☐	
Instrument Identifications	☒	☐	
Dates of Analysis	☒	☐	
Calculated Recoveries	☒	☐	
<u>Laboratory Control Samples (LCS)</u>			
Results Reports for LCS Analyses, Reruns and Reanalyses	☒	☐	
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
LCS Identification, Concentration and Traceability	☒	☐	
Instrument Identifications	☒	☐	
Dates of Analysis	☒	☐	
Calculated Recoveries	☒	☐	

Project: <u>3D-FF-S</u>		Reviewer: <u>S. Lundberg</u>		Date: <u>4/21/93</u>							
Laboratory: <u>TMA</u>		Case: <u>N3-03-011-9165</u>		SDG: <u>BK/GV</u>							
HASH Data Package ID: <u>608604-TMA-117</u>											
HHS NO.	Sample Matrix	WIC COC	WIC SAR	Beta and Gas Proportional Counting			Alpha Spectroscopy			LSC	Total U
				GAB	Sr90	Tc99	Iso U	Iso Pu	Iso Am		
<u>608604</u>	<u>Wolx4</u>	<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608605</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608606</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608607</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608608</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608609</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608610</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608611</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608612</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608613</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608614</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608615</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608616</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608617</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608618</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608619</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608620</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608621</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608622</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608623</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608624</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608625</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608626</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608627</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608628</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608629</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608630</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608631</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608632</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608633</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608634</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608635</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608636</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608637</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>
<u>608638</u>		<u>X</u>	<u>X</u>	<u>X</u>							<u>X</u>

Date: 12/1/93

RADIOCHEMICAL INITIAL CALIBRATION DATA VERIFICATION CHECKLIST															
Laboratory: TMA		HASN Calibration Data Package ID: R226Q4-TMA-419													
Required Information		GAB		Sr90		Tc99		GEA		Asp		R226			
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Date of Initial Calibration:	3/90														
Detector ID:	X														
Detector Efficiency:	X														
Lucas Cell ID:															
Lucas Cell Efficiency:															
Calibration Standard ID:															
NIST Certificates:	X														
Initial Calibration Data:	X														
High Voltage Plateau Determination:	X														
Self-absorption curve:	X														
Preparation weight:	X														
Carrier Standardization:															
Alpha crossstalk:	X														
Beta crossstalk:	X														
FWHM Values:															
Sample Geometry:															

Comments:

Date 1/21/13

RADIOCHEMICAL CONTINUING CALIBRATION DATA VERIFICATION CHECKLIST															
Laboratory: TSN		HASH Data Package ID: 022004 - TSN-119													
Required Information		GAB		Sr90		Tc99		GEA		ASp		Ra226			
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Calibration Time Period, From/To	Continuing														
Detector ID:		X													
Detector Efficiency:		X													
Lucas Cell ID:															
Lucas Cell Efficiency:															
Check Standard ID:		X													
Check Standard Activity:		X													
Check Standard Traceability:		X													
Check Standard Raw Data:		X													
Control Charts:		X													
Background Data, CPM:		X													
Background Count Time:		X													
Background Control Charts:		X													
Preparation Weights:		X													
Carrier Recovery Checks:															
Alpha/Beta Cross Talk:		X													
FHM Control Charts:															
Sample Geometry:															

Comments:

Package ID: 609604-TTCA-119

VERIFICATION CHECKLIST FOR BETA AND GAS PROPORTIONAL COUNTING NS-02-011-7165

Analysis: Gross Alpha Beta

	Yes	No	NA
<u>Analysis Results</u>			
Results and Minimum Detectable Activity (MDA) Report for Sample Analyses, Recounts and Reanalyses for Blank Analyses, Recounts and Reanalyses for Duplicate Analyses, Recounts and Reanalyses	☒ ☒ ☒ ☒	☐ ☐ ☐ ☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
Sample Identifications	☒	☐	
Detector Identifications	☒	☐	
Detector Efficiencies	☒	☐	
Dates of Analysis	☒	☐	
<u>Gravimetric/Chemical Yields</u>			
Results Report for Chemical Yields	☐	☐	☒
Raw Data (Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Sample Identifications	☐	☐	
Chemical Yield Source Identification, Traceability and Dilution Log	☐	☐	
Calculated Recoveries	☐	☐	
<u>Matrix Spike Recovery</u>			
Results and MDA Reports for Matrix Spike Analyses, Recounts and Reanalyses	☐	☐	☒
Raw Data (Counting Logs or Printouts or Notebook Pages)	☐	☐	
Sample Preparation Data	☐	☐	
Calculation Sheets	☐	☐	
Matrix Spike Sample Identifications	☐	☐	
Matrix Spike Source Traceability and Dilution Log	☐	☐	
Detector Identifications	☐	☐	
Detector Efficiencies	☐	☐	
Dates of Analysis	☐	☐	
Calculated Recoveries	☐	☐	
<u>Laboratory Control Samples (LCS)</u>			
Results and MDA Reports for LCS Analyses, Recounts and Reanalyses	☒ ☒ ☒ ☒	☐ ☐ ☐ ☐	
Raw Data (Counting Logs or Printouts or Notebook Pages)	☒	☐	
Sample Preparation Data	☒	☐	
Calculation Sheets	☒	☐	
LCS Identification, Activity and Traceability	☒	☐	
Detector Identifications	☒	☐	
Detector Efficiencies	☒	☐	
Dates of Analysis	☒	☐	
Calculated Recoveries	☒	☐	

Package ID: 608624-TMA-419

VERIFICATION CHECKLIST FOR TOTAL URANIUM
ANALYSIS BY KINETIC PHOSPHORIMETRY

103-02-011-7165

	Yes	No	NA
<u>Analysis Results</u>			
Results Report			
for Sample Analyses, Reruns, and Reanalyses	X		
for Blank Analyses, Reruns, and Reanalyses	X		
for Duplicate Analyses, Reruns and Reanalyses	X		
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	X		
Sample Preparation Data	X		
Calculation Sheets	X		
Sample Identifications	X		
Instrument Identifications	X		
Dates of Analysis	X		
<u>Initial and Continuing Calibration</u>			
Instrument Identifications	X		
Initial Calibration Results and Linearity	X		
Initial and Continuing Calibration Verification	X		
Calibration Standard Concentration, Traceability and Dilution Logs	X		
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	X		
Sample Preparation Data	X		
Detection Limit Verification	X		
<u>Matrix Spike Recovery</u>			
Results Reports for Matrix Spike Analyses, Reruns and Reanalyses	X		
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	X		
Sample Preparation Data	X		
Calculation Sheets	X		
Matrix Spike Sample Identifications	X		
Matrix Spike Source Traceability and Dilution Log	X		
Instrument Identifications	X		
Dates of Analysis	X		
Calculated Recoveries	X		
<u>Laboratory Control Samples (LCS)</u>			
Results Reports for LCS Analyses, Reruns and Reanalyses	X		
Raw Data (Phosphorimeter Readings and Printouts or Notebook Pages)	X		
Sample Preparation Data	X		
Calculation Sheets	X		
LCS Identification, Concentration and Traceability	X		
Instrument Identifications	X		
Dates of Analysis	X		
Calculated Recoveries	X		

see
+1/2/93

Transmittal Number TTCD 76

Transmittal Form to Validator

1 To Validator (BGA) Hart Grewer
Project/OU 302FF-S

2 Data Packages Attached (list and attach)
3086PI-TMG-439

3 The attached data packages have been verified and (check one)
☒ All required checklist items are included
☐ Checklist items circled on attached verification checklist forms cannot be provided and the decision has been made to proceed with validation anyway
NCR # _____

4 Certified by Verifier
S. L. G.
Signature
4/21/93 2:25 PM
Date

5 Received by Validator
CLW/Hart Grewer
Signature
4/30/93
Date

MRAM021317

A-24

Package ID: 6026P9-TM-438

VOLATILE ORGANIC DATA VERIFICATION CHECKLIST - FORM A-1

Review the data package for completeness and check off the items below. If any data review elements are missing, contact the laboratory for submittal.

Data Package Item

Present?: Yes No N/A

Quality Control (QC) Summary

Surrogate Summary report

X

MS/MSD Summary report

X

Blank summary report

X

GC/MS tuning report

X

Sample Data

Sample reports

X

TIC reports for each sample

X

Chromatograms for all samples

X

Raw and corrected spectra for all detected results

X

Raw and corrected library search data

X

for all reported TIC

 X

Quantitation and calculation data for all TIC

 X

Standards Data

Initial calibration report

X

RIC and quantitation reports for initial calibration

X

Continuing calibration reports

X

RIC and quantitation reports for cont. calibrations

X

Internal standard summary report

X

Raw QC Data

Tuning, spectra and mass lists

X

Blank Data

Blank analysis reports

X

TIC reports for all blanks

X

RIC and quantitation reports for blanks

X

Raw and corrected spectra

 X

for all detected results in blanks

 X

Raw and corrected library search data

 X

for all reported TIC

 X

Quantitation and calculation data for all TIC

 X

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Data

MS/MSD Analysis Reports

X

RIC and quantitation reports for MS/MSD

X

Additional Data

Moisture/% solids data sheets

 X

Sample preparation sheets

 XComments: Complete

Transmittal Number T20113

Transmittal Form to Validator

1 To Validator (BOA) Ed. A. Rowser
ProjectOU 300 - FF - S

2 Data Packages Attached (list and attach) 7-
BOB609-TMA-418

3 The attached data packages have been verified and (check one)
☒ All required checklist items are included.

Checklist items circled on attached verification checklist
cannot be provided and the decision has been made
to proceed with validation anyway.
NCR # _____

4 Certified by Validator
[Signature]

Signature
5/11/93 4:30 pm

Date

5 Received by Validator
[Signature]

Signature
5/12/93

Date

~~STANDARD~~

Page 1 of 1

[illegible]

Transmittal Number TC00073

Transmittal Form to Validator

1 To Validator (SCA) Hwt Crumley
Project/OU 380-FF-S

2 Data Packages Attached (list and attach) 7-
9302 L749 - WFS - 1063

3 The attached data packages have been verified and (check one)
☒ All required checklist items are included
☐ Checklist items circled on attached verification checklist forms cannot be provided and the decision has been made to proceed with validation anyway
NCR # _____

4 Certified by Verifier
[Signature]
Signature
4/19/93 3:40 PM
Date

5 Received by Validator
[Signature]
Signature
5/10/93
Date

UNCLASSIFIED

Package ID: 450-L748-WES-1003

VOLATILE ORGANIC DATA VERIFICATION CHECKLIST - FORM A-1

Review the data package for completeness and check off the items below. If any data review elements are missing, contact the laboratory for submittal.

<u>Data Package Item</u>	Present?:	Yes	No	N/A
Quality Control (QC) Summary				
Surrogate Summary report		☒		
MS/MSD Summary report		☒		
Blank summary report		☒		
GC/MS tuning report		☒		
Sample Data				
Sample reports		☒		
TIC reports for each sample		☒		
Chromatograms for all samples		☒		
Raw and corrected spectra for all detected results		☒		
Raw and corrected library search data for all reported TIC				☒
Quantitation and calculation data for all TIC				☒
Standards Data				
Initial calibration report		☒		
RIC and quantitation reports for initial calibration		☒		
Continuing calibration reports		☒		
RIC and quantitation reports for cont. calibrations		☒		
Internal standard summary report		☒		
Raw QC Data				
Tuning, spectra and mass lists		☒		
Blank Data				
Blank analysis reports		☒		
TIC reports for all blanks		☒		
RIC and quantitation reports for blanks		☒		
Raw and corrected spectra for all detected results in blanks		☒		
Raw and corrected library search data for all reported TIC				☒
Quantitation and calculation data for all TIC				☒
Matrix Spike/Matrix Spike Duplicate (MS/MSD) Data				
MS/MSD Analysis Reports		☒		
RIC and quantitation reports for MS/MSD		☒		
Additional Data				
Moisture/% solids data sheets				☒
Sample preparation sheets		☒		

Comments: Complete

Transmittal Number 100117

Transmittal Form to Validator

1 To Validator (BOA) Hurt Cruise
Project/CU 300 SES

2 Data Packages Attached (list and attach)
93031887-485-1006

3 The attached data packages have been verified and (check one)
☒ All required checklist items are included

Checklist items circled on attached verification checklist
forms cannot be provided and the decision has been made
to proceed with validation anyway
NCR # _____

4 Certified by Verifier
[Signature]
Signature
4/26/93 9^{PM}
Date

5 Received by Validator
[Signature] HC
Signature
5/12/93
Date

UNCLASSIFIED

~~MISSING pg. 3 WHE Col 844~~
~~4/26/93~~

Package ID: 9303L387-WES-1066

VOLATILE ORGANIC DATA VERIFICATION CHECKLIST - FORM A-1

Review the data package for completeness and check off the items below. If any data review elements are missing, contact the laboratory for submittal.

<u>Data Package Item</u>	<u>Present?:</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>
Quality Control (QC) Summary				
Surrogate Summary report		X		
MS/MSD Summary report		X		
Blank summary report		X		
GC/MS tuning report		X		
Sample Data				
Sample reports		X		
TIC reports for each sample		X		
Chromatograms for all samples		X		
Raw and corrected spectra for all detected results		X		
Raw and corrected library search data for all reported TIC				X
Quantitation and calculation data for all TIC				X
Standards Data				
Initial calibration report		X		
RIC and quantitation reports for initial calibration		X		
Continuing calibration reports		X		
RIC and quantitation reports for cont. calibrations		X		
Internal standard summary report		X		
Raw QC Data				
Tuning, spectra and mass lists		X		
Blank Data				
Blank analysis reports		X		
TIC reports for all blanks		X		
RIC and quantitation reports for blanks		X		
Raw and corrected spectra for all detected results in blanks		X		
Raw and corrected library search data for all reported TIC				X
Quantitation and calculation data for all TIC				X
Matrix Spike/Matrix Spike Duplicate (MS/MSD) Data				
MS/MSD Analysis Reports		X		
RIC and quantitation reports for MS/MSD		X		
Additional Data				
Moisture/% solids data sheets				X
Sample preparation sheets		X		

Comments: ~~Missing the 1st page of the quantitation report for 15-0200 on 4/19/93~~
Complete

END

DATE
FILMED
9/24/93