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ENGINEERING DATA TRANSMITTAL

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Name: L. C. Hulstrom

LC Hulstrom 3/3/93

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APPENDIX A
FIELD PRECISION DOCUMENTATION

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1.0 INTRODUCTION

Laboratory data for Third 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. The initial results of this review have been previously documented in a series of Preliminary Quality Assurance Reports previously provided to Westinghouse Hanford. This report summarizes the results previously presented in the Preliminary Quality Assurance Reports for all of the Third Round Groundwater samples. In some instances, the data qualifiers originally presented in the Preliminary Quality Assurance Reports have been changed based upon further review of all of the data for the Third Round Groundwater samples; these instances 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 1-1.

1.1 CHEMICAL ANALYSES

Data from the chemical analysis of 63 samples from the 300-FF-5 Operable Unit Remedial Investigation 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) using U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) protocols. Two analytical cases were analyzed by Roy F. Weston (Weston) Laboratories using CLP protocols. Sample analyses included:

- Volatile organics (42 aqueous samples);
- Metals (42 aqueous samples); and
- General chemical parameters (21 aqueous samples).

1.2 RADIOCHEMICAL ANALYSES

Data from the radiochemical analysis of five data packages were reviewed. Of these five packages, three were analyzed by TMA and two were analyzed by Weston. Both laboratories used analytical protocols specified in the *Remedial Investigation/*

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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 determination (47 aqueous samples analyzed, 34 evaluated);
- Strontium 90 (47 aqueous samples analyzed, 34 evaluated);
- Uranium isotopes (47 aqueous samples analyzed, 34 evaluated); and
- Gamma spectroscopy (47 aqueous samples analyzed, 34 evaluated).

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 Company (WHC) procedures (WHC 1992a and 1992b). Data were qualified based on their quality and the guidance provided by these sources.

1.4 MAJOR DEFICIENCIES

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

Metals Analyses. Selenium data for samples B075X9, B075Y3, B075Z1, B07615, B07619, B07659, B07679, B07683, and B07684; and B075W3, B075W7, B075Z5, B07603, B07607, B07611, B07643, B07691, B07695, and B07841 were rejected due to 0 percent recovery of the associated matrix spike samples.

General Chemistry Analyses. No sample data were rejected due to deficiencies in data quality.

Radiochemical Analysis. No radiochemical analytical sample data were rejected due to deficiences in data quality.

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1.5 GENERAL QUALITY TRENDS

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

- Blank contamination was noted in method and trip blanks analyzed for volatile organic compounds.
- Some holding time exceedences between sample collection and analysis, and lack of daily calibration supporting data for ammonia were observed for analyses performed by TMA.
- The method precision for radiochemical analysis for several samples, including all TMA Gamma Scans could not be determined because replicate sample results were less than the minimum detectable amount (MDA).
- Method accuracy was less than acceptable for some radiochemical results.
- QA/QC Data were not reported in Weston Radiochemical data packages.

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Table 1-1 - 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 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.

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2.0 VOLATILE ORGANIC DATA VALIDATION AND LIMITATIONS

2.1 SUMMARY

2.1.1 Four Sample Delivery Groups

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

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	A209034	18	6
TMA	A209030	20	10
Weston	9209L845	2	2
Weston	9209L785	2	2

Data qualifiers assigned to the 300-FF-5 operable unit compounds of concern (1,2-dichloroethene, methylene chloride, tetrachloroethene, and trichloroethene) and for all other compounds originally reported as detected 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 Cases A209030 and 9209L785, 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's Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA 1990).

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2.1.4 Samples Analyzed According to CLP Protocols

Forty-two low level water samples (including 21 trip blanks) were submitted for analysis. Analyses were performed according to the 1990 CLP protocol (EPA 1990).

Sample analyses were performed using 2 gas chromatograph/mass spectrometer (GC/MS) systems. One system was outfitted with a packed column, the other with a capillary column. 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 quantification limit (CRQL) requirements (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: missed holding times; minor blank contamination; a surrogate percent recovery exceedence; sample concentrations reported below the quantification limit; and one instance where an incorrect concentration may have been calculated by the instrument. 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 gas chromatography/mass spectrometry (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 Westinghouse Hanford (WHC 1992a) and in EPA (1990).

The original tuning data were checked for transcription and calculation errors in two of the packages (Cases A209034 and 9209L785). In the remaining data packages, tuning and mass calibration summary forms (Form V) were evaluated to verify that tuning criteria were met. Prior to calibration and sample analysis, all tuning criteria were met. Therefore, no data were qualified based on the tuning results.

9 3 1 2 9 6 9 2 0 5 2

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 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 four 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 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 the four cases. Therefore, no data were qualified based on the continuing calibration results.

9 3 1 2 9 6 9 2 0 5 3

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. Several compounds were detected in the blanks at low concentrations. These included: 4-methyl-2-pentanone, and methylene chloride. Based on the 5 times and 10 times criteria, all associated sample data were qualified as undetected (U).

A listing of the blank concentrations, associated samples, and qualifier assignments can be found on Form B-3 of the data validation supporting documentation filed with the original data package.

2.2.3.2 No Trip or Equipment Blank Contamination

Several trip blanks and equipment blanks were analyzed with the samples. The equipment blank results were not validated, so no evaluation was made. There were several compounds detected in most trip blank samples (methylene chloride, acetone, chloroform, and 1,1,1-trichloroethane). These compounds were qualified as undetected in the associated samples. There was one instance where a compound of concern, tetrachloroethene, was detected in a trip blank (B075Y1). Tetrachloroethene was not detected in the associated sample (B075X9) so no qualifier was assigned.

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: aqueous samples must be analyzed within 7 days of the date of sample collection (if unpreserved) and 14 days of the date of sample collection (if preserved); and all samples must be shipped on ice to the laboratory and stored at 4°C until analysis.

The holding times were acceptable for the samples associated with these four cases, with the following exceptions. Samples B075X9 and B075Y1 in Case A209034

9 3 1 2 9 6 9 2 0 5 4

exceeded the 14-day holding time by 2 days. Therefore, all data associated with these samples were qualified as estimates (J and UJ).

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 High for One Sample

Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program. 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 surrogate compound recoveries calculated for the three stable isotopically labeled surrogate compounds were acceptable and ranged from 87 to 115 percent with the following exception. The percent recovery (123 percent) of 1,2-dichloroethane-d4 in sample B076C1 (Case 9209L845) exceeded the control limits. Therefore, all detected compounds in sample B076C1 were qualified as estimates (J) and non-detects were qualified as having estimated detection limits (UJ).

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 aqueous matrix spike samples were analyzed with the four cases addressed in this report. The matrix spike compound recoveries were acceptable and ranged from 84 to 127 percent. Therefore, no qualifiers were assigned based on matrix spike percent recoveries.

9 3 1 2 9 6 9 2 0 5 5

2.5 PRECISION ACCEPTABLE

The overall precision goal for the four compounds of concern is ±10 percent. Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed matrix spike/matrix spike duplicate (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.

2.5.1 Matrix Spike Duplicates Acceptable

Four matrix spike duplicate samples were analyzed with the four cases addressed in this report. The matrix spike duplicate RPDs were acceptable for all four cases and ranged from 0 to 12 percent. Therefore, no qualifiers were assigned based on the matrix spike duplicate precision.

2.5.2 Field Duplicates Analyzed

There were 2 sets of field duplicate samples analyzed for volatile organics. Only one set was included in the validated packages (B07841 and B07603 of Case A209030).

For these samples, the compounds of concern were not detected or were detected at concentrations less than the CRQL. Therefore, field duplicate precision could not be evaluated. A full presentation of field duplicate data and RPD calculations are given in Appendix A. No qualifiers were assigned based on field duplicate precision data.

2.5.3 Interlaboratory Precision

There were 2 sets of field split samples analyzed. Only one set was included in the validated packages (B076C1 of Case 9209L845, and B07603 of Case A209030).

For these samples, the compounds of concern were not detected or were detected at concentrations less than the CRQL. Therefore, interlaboratory precision could not be evaluated. A full presentation of interlaboratory precision data and RPD calculations were given in Appendix A. 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 in all cases. Therefore, no qualifiers were assigned based on internal standard performance.

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 compound identifications were confirmed by the validator. The compounds that were confirmed to be present in samples associated with these four cases include 1,2-dichloroethene, trichloroethene, chloroform, and methylene chloride.

All tentatively identified compounds (TICs) detected in these samples were qualified as presumptively identified at estimated concentrations (JN).

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).

The presence of styrene in sample B07611 was confirmed, but the reported

concentration of the compound could not be. The profile at scan 988 indicates a styrene level at 50 to 100 μg/L. The correct RRF was used, the correct m/z ion was used, and the spectra confirms it as styrene. But the area quantitated by the data system is inconsistent with the chromatogram. Therefore, the styrene concentration was qualified as an estimate (J). This conclusion should be confirmed by the laboratory.

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. The following changes were made after the submittal of the Preliminary QA Report:

- In Case A209034 and Case 9209L845 there were several compounds (methylene chloride, acetone, 1,2-dichloropropane, and chloroethane) whose data had been qualified as estimates due to an apparent calibration exceedence. The associated sample data were "unqualified" when it was shown that the incorrect criteria had been used.

- In Case 9209L845 data for sample B076C1 were qualified as estimates (J or UJ) due to a surrogate percent recovery exceedence.

No other changes were made to the sample data.

2.11 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the four cases discussed above, 10 additional Round 3 Groundwater volatile organic data packages, which were not validated, were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 2-2.

9 3 1 2 9 6 9 2 0 5 8

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Volatile Organic Compounds
Analysis and Qualifier Summary

Sheet 1 of 5

Sample No.	B07689	B07687	B07685	B07683	B07681	B07679	B07661	B07659	B07621
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	3 J	10 U	10 U	3 J	3 J	10 U	10 U	3 J	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:									
Acetone	NR	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Tetrachloride	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	2 J	NR	2 J	NR	2 J	NR	2 J	NR	2 J
1,1,1-Trichloroethane	NR	1 J	NR	NR	1 J	10 U	NR	2 J	1 J
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR	NR
Styrene	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Volatile Organic Compounds
Analysis and Qualifier Summary

Sheet 2 of 5

Sample No.	B07619	B07617	B07615	*B075Z3	*B075Z1	*B075Y5	*B075Y3	*B075Y1
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	3 J	4 J	10 U	10 U	10 U	3 J	10 U	10 UJ
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Trichloroethene	10 U	10 U	10 U	10 U	6 J	10 U	6 J	10 UJ
Tetrachloroethene	10 U	10 U	3 J	10 U	10 U	10 U	10 U	3 J
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Tetrachloride	NR	NR	2 J	NR	NR	NR	NR	NR
Chloroform	NR	2 J	10 U	2 J	10 U	2 J	10 U	2 J
1,1,1-Trichloroethane	10 U	1 J	NR	1 J	10 U	2 J	10 U	2 J
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	10 U	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	3 J	NR
Styrene	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Volatile Organic Compounds Analysis and Qualifier Summary

Sheet 3 of 5

Sample No.	*B075X9	*B07843	*B07841	B07697	B07695	B07693	B07691	B07645
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	3 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	4 J	10 U	7 J	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Tetrachloride	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	NR	3 J	10 U	3 J	NR	3 J	10 U	NR
1,1,1-Trichloroethane	10 UJ	NR	NR	NR	NR	NR	NR	1 J
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR
Styrene	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected

* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Volatile Organic Compounds Analysis and Qualifier Summary

Sheet 4 of 5

Sample No.	B07643	*B07613	*B07611	*B07609	*B07607	*B07605	*B07603	*B075Z7	*B075Z5
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	7 J	10	3 J
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10	10 U
Additional Compounds Originally Detected in Sample:									
Acetone	NR	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Tetrachloride	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	3 J	NR	NR	3 J	NR	3 J	10 U	3 J	10 U
1,1,1-Trichloroethane	NR	NR	NR	NR	NR	NR	NR	NR	NR
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR	NR
Styrene	NR	NR	1 J	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	16 JN	NR	NR	NR	NR	NR	NR

NR - not reported as detected

* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Volatile Organic Compounds Analysis and Qualifier Summary

Sheet 5 of 5

Sample No.	B075W9	B075W7	B075W5	B075W3	*B076C1	*B076C3	*B076B7	*B076B9
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	2 J
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	6 J	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	5 J	NR	10 J	2 J
Carbon Tetrachloride	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	NR	3 J	3 J	NR	10 U	3 J	NR	3 J
1,1,1-Trichloroethane	NR	NR	NR	NR	NR	NR	NR	NR
4-Methyl-2-pentanone	NR	NR	NR	3 J	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	3 J	NR	NR	NR	NR
Styrene	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

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Table 2-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Volatile Organic
Data Package Completeness Verification Results

Sheet 1 of 2

Data Package Item	Case Number								
	09-008	09-045	09-019	9209L910	09-036	09-044	09-051	10-037	09-059
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
Chain-of-Custody	Yes	No	Yes	Yes	No	Yes	No	Yes	No
QC Summary									
Surrogate Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS/MSD Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blank Summary Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GC/MS Tuning Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal Standard Summary Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Data									
Sample Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TIC Reports For Each Sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC Reports for All Samples	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Spectra-Detected Results	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Library Search-Rep. TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantitation and Calculation Data-All TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data									
Initial Calibration Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports-Initial Calibration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continuing Calibration Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports-Cont. Calibration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal Standard Summary report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw QC Data									
Tuning Report, Spectra, Mass Lists	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blank Analysis Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TIC Reports for all Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and quantitation reports for blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Spectra-Detected Results in Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Raw and Corrected Library Search-Rep. TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Quantitation and Calculation Data-TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS/MSD Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports for MS/MSD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Data									
Moisture, %Solids Data Sheets	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Time Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample Preparation Sheets	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	Yes	No	No	Yes	No	Yes	No	Yes

♦ - Fully validated data package

Table 2-2. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Volatile Organic Data Package Completeness Verification Results

Sheet 2 of 2

Data Package Item	Case Number				
	9209L009	09-034*	09-030*	9209L845*	9209L785*
Case Narrative	Yes	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes	Yes
QC Summary					
Surrogate Report	Yes	Yes	Yes	Yes	Yes
MS/MSD Report	Yes	Yes	Yes	Yes	Yes
Blank Summary Report	Yes	Yes	Yes	Yes	Yes
GC/MS Tuning Report	Yes	Yes	Yes	Yes	Yes
Internal Standard Summary Report	Yes	Yes	Yes	Yes	Yes
Sample Data					
Sample Reports	Yes	Yes	Yes	Yes	Yes
TIC Reports For Each Sample	Yes	Yes	Yes	Yes	Yes
RIC Reports for All Samples	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Spectra-Detected Results	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Library Search-Rep. TIC	Yes	Yes	Yes	Yes	Yes
Quantitation and Calculation Data-All TIC	Yes	Yes	Yes	Yes	Yes
Standards Data					
Initial Calibration Report	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports-Initial Calibration	Yes	Yes	Yes	Yes	Yes
Continuing Calibration Reports	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports-Cont. Calibration	Yes	Yes	Yes	Yes	Yes
Internal Standard Summary report	Yes	Yes	Yes	Yes	Yes
Raw QC Data					
Tuning Report, Spectra, Mass Lists	Yes	Yes	Yes	Yes	Yes
Blank Analysis Report	Yes	Yes	Yes	Yes	Yes
TIC Reports for all Blanks	Yes	Yes	Yes	Yes	Yes
RIC and quantitation reports for blanks	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Spectra-Detected Results in Blanks	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Library Search-Rep. TIC	Yes	Yes	Yes	Yes	Yes
Quantitation and Calculation Data-TIC	Yes	Yes	Yes	Yes	Yes
MS/MSD Report Forms	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports for MS/MSD	Yes	Yes	Yes	Yes	Yes
Additional Data					
Moisture, %Solids Data Sheets	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A
Instrument Time Logs	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A
Sample Preparation Sheets	Yes	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No	No

* - Fully validated data package

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3.0 METALS DATA VALIDATION AND LIMITATIONS

3.1 SUMMARY

3.1.1 Four Sample Delivery Groups

Sample results from the following four metals cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N209086	18	6
TMA	N209074	20	10
Weston	9209L845	2	2
Weston	9209L785	2	2

Data qualifiers assigned to the 300-FF-5 analytes of concern (aluminum, antimony, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc) and for all other analytes reported for these cases are summarized in Table 3-1.

3.1.2 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 Cases N209074 and 9209L785, 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).

3.1.3 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).

9 3 1 2 9 6 9 2 0 6 6

3.1.4 Samples Analyzed According to CLP Protocols

Forty-two low level groundwater samples were submitted for analysis for inorganic target analyte list (TAL) metals, with the exception of Weston Cases 9209L785 and 9205L845, which were not analyzed for arsenic, selenium, and thallium. Analyses were performed according to the 1990 CLP protocol (EPA 1990).

Samples were analyzed using an inductively coupled argon plasma emission spectrometer (ICP), a graphite furnace atomic absorption spectrometer (GFAA), and a cold vapor atomic absorption spectrophotometer (CVAA). Failure to comply with various technical requirements established by CLP protocols resulted in qualification of the data.

3.1.5 Most Data Quality Objectives Met

The analyses were complete and met the method and work plan contract required detection limit (CRDL) requirements (DOE 1990), except as noted below.

3.1.6 Major Deficiencies

Selenium data for samples B075X9, B075Y3, B075Z1, B07615, B07619, B07659, B07679, B07683, and B07687 (Case N209086); and B075W3, B075W7, B075Z5, B07603, B07607, B07611, B07643, B07691, B07695, and B07841 (Case N209074) were rejected due to 0 percent recovery of the associated matrix spike samples.

3.1.7 Minor Deficiencies in Other Qualified Data

There were minor deficiencies associated with the analysis of these samples. Minor deficiencies included minor blank contamination; matrix spike percent recovery exceedences; low calibration correlation coefficients; analytical spike percent recovery exceedences; instruments not defaulting at IDL values; and ICP serial dilution RPD exceedences.

In addition, the minimum detection limit requirements were not met for mercury, cadmium, and nickel in some samples. The mercury detection limit requirement was 0.1 μg/L. In all TMA cases the laboratory reported a detection limit of 0.2 μg/L. The cadmium detection limit requirement was 2 μg/L. In all Weston cases the laboratory reported 7 μg/L. The nickel detection limit requirement was 10 μg/L. In all Weston cases, the laboratory reported 20 μg/L.

These deficiencies and the resulting data qualifications are explained in greater detail in the following sections.

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3.2 ANALYTICAL METHODS

Performance of specific instrument quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are discussed below.

3.2.1 Instrument Calibration Acceptable Except for Selenium

3.2.1.1 GFAA

Four calibration standards and a blank were analyzed for arsenic, selenium, thallium, and lead by GFAA. The correlation coefficient of a least squares linear regression met the requirements for calibration with the exception of the following case:

Case N209074. The correlation coefficient for dissolved selenium (0.993) was less than 0.995. Selenium was not detected in the associated samples (B07644, B075W4, B07604, B07608, and B07612). Therefore, the selenium detection limits for these samples were qualified as estimates (UJ).

The correlation coefficient for total selenium (0.989) was less than 0.995. Selenium data were rejected in the associated samples due to a low matrix spike percent recovery (see **3.3 ACCURACY**). No additional qualifiers were assigned to these samples (B075W3, B075W7, B07603, B07611, B07643, B07695, and B07841) based on the calibration exceedence because the data were rejected due to matrix spike exceedences.

3.2.1.2 CVAA

Up to five calibration standards and a blank were analyzed for mercury by CVAA. The correlation coefficient of a least squares linear regression met the requirements for calibration.

3.2.1.3 ICP

At least one standard and a blank were analyzed by ICP for all other elements, and the calibration was acceptable.

3.2.2 Calibration Verification Acceptable

The above calibrations were each immediately verified with an initial calibration verification (ICV) standard and a calibration blank. The ICV standard was prepared from a source independent of the calibration standards, at a mid-calibration range

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concentration. The ICV percent recovery must fall within the control limits of 90 to 110 percent for metals analyzed by ICP and GFAA, and 80 to 120 percent for mercury. Calibration linearity near the detection limit was verified with a standard prepared at a concentration near the CRDL. The ICVs met the required control limits in all cases.

The calibrations were subsequently verified at regular intervals using a continuing calibration verification (CCV) standard. The control windows for percent recovery of CCV standards are the same as the ICV windows described above. The CCVs met the required control limits in all cases.

3.2.3 Low Level Blank Contamination

Initial calibration blank (ICB), continuing calibration blank (CCB), and preparation or method blank (PB or MB) results were reviewed to determine the extent of variability of the sample detection limit and the existence and magnitude of blank contamination.

Samples with digestate concentrations (in μg/L) of less than five times the highest amount found in any of the associated blanks are qualified as non-detected (U). Samples with concentrations of greater than five times the highest amount found in any of the associated blanks do not require qualification.

The laboratory reports any negative values acquired during blank sample analyses that are greater than the IDL in magnitude. These "negative blanks" often occur due to errors in the linear approximation of the instrument calibration curve near the zero point. When negative blanks occur, any sample detection limits are qualified as estimates (UJ) because they potentially could be positive concentrations reported as non-detects by the laboratory. Any positive sample concentrations reported near the IDL (i.e., less than 5 times the absolute value of the blank) are also qualified as estimates (J). Any sample concentration greater than 5 times the absolute value of the blank is not qualified.

Several elements were detected in blanks associated with these four cases. Qualifications made as a result of the blank contamination are also outlined below.

In both of the Weston cases (9209L785 and 9209L845), the ICP instrument did not default to the reported IDL. The default values were lower than the CRDLs. Defaulting to another detection limit is not technically incorrect. Therefore, these default values were used in place of the reported IDLs to make the data qualifications.

Case N209086. Aluminum in samples B075Y0 and B07680; cadmium in samples B07680 and B07688; iron in samples B075Y0, B075Y4, B07522, B07620, B07660, and B07680; and manganese in samples B075Y0, B075Z2, B07616, B07660, and B07680 were qualified as undetected (U) due to blank contamination.

Negative blanks were reported for copper and lead. Copper was not detected in the samples (B075Y0, B075Y4, B075Z2, B07616, B07620, B07660, B07680, B07684, and B07688); lead was not detected in some of the samples (B075Y0, B075Z2, and B07660); and the associated copper and lead detection limits were qualified as estimates (UJ). Lead was detected in some of the samples (B075Y4, B07616, B07620, B07680, B07684, and B07688), and the associated lead concentrations were qualified as estimates (J).

Beryllium in sample B075X9; copper in sample B07687; cobalt in sample B07659; aluminum in samples B075Y3, B075Z1, B07619, B07659, and B07679; iron in samples B07619, B06759, and B07679; and manganese in samples B075X9, B075Y3, B075Z1, B07615, B07619, B07659, and B07679 were qualified as undetected (U) due to blank contamination.

Case N209074. Iron in samples B07692 and B075Z6; silver in sample B07696; and vanadium in samples B07842, B07696, B07692, B07644, B07612, B07608, B07604, and B075Z6 were qualified as undetected (U) due to blank contamination.

There were negative blanks associated with the beryllium, copper, and silver data in Case N209074. The beryllium concentration in sample B07644 was qualified as an estimate (J). In all other samples (B07842, B07696, B07692, B07644, B07612, B07608, B07604, B075Z6, B075W8, and B075W4) detection limits for beryllium, copper, and silver, and the copper and silver detection limits for sample B07644, were qualified as estimates (UJ).

Aluminum in samples B07695, B075W3, and B07643, and copper in samples B075W3 and B07691 were qualified as undetected (U) due to blank contamination.

There were negative blanks associated with the analyses in Case N209074. The arsenic concentrations in some samples (B07691, B07841, B07643, B075W3, B07525, B07603, and B07607); the iron concentrations in some samples (B07525, B07611, B07643, and B07691); and the zinc concentrations in some samples (B075W3, B07525, B07603, B07607, B07611, B07643, and B07841) were qualified as estimates (J). All associated detection limits for arsenic, iron, silver, and zinc were also qualified as estimates (UJ).

Cases 9209L845 and 9209L785. No data in Cases 9209L845 and 9209L785 were qualified due to blank results.

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3.2.4 Holding Time Not Met for One Sample

Analytical holding times for ICP metals, GFAA metals, and CVAA mercury analyses were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: samples must be analyzed within twenty-eight days for mercury; and within six months for all other metals.

Required holding times were met for the samples in each of these four cases, with the following exception:

N209086. One sample (B075Y0) exceeded the mercury holding time by 3 days. Mercury was not detected in the sample. Therefore, the detection limit for mercury in sample B075Y0 was qualified as an estimate (UJ).

3.2.5 Instrument-Specific Quality Control Procedures

3.2.5.1 ICP

Interference Check Sample (ICS). ICSs were analyzed at the beginning and end of each ICP sample sequence to verify the laboratory interelement and background correction factors. Results for the ICS solution must fall within the control limit of ±20 percent of the true value.

The ICS samples analyzed with these cases were acceptable.

Serial Dilutions. A five-fold serial dilution is required for all elements analyzed by ICP whose concentrations are greater than 50 times the IDL. The subsequent concentrations of the reanalysis are compared with the original analysis. The concentration values must agree within a ±10 percent difference (%D).

A serial dilution was required for many of the ICP metals in these four cases. The dilution concentrations were found to be within 10%D of the initial analysis except for the following:

Case N209086. The serial dilution criteria were exceeded for iron (13.5 percent) and manganese (15.8 percent) in sample B07687L. All associated samples with iron (B075X9, B075Y3, B075Z1, B07615, B07683, and B07687) and manganese (B07683 and B07687) concentrations greater than 50 times the IDL were qualified as estimates (J).

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3.2.5.2 GFAA

Duplicate injections are required for all GFAA analyses. The duplicate injections establish the precision of the individual analytical determinations. For sample concentrations greater than the CRDL, duplicate injections must agree within ±20 percent RSD.

Duplicate injection frequency and precision requirements were met.

The post-digestion analytical spike is analyzed to determine the extent of interference in the digestate matrix. When the results of the analytical spike analyses exceed the control window of 85 to 115 percent recovery and the absorbance of the sample is greater than fifty percent of the analytical spike absorbance, the sample must be reanalyzed using the method of standard additions (MSA).

Case N209086. Analytical spike percent recoveries in samples B07684 (69 percent) and B07688 (70 percent) exceeded the control limits for selenium. Selenium was not detected in these samples. Therefore, the selenium detection limits for these samples were qualified as estimates (UJ).

Three samples were analyzed for selenium by the MSA method. The correlation coefficient for samples B075Z2 (0.9655), B07620 (0.9467), and B07660 (0.9554) were less than 0.995. Selenium was detected in these samples. Therefore, the selenium concentrations for these samples were qualified as estimates (J).

The analytical spike percent recovery in sample B07680 (83 percent) exceeded the control limits for lead. Lead was not detected in the sample. Therefore, the lead detection limit was qualified as an estimate (UJ).

The analytical spike percent recovery in sample B07683 (118 percent) exceeded the control limits for lead. Lead was not detected in the sample, and no qualifier was assigned.

The analytical spike percent recoveries in samples B075Y0 (70 percent), B075Y4 (75 percent), B075Z2 (69 percent), B07616 (62 percent), B07620 (57 percent), B07660 (64 percent), B07680 (56 percent), B07684 (70 percent), and B07688 (68 percent) exceeded the control limits for thallium. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

The analytical spike percent recoveries in samples B075X9 (49 percent), B075Y3 (52 percent), B075Z1 (41 percent), B07615 (54 percent), B07619 (41 percent), B07659 (54 percent), B07679 (44 percent), B07683 (49 percent), and B07687 (43 percent)

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exceeded the control limits for thallium. Thallium was detected in sample B07619, and the concentration was qualified as an estimate (J). Thallium was not detected in the remaining samples, listed above, and their detection limits were qualified as estimates (UJ).

The analytical spike percent recoveries in samples B075Z1 (72 percent), B07615 (82 percent), and B07679 (84 percent) exceeded the control limits for arsenic. Arsenic was detected in these samples. Therefore, the associated concentrations were qualified as estimates (J).

The analytical spike percent recoveries in samples B075Z1 (143 percent), B07659 (71 percent), B07687 (40 percent), B075X9 (79 percent), B07615 (52 percent), B07619 (63 percent), B07679 (82 percent), and B07683 (51 percent) exceeded the control limits for selenium. Associated selenium data were rejected due to a matrix spike exceedence (see 3.3 ACCURACY). No additional qualifiers were assigned due to these associated spike exceedences.

Case N209074. The analytical spike percent recoveries were outside the required limits for arsenic, selenium, thallium, and lead in several samples in SDG B075W4.

Arsenic was not detected in samples B075W4 (69 percent) and B075W8 (68 percent), and the associated arsenic detection limits were qualified as estimates. Arsenic was detected in samples B07608 (69 percent), B07612 (70 percent), and B07644 (66 percent), and the associated arsenic concentrations were qualified as estimates (J).

Selenium was not detected in samples B075W4 (41 percent), B07604 (69 percent), B07608 (69 percent), B07612 (61 percent), B07644 (50 percent), B075Z6 (83 percent), B07692 (72 percent), B07696 (56 percent), B07842 (74 percent), and B075W8 (84 percent), and the associated selenium detection limits were qualified as estimates (UJ).

Lead was detected in samples B07604 (84 percent), B07644 (83 percent), and B07696 (76 percent), and the associated lead concentrations were qualified as estimates (J).

Thallium was not detected in samples B075W4 (65 percent), B075W8 (72 percent), B075Z6 (80 percent), B07604 (72 percent), B07608 (70 percent), B07644 (76 percent), B07692 (77 percent), B07696 (61 percent), B07842 (78 percent), and the associated thallium detection limits were qualified as estimates (UJ).

The analytical spike percent recoveries were exceeded for arsenic, selenium, and thallium in several samples in SDG B075W3.

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The analytical spike percent recoveries exceeded the control limits for arsenic in samples B075Z5 (52 percent), B075W3 (48 percent), B075W7 (60 percent), B07603 (62 percent), B07691 (55 percent), B07695 (53 percent), and B07841 (48 percent). Arsenic was not detected in samples B075W7 and B07695, and the associated arsenic detection limits were qualified as estimates (UJ). Arsenic was detected in the remaining samples, and the associated arsenic concentrations were qualified as estimates (J).

Selenium was not detected in samples B075W3 (72 percent), B075W7 (66 percent), B075Z5 (71 percent), B07603 (59 percent), B07607 (46 percent), B07611 (79 percent), B07643 (80 percent), B07691 (41 percent), B07695 (65 percent), and B07841 (81 percent). The associated selenium data were rejected due to a low matrix spike percent recovery. No additional qualifiers were assigned based on the analytical spike recoveries.

Thallium was not detected in samples B075W3 (75 percent), B075W7 (70 percent), B075Z5 (81 percent), B07603 (74 percent), B07607 (72 percent), B07611 (72 percent), B07643 (73 percent), B07691 (76 percent), B07695 (70 percent), and B07841 (65 percent), and the associated thallium detection limits were qualified as estimates (UJ).

Case 9209L845. The analytical spike percent recovery in samples B076C1 (79 percent) was outside of the required control limits for lead. Lead was not detected in the sample. Therefore, the lead detection limit was qualified as an estimate (UJ).

Case 9209L785. The analytical spike percent recovery in samples B076B7 (80 percent) and B076B8 (81 percent) was outside of the required control limits for lead. Lead was not detected in the sample. Therefore, the lead detection limits were qualified as estimates (UJ).

3.3 ACCURACY

The overall accuracy goal for the 300-FF-5 metals of concern is ±25 percent. This goal was met for the target metals, with the exception of mercury, selenium, thallium, and lead and the non target metals.

3.3.1 Matrix Spike Exceedences for Selenium, Thallium, Mercury, and Lead

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must generally fall within the range of 75 to 125 percent.

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The matrix spike results were acceptable with the following exceptions:

Case N209086. The matrix spike (sample B07688) percent recoveries were outside the control limits for selenium (48.1 percent) and thallium (64.7 percent). Selenium was detected in three associated samples (B075Z2, B07620, and B07660). Therefore, the selenium concentrations for these three samples were qualified as estimates (J). Selenium was not detected in samples B075Y0, B075Y4, B07616, B07680, B07684, and B07688 and the associated selenium detection limits were qualified as estimates (UJ). Thallium was not detected in any of the above samples, and the thallium detection limits for the samples were qualified as estimates (UJ).

The matrix spike (sample B075X9) percent recoveries were outside the control limits for selenium (0 percent) and thallium (42 percent). Selenium was not detected in the associated samples (B075X9, B075Y3, B075Z1, B07615, B07619, B07659, B07679, B07683, and B07687). The selenium data were, therefore, rejected (R). Thallium was detected in sample B07619, and was qualified as an estimate (J). Thallium was not detected in the remaining samples (listed above), and the associated thallium detection limits were qualified as estimates (UJ).

Case N209074. The matrix spike (sample B07841) percent recoveries were outside the control limits for mercury (144 percent) and selenium (0 percent). Mercury and selenium were not detected in the associated samples (B075W3, B075W7, B075Z5, B07603, B07607, B07611, B07643, B07691, B07695, and B07841). Therefore, the mercury data were not qualified, and the selenium data were rejected (R).

Case 9209L785. The matrix spike (sample B076B7) percent recovery (74 percent) was outside the control limits for lead. Lead was not detected in the associated samples (B076B7 and B076B8). Therefore, the lead detection limits were qualified as estimates (UJ).

3.3.2 Laboratory Control Sample Results Acceptable

The laboratory control sample (LCS) monitors the overall performance of the analysis, including the sample preparation. An LCS should be digested and analyzed with every group of samples that have been prepared together. The performance criteria for aqueous LCS samples are 80 to 120 percent recovery.

One aqueous LCS was digested and analyzed with each case. The results were compared against the control windows and were found to be acceptable. Therefore, no data were qualified based on the laboratory control samples analyses.

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3.4 PRECISION

3.4.1 Duplicate Analyses

The overall precision goal for the metals of concern is ± 20 percent. Analytical duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Field duplicate analyses are used to measure both the laboratory and the field sampling procedure precision. Field split analyses are used to measure interlaboratory precision.

3.4.1.1 Analytical Duplicates Acceptable

The CLP RPD goal for analytical duplicates in an aqueous matrix is less than or equal to 20 percent for concentrations greater than 5 times the CRDL, and ± CRDL for concentrations less than 5 times the CRDL.

One set of analytical duplicates were analyzed for all analytes with each sample delivery group (SDG). The laboratory duplicate precision goals were met.

Lead data in Case N209086 were incorrectly flagged by the laboratory as exceeding the duplicate criteria for sample B07687D. The duplicate precision was acceptable, and no qualifiers were assigned.

3.4.1.2 Field Duplicates Acceptable

Two sets of field duplicate samples were analyzed for total metals, and two sets were analyzed for dissolved metals. However, only one set of field duplicate samples (B07841 and B07693 of Case N209074) were validated for total metals. In addition, one set of field duplicate samples (B07842 and B07604 of Case N209074) were validated for dissolved metals.

Field duplicate precision goals were met. A full presentation of field duplicate data and RPD calculations are given in Appendix A.

3.4.1.3 Interlaboratory Precision Data Acceptable

There were two sets of field split samples analyzed. However, only one set of field split samples (B076C1 of Case 9209L845 and B07603 of Case N209074) were validated for total metals. In addition, one set of field split samples (B076C2 of Case 9209L845 and B07604 of Case N209074) were validated for dissolved metals.

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Interlaboratory precision goals were met. A full presentation of field split data and RPD calculations are given in Appendix A.

3.5 SAMPLE RESULT VERIFICATION

All of the sample results and reported detection limits for the samples selected by Westinghouse Hanford were recalculated to ensure that the reported results were accurate. Raw data were examined for anomalies, transcription errors, and reduction errors. In addition, the reviewer verified that the results fell within the linear range of the instrument.

Sample calculations were acceptable. No transcription errors or other anomalies were found.

3.6 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. The following changes were made after the submittal of the Preliminary QA Report:

- The mercury detection limit for sample B075Y0 was qualified as an estimate (UJ) due to a holding time exceedence.

- Thallium data for samples in Case N209086, SDG B075X9 were not rejected due to the matrix spike exceedence, but instead were qualified as having estimated detection limits.

- Several samples had been qualified as undetected due to blank contamination. However, the blank values used to make the qualifications were negative. Upon review, these qualifications were changed to estimates (J), and associated non-detects were qualified as estimates (UJ). Additional details can be found on Form B-3 of the data validation suppporting documentation filed with the original data package.

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3.7 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the four metals cases discussed above, 8 additional Round 3 Groundwater metals data packages, which were not validated, were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 3-2. In no case were key deliverables noted to be missing.

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Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Analysis and Qualifier Summary

Sample No.:	♦B075Y0	♦B075Y4	♦B075Z2	B07616	B07620	B07660	B07680
Appendix No.:	Ca	Ca	Ca	Ca	Ca	Ca	Ca
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	17.7 U	14.7 U	14.7 U	14.7 U	14.7 U	14.7 U	22.5 U
Antimony	14.8 U	14.8 U	14.8 U	14.8 U	14.8 U	14.8 U	14.8 U
Beryllium	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
Cadmium	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	2.1 U
Chromium	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.8	2.6 U
Copper	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ
Iron	16.5 U	10.5 U	10.3 U	70.2	13.0 U	10.3 U	41.6 U
Lead	1.9 UJ	5.1 J	1.9 UJ	7.9 J	2.8 J	1.9 UJ	3.0 J
Manganese	3.0 U	0.9 U	2.2 U	1.1 U	0.9 U	1.4 U	1.7 U
Mercury	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.9
Silver	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Zinc	18.3	18.3	62.6	85.6	28.5	9.0	13.6
Additional Metals Reported:							
Arsenic	7.4	4.3	6.4	6.2	6.4	7.5	8.4
Barium	36.7	31.9	45.9	37.1	44.4	38.0	53.2
Calcium	44100	37600	48400	40000	41400	45900	50800
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Magnesium	9190	7570	9910	8140	8520	8890	10800
Potassium	5180	4280	5310	5020	5410	4880	5920
Selenium	3.9 UJ	3.9 UJ	11.6 J	3.9 UJ	5.0 J	3.9 J	3.9 UJ
Sodium	15500	14600	21200	16900	20100	12900	21500
Thallium	1.7 UJ	1.7 UJ	1.7 UJ	1.7 UJ	1.7 UJ	1.7 UJ	1.7 UJ
Vanadium	7.3	7.0	6.1	10.7	9.4	9.4	10.4

NA - not analyzed for
♦ - fully validated sample

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Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Analysis and Qualifier Summary

Sample No.:	B07684	B07688	♦B075X9	♦B075Y3	♦B075Z1	B07615	B07619
Appendix No.:	Ca	Ca	Cb	Cb	Cb	Cb	Cb
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	14.7 U	14.7 U	14.7 U	24.4 U	24.0 U	14.7 U	17.1 U
Antimony	14.8 U	14.8 U	14.8 U	14.8 U	14.8 U	14.8 U	14.8 U
Beryllium	0.30 U	0.30 U	0.43 U	0.30 U	0.30 U	0.30 U	0.30 U
Cadmium	1.5 U	2.6 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Chromium	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	5.4	2.6 U
Copper	1.9 UJ	1.9 UJ	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Iron	166	171	213 J	205 J	180 J	291 J	71.1 U
Lead	3.8 J	2.0 J	3.6	2.0 U	7.3	2.3	2.0 U
Manganese	89.8	69.8	3.0 U	3.5 U	3.0 U	2.8 U	1.6 U
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.9	2.6 U
Silver	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Zinc	12.7	21.4	9.6	9.3	9.9	5.7 U	5.7 U
Additional Metals Reported:							
Arsenic	3.3	3.2 U	5.6	5.1	4.0 J	7.8 J	6.2
Barium	158.0	95.6	37.4	33.2	45.4	35.2	37.1
Calcium	19100	22100	44200	38700	47600	38800	40700
Cobalt	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Magnesium	6740	7980	9300	7840	9650	7900	8560
Potassium	5590	6440	5250	4430	5120	4870	5280
Selenium	3.9 UJ	19.5 UJ	R	R	R	R	R
Sodium	33800	43900	15800	15200	20700	16400	19700
Thallium	1.7 UJ	1.7 UJ	1.3 UJ	1.3 UJ	1.3 UJ	1.3 UJ	1.3 J
Vanadium	2.5 U	2.5 U	7.6	7.6	5.8	8.9	7.0

NA - not analyzed for
♦ - fully validated sample

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Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Analysis and Qualifier Summary

Sample No.:	B07659	B07679	B07683	B07687	*B07842	B07696	B07692
Appendix No.:	Cb	Cb	Cb	Cb	Fa	Fa	Fa
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	24.0 U	38.0 U	14.7 U	604	21.4 U	21.4 U	21.4 U
Antimony	14.8 U	14.8 U	14.8 U	14.8 U	16.9 U	16.9 U	16.9 U
Beryllium	0.30 U	0.30 U	0.30 U	0.30 U	0.40 UJ	0.40 UJ	0.40 UJ
Cadmium	1.5 U	1.5 U	1.5 U	1.5 U	1.0 U	1.0 U	1.0 U
Chromium	21.1	4.7	14.8	77.8	4.5 U	4.5 U	5.7
Copper	1.9 U	1.9 U	1.9 U	2.6 U	3.5 UJ	3.5 UJ	3.5 UJ
Iron	110 U	94.6 U	258 J	1370 J	11.6 U	159	43.4 U
Lead	2.0 U	3.4 J	2.0 U	2.0 U	2.8	3.0 J	1.8
Manganese	3.2 U	1.7 U	89.0 J	93.1 J	4.7 U	224	10.1
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	9.2	5.5	5.8	34.3	5.4 U	5.4 U	5.4 U
Silver	3.6 U	3.6 U	3.6 U	3.6 U	2.5 UJ	4.6 UJ	2.5 UJ
Zinc	5.7 U	6.5	5.7 U	14.9	5.0	4.4	2.4
Additional Metals Reported:							
Arsenic	6.7	7.1 J	2.2 U	2.2 U	3.4	1.9 U	4.3
Barium	37.3	50.3	152.0	96.9	36.0	39.8	62.1
Calcium	43900	48800	18700	22600	44900	14300	67600
Cobalt	1.4 U	1.3 U	1.3 U	1.3 U	2.7 U	2.7 U	2.7 U
Magnesium	8520	10400	6540	8010	8680	5550	14200
Potassium	4620	5620	5410	6350	4900	5640	6880
Selenium	R	R	R	R	2.9 UJ	2.9 UJ	2.9 UJ
Sodium	12200	20600	32800	43300	18000	44300	25300
Thallium	1.3 UJ	1.3 UJ	1.3 UJ	1.3 UJ	3.8 UJ	3.8 UJ	3.8 UJ
Vanadium	7.7	10.7	2.5 U	2.5 U	8.5 U	3.4 U	10.3 U

NA - not analyzed for
* - fully validated sample

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Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Analysis and Qualifier Summary

Sample No.:	B07644	♦B07612	♦B07608	♦B07604	♦B075Z6	B075W8	B075W4
Appendix No.:	Fa	Fa	Fa	Fa	Fa	Fa	Fa
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	21.4 U	21.4 U	21.4 U	21.4 U	21.4 U	21.4 U	21.4 U
Antimony	16.9 U	16.9 U	16.9 U	16.9 U	16.9 U	16.9 U	16.9 U
Beryllium	0.46 J	0.40 UJ	0.40 UJ	0.40 UJ	0.40 UJ	0.40 UJ	0.40 UJ
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chromium	5.0	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U
Copper	3.5 UJ	3.5 UJ	3.5 UJ	3.5 UJ	3.5 UJ	3.5 UJ	3.5 UJ
Iron	11.6 U	11.6 U	11.6 U	11.6 U	25.6 U	328	236
Lead	1.4 J	1.2	2.7	3.7 J	2.4	2.2	2.6
Manganese	4.7 U	4.7 U	4.7 U	4.7 U	5.7	59.3	49.9
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U
Silver	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ
Zinc	2.2 U	2.8	9.1	5.5 U	3.8	3.3	2.8
Additional Metals Reported:							
Arsenic	5.5 J	4.7 J	4.2 J	3.0	1.9 U	1.9 UJ	1.9 UJ
Barium	41.0	47.2	58.4	34.8	53.4	60.9	36.0
Calcium	49500	52800	65300	44500	38600	12800	12300
Cobalt	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Magnesium	12800	11700	13300	8610	7500	5220	5140
Potassium	5070	6040	6700	5010	4450	6650	6210
Selenium	2.9 UJ	2.9 UJ	2.9 UJ	2.9 UJ	2.9 UJ	14.5 UJ	2.9 UJ
Sodium	17500	22900	24900	18000	15900	64900	61600
Thallium	3.8 UJ	3.8 U	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ
Vanadium	16.5 U	11.4 U	8.6 U	11.4 U	7.4 U	2.8 U	2.8 U

NA – not analyzed for
♦ – fully validated sample

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Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Analysis and Qualifier Summary

Sample No.:	B075W3	B075W7	*B075Z5	*B07603	*B07607	*B07611	B07643
Appendix No.:	Fb	Fb	Fb	Fb	Fb	Fb	Fb
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	26.8 U	21.4 U	21.4 U	21.4 U	21.4 U	21.4 U	29.5 U
Antimony	16.9 U	16.9 U	16.9 U	16.9 U	16.9 U	16.9 U	16.9 U
Beryllium	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chromium	52.0	11.7	4.5 U	4.5 U	4.5 U	4.5 U	10.2
Copper	3.8 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Iron	617	396	37.5 J	11.6 UJ	11.6 UJ	48.2 J	54.9 J
Lead	2.3	2.2	2.1	5.6	3.1	2.4	1.6
Manganese	51.9	58.6	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	37.1	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	6.3
Silver	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ
Zinc	10.1 J	24.3	7.1 J	3.2 J	6.0 J	7.7 J	2.8 J
Additional Metals Reported:							
Arsenic	1.9 J	1.9 UJ	2.2 J	4.1 J	5.4 J	9.5 UJ	6.2 J
Barium	38.4	59.4	48.3	37.1	59.4	44.6	40.8
Calcium	12300	12300	35800	42900	62200	49400	46900
Cobalt	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Magnesium	5210	5100	7060	8350	12900	11100	12300
Potassium	6020	6240	4030	4590	6310	5570	4830
Selenium	R	R	R	R	R	R	R
Sodium	62100	62400	14800	17400	23900	21700	16800
Thallium	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ
Vanadium	2.8 U	2.8 U	5.7	10.2	10.3	9.1	16.0

NA - not analyzed for
* - fully validated sample

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Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Analysis and Qualifier Summary

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Sample No.:	B07691	B07695	♦B07841	♦B076C1	♦B076C2	♦B076B8	♦B076B7
Appendix No.:	Fb	Fb	Fb	I	I	L	L
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	21.4 U	32.8 U	21.4 U	49.0 U	49.0 U	49.0 U	70.4
Antimony	16.9 U	16.9 U	16.9 U	60.0 U	60.0 U	60.0 U	60.0 U
Beryllium	0.40 U	0.40 U	0.40 U	1.00 U	1.00 U	1.20	1.00 U
Cadmium	1.0 U	1.0 U	1.0 U	7.0 U	7.0 U	7.0 U	7.0 U
Chromium	10.2	4.5 U	4.5 U	9.0 U	9.0 U	9.0 U	38.9
Copper	3.7 U	3.5 U	3.5 U	8.0 U	8.0 U	8.0 U	12.0
Iron	47.0 J	259	11.6 U	15.0 U	15.0 U	97.7	478
Lead	1.2	2.9	2.2	3.0 UJ	2.0 U	2.0 UJ	2.0 UJ
Manganese	4.7 U	170	4.7 U	4.0 U	4.0 U	52.9	60.4
Mercury	0.20 U	0.20 U	0.20 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	7.3	5.4 U	5.4 U	20.0 U	20.0 U	20.0 U	23.0
Silver	2.5 UJ	2.5 UJ	2.5 UJ	10.0 U	10.0 U	10.0 U	10.0 U
Zinc	2.2 UJ	2.2 UJ	2.6 J	9.9	9.9	59.6	115
Additional Metals Reported:							
Arsenic	3.9 J	1.9 UJ	3.3 J	NA	NA	NA	NA
Barium	59.4	48.3	38.4	39.6	38.2	135	132
Calcium	63900	13100	39600	43600	43200	20000	19400
Cobalt	2.7 U	2.7 U	2.7 U	9.0 U	9.0 U	9.0 U	9.0 U
Magnesium	13600	5270	7850	8300	8210	7280	7030
Potassium	6460	5330	4450	4260	4630	5860	6310
Selenium	R	R	R	NA	NA	NA	NA
Sodium	24100	44800	16900	17500	17300	30700	29600
Thallium	3.8 UJ	3.8 UJ	3.8 UJ	NA	NA	NA	NA
Vanadium	8.6	2.8 U	8.0	11.4	10.5	8.0 U	8.0 U

NA - not analyzed for
♦ - fully validated sample

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Table 3-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Data Package Completeness Verification Results

Data Package Item	Case Number							
	filtered N2-09-017	filtered N2-09-017	filtered N2-09-124	unfiltered N2-09-124	filtered 09-43	unfiltered 09-043	filtered N2-09-101	unfiltered N2-09-101
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports/Chains of Custody	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Sample Data								
Inorganic Analysis Data Sheets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data								
Initial and Cont. Calibration Verfication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CRDL Standard for AA and ICP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary								
Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interference Check Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spike Sample Recovery	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Post-Digestion Sample Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Duplicate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard Addition Results	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Serial Dilution	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument Detction Limits	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interelement Correction Factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Linear Ranges	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Preparation Log	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Analysis Log Run	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw Data								
ICP Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Furnace AA Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mercury Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cyanide Raw Data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Additional Data								
Internal Laboratory Chain-of-Custody	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Sample Preparation Records	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
%Solids Analysis Records	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	Yes	Yes	No	No	No	No

* - Full validated data package

Table 3-2. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Metals Data Package Completeness Verification Results

Data Package Item	Case Number							
	unfiltered N2-09-131	filtered N2-09-131	unfiltered N2-09-112	filtered N2-09-112	unfiltered N2-10-076	filtered N2-10-076	filtered N2-09-153	unfiltered N2-09-153
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports/Chains of Custody	No	No	Yes	Yes	Yes	Yes	No	No
Sample Data								
Inorganic Analysis Data Sheets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data								
Initial and Cont. Calibration Verfication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CRDL Standard for AA and ICP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary								
Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interference Check Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spike Sample Recovery	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Post-Digestion Sample Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Duplicate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard Addition Results	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Serial Dilution	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument Detction Limits	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interelement Correction Factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Linear Ranges	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Preparation Log	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Analysis Log Run	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw Data								
ICP Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Furnace AA Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mercury Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cyanide Raw Data	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Additional Data								
Internal Laboratory Chain-of-Custody	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Sample Preparation Records	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
%Solids Analysis Records	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	Yes	Yes	No	No	No	No	Yes	Yes

* - Full validated data package

Table 3-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Metals
Data Package Completeness Verification Results

Sheet 3 of 3

Data Package Item	Case Number					
	filtered 9209L785*	unfiltered 9209L845*	filtered N2-09-074*	unfiltered N2-09-074*	filtered N2-09-086*	unfiltered N2-09-086*
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports/Chains of Custody	Yes	Yes	Yes	Yes	Yes	Yes
Sample Data						
Inorganic Analysis Data Sheets	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data						
Initial and Cont. Calibration Verfication	Yes	Yes	Yes	Yes	Yes	Yes
CRDL Standard for AA and ICP	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary						
Blanks	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interference Check Summary	Yes	Yes	Yes	Yes	Yes	Yes
Spike Sample Recovery	Yes	Yes	Yes	Yes	Yes	Yes
Post-Digestion Sample Recovery	N/A	N/A	N/A	N/A	N/A	N/A
Duplicate	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample	Yes	Yes	Yes	Yes	Yes	Yes
Standard Addition Results	Yes	Yes	Yes	Yes	Yes	Yes
ICP Serial Dilution	Yes	Yes	Yes	Yes	Yes	Yes
Instrument Detction Limits	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interelement Correction Factors	Yes	Yes	Yes	Yes	Yes	Yes
ICP Linear Ranges	Yes	Yes	Yes	Yes	Yes	Yes
Preparation Log	Yes	Yes	Yes	Yes	Yes	Yes
Analysis Log Run	Yes	Yes	Yes	Yes	Yes	Yes
Raw Data						
ICP Raw Data	Yes	Yes	Yes	Yes	Yes	Yes
Furnace AA Raw Data	Yes	Yes	Yes	Yes	Yes	Yes
Mercury Raw Data	Yes	Yes	Yes	Yes	Yes	Yes
Cyanide Raw Data	N/A	N/A	N/A	N/A	N/A	N/A
Additional Data						
Internal Laboratory Chain-of-Custody	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Sample Preparation Records	Yes	Yes	Yes	Yes	Yes	Yes
%Solids Analysis Records	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No	No	No

* - Full validated data package

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4.0 CONVENTIONAL WET CHEMISTRY DATA VALIDATION AND LIMITATIONS

4.1 SUMMARY

4.1.1 Four Sample Delivery Groups

Sample results from the following four general chemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	A209034	9	3
TMA	A209030	10	5
Weston	9209L845	1	1
Weston	9209L785	1	1

Data qualifiers assigned to the 300-FF-5 analytes of concern (ammonium and nitrate/nitrite) are summarized in Table 4-1.

4.1.2 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 cases A209030 and 9209L785 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 raw laboratory data).

4.1.3 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).

4.1.4 Samples Analyzed According to Non-CLP Protocols

A total of twenty-one aqueous samples were submitted for analysis for general chemistry analytes (ammonium and nitrate/nitrite). Samples were analyzed by EPA methods for wastewater analysis.

4.1.5 Majority of Data Quality Objectives Met

The analyses were complete and CRDL requirements were met. Many of the results were qualified as estimates due to quality control exceedences. However, overall, the data quality objectives were met.

4.1.6 Minor Deficiencies in Other Qualified Data

There were minor deficiencies associated with the analysis of these samples. These included the following: holding time exceedences, and lack of daily calibrations.

These deficiencies and the resulting data qualifications are explained in greater detail below.

4.2 ANALYTICAL METHODS

Performance of specific instrumental quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are outlined below.

4.2.1 Instrument Calibration and Verification Criteria

4.2.1.1 Nitrate/Nitrite by Autoanalyzer

The autoanalyzer used for the analysis of nitrate/nitrite must be calibrated on each day of use using a minimum of three standards and a calibration blank. The correlation coefficient of a least squares linear regression must be equal to or greater than 0.995.

Two different methods were used for the determination of nitrate/nitrite. TMA analyzed the samples using Method 353.2 (automated cadmium reduction). Weston analyzed the samples using Method 353.1 (automated hydrazine reduction). The initial calibrations were acceptable.

9 3 1 2 9 6 9 2 0 8 9

4.2.1.2 Ammonia by Ion Selective Electrode (ISE)

The ISE used for the analysis of ammonia (as nitrogen, N) must be calibrated on each day of use, using a minimum of three standards. No calibration blank is required (although a method blank is required). Using semilogarithmic paper the concentration of ammonia (as N) versus the electrode potential is plotted, and a line of best fit is drawn.

Both laboratories analyzed for ammonia using the ISE method (method 350.3). The following qualifiers were assigned based on the calibration data.

Case A209034. The laboratory reported that an initial calibration had been performed for ammonia on the day of analysis. However, no supporting data were provided. Therefore, the ammonia data for samples B075X9, B075Y3, B075Z1, B07615, B07619, B06759, B07679, B07683, and B07687 were qualified as estimates (J or UJ).

Case A209030. The laboratory reported that an initial calibration had been performed for ammonia on the day of analysis. However, no supporting data were provided. Therefore, the ammonia data for samples B075W3, B075W7, B075Z5, B07607, B07611, B07643, B07691, B07695, and B07841 were qualified as estimates (J or UJ).

4.2.1.3 Calibration Verifications Acceptable

The above calibrations are each immediately verified with an ICV standard analysis. The ICV standard is prepared from a source independent of the calibration standards, at a mid-calibration range concentration. The ICV percent recovery must fall within the control limits of 90 to 110 percent.

The calibrations are subsequently verified at regular intervals using a CCV standard. The control limits for percent recovery of CCV standards are the same as the ICV control limits.

All cases had acceptable calibration verification analyses.

4.2.2 Acceptable Blank Analyses

Blanks were analyzed for all of the analytes and were found to be acceptable, with no detectable contamination.

4.3 HOLDING TIMES EXCEEDED FOR ANIONS AND AMMONIA

Analytical holding times for nitrite/nitrate and ammonia analyses were assessed to ascertain whether the holding time requirements were met by the laboratory. Samples must be analyzed within 28 days for ammonia and nitrate/nitrite.

The following cases had holding time exceedences.

Case A209034. The nitrate/nitrite holding time was exceeded by 6 to 14 days for all samples (B075X9, B075Y3, B075Z1, B07615, B07619, B07659, B07679, B07683, and B07687). Therefore, all associated nitrate/nitrite data were qualified as estimates (J or UJ).

Case A209030. The nitrate/nitrite holding time was exceeded by 6 to 7 days for all samples (B075W3, B075W7, B075Z5, B07607, B07611, B07643, B07691, B07695, and B07841). Therefore, all associated nitrate/nitrite data were qualified as estimates (J or UJ).

4.4 ACCURACY

The overall accuracy goals for the analytes of concern are ± 10 percent for nitrate and nitrite; and ± 25 percent for ammonia (DOE 1990). Accuracy is evaluated through the analysis of spiked samples, and the analysis of standard reference materials.

4.4.1 Matrix Spike Exceedence for Nitrate/Nitrite

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 90 to 100 percent for nitrate/nitrite; and 75 to 125 percent for ammonia.

Matrix spike analyses for these cases met the percent recovery criteria for ammonia. Three of the four matrix spike percent recoveries (range 77 to 86 percent) exceeded the 90 to 110 percent criteria for nitrate/nitrite. All associated samples (all samples except B076C1) were qualified as estimates (J or UJ).

4.4.2 Laboratory Control Sample

The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be prepared (e.g., digested) and analyzed with every group of samples which have been prepared together. The performance criteria for aqueous

LCS percent recovery is 90 to 110 percent for nitrate/nitrite; and 80 to 120 percent for ammonia.

Aqueous LCS (blank spikes) analyzed for the analytes in these cases were found to be acceptable.

4.5 PRECISION

The overall precision goals for the analytes of concern are ± 10 percent for nitrate/nitrite; and ± 20 percent for ammonia (DOE 1990).

4.5.1 Acceptable Duplicate Analyses

4.5.1.1 Acceptable Analytical Duplicates

Analytical (laboratory) duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Analytical duplicate RPD values must be less than or equal to 10 percent for nitrate/nitrite, and less than or equal to 20 percent for ammonia.

Four sets of analytical duplicate results were submitted with these cases. The analytical duplicates met the RPD criteria. Therefore, no qualifiers were assigned based on the duplicate data.

4.5.1.2 Field Duplicates Acceptable

Field duplicate analyses are used to measure precision of both the laboratory and the field sampling procedure.

There were two sets of field duplicate samples analyzed for general chemistry analytes. Only one set (B07841 and B07603 in Case A209030) was validated. The field duplicate precision was acceptable for nitrate/nitrite. Ammonia was not detected in the samples, so precision could not be evaluated for ammonia. A full presentation of field duplicate data and RPD calculations are given in Appendix A.

4.5.1.3 Field Split Samples

Field split analyses are used to measure interlaboratory precision.

There were two sets of field split samples analyzed. Only one set (B07603 in Case A209030, and B076C1 in Case 9209L845) was validated. The nitrate/nitrite RPD (16 percent) exceeded the 10 percent criteria. These samples were qualified as estimated (J

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and UJ). Ammonia was not detected in the samples, so precision could not be evaluated for ammonia.

A full presentation of field split data and RPD calculations are given in Appendix A.

4.6 SAMPLE RESULT VERIFICATION

Sample results and reported detection limits were recalculated to ensure that the reported results were accurate. Raw data were examined for anomalies, transcription errors, and reduction errors. In addition, the reviewer verified that the results fell within the linear range of the instrument. There were no discrepancies found. The data are acceptable for use as qualified.

4.7 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. There were no changes made after the submittal of the Preliminary QA Report.

4.8 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the four general chemistry cases discussed above, 18 additional Round 3 Groundwater general chemistry packages, which were not validated, were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 4-2. In no case were key deliverables noted to be missing.

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Table 4-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater General Chemistry Data Analysis and Qualifier Summary

Sheet 1 of 3

Sample No.:	♦B075X9	♦B075Y3	♦B075Z1	B07615	B07619	B07659	B07679	B07683	B07687
Analytes of Concern:									
Ammonia in mg/L	0.05 UJ	0.05 UJ	0.11 J	0.05 UJ	0.05 UJ	0.05 UJ	0.11 J	0.05 UJ	0.12 J
Nitrate/Nitrite in mg/L	3.45 J	2.49 J	3.33 J	2.89 J	2.22 J	4.71 J	6.83 J	0.25 UJ	0.25 UJ

♦ - fully validated sample

Table 4-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater General Chemistry Data Analysis and Qualifier Summary

Sheet 2 of 3

Sample No.:	B075W3	B075W7	*B075Z5	*B07603	*B07607	*B07611	B07643	B07691	B07695
Analytes of Concern:									
Ammonia in mg/L	0.07 U	0.08 J	0.39 J	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	0.05 J
Nitrate/Nitrite in mg/L	0.25 UJ	0.25 UJ	0.25 UJ	2.91 J	13.0 J	7.36 J	4.74 J	16.9 J	0.25 UJ

* – fully validated sample

Table 4-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater General Chemistry Data Analysis and Qualifier Summary

Sheet 3 of 3

Sample No.:	*B07841	*B076C1	*B076B7
Analytes of Concern:			
Ammonia in mg/L	0.05 UJ	0.10 U	0.10 U
Nitrate/Nitrite in mg/L	3.06 J	3.4	0.10 UJ

* – fully validated sample

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Table 4-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater General Chemistry
Data Package Completeness Verification Results

Sheet 1 of 3

Data Package Item	Case Number								
	N2-09-017	09-008	09-045	N2-09-124	09-043	09-019	9209L845*	9209L785*	09-036
Case Narrative	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports/Chain-of-Custody	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Sample Analysis Data Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary									
Blanks Summary Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spike Sample Recovery Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate Sample Analysis Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample Report Forms	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A	N/A
Raw Data									
Ion Chromatograph Chromatograms	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A	N/A
TOC/TOX Instrument Printouts	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Bench Sheets	Yes	N/A	N/A	Yes	Yes	N/A	Yes	N/A	N/A
Additional Data									
Laboratory Sample Preparation Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Internal Laboratory Chain-of-Custody	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A	N/A
%Solids Analysis records	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	Yes	No	No	No	No	No

* - Fully validated data package

Table 4-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater General Chemistry
Data Package Completeness Verification Results

Sheet 2 of 3

Data Package Item	Case Number								
	N2-09-101	09-044	N2-09-112	N2-09-131	09-051	N2-10-076	09-059	N2-09-153	09-030*
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports/Chain-of-Custody	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Sample Analysis Data Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary									
Blanks Summary Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spike Sample Recovery Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate Sample Analysis Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample Report Forms	Yes	N/A	Yes	Yes	N/A	Yes	N/A	Yes	Yes
Raw Data									
Ion Chromatograph Chromatograms	Yes	N/A	Yes	Yes	N/A	Yes	N/A	Yes	Yes
TOC/TOX Instrument Printouts	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Bench Sheets	Yes	N/A	Yes	Yes	N/A	Yes	N/A	Yes	Yes
Additional Data									
Laboratory Sample Preparation Logs	N/A	N/A	N/A	X	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Internal Laboratory Chain-of-Custody	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
%Solids Analysis records	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	Yes	N/A	N/A	Yes	N/A	Yes	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	Yes	Yes	No	Yes	Yes	No

* - Fully validated data package

Table 4-2. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater General Chemistry Data Package Completeness Verification Results

Sheet 3 of 3

Data Package Item	Case Number			
	09-034*	N2-09-086*	N2-09-074*	9209L910*
Case Narrative	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes
Traffic Reports/Chain-of-Custody	Yes	Yes	Yes	Yes
Sample Analysis Data Report Forms	Yes	Yes	Yes	Yes
Standards Data	Yes	Yes	Yes	Yes
QC Summary				
Blanks Summary Report Forms	Yes	Yes	Yes	Yes
Spike Sample Recovery Report Forms	Yes	Yes	Yes	Yes
Duplicate Sample Analysis Report Forms	Yes	Yes	Yes	Yes
Laboratory Control Sample Report Forms	N/A	Yes	Yes	Yes
Raw Data				
Ion Chromatograph Chromatograms	N/A	Yes	Yes	Yes
TOC/TOX Instrument Printouts	N/A	N/A	N/A	N/A
Laboratory Bench Sheets	N/A	Yes	Yes	Yes
Additional Data				
Laboratory Sample Preparation Logs	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A
Internal Laboratory Chain-of-Custody	Yes	Yes	N/A	N/A
%Solids Analysis records	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No

* - Fully validated data package

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5.0 GROSS ALPHA AND GROSS BETA DETERMINATION DATA VALIDATION AND LIMITATIONS

5.1 SUMMARY

5.1.1 Five Sample Delivery Groups

Sample results for gross alpha and gross beta analyses for the following five radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N2-09-019-7079	20	8
TMA	N2-09-095-7086*	11	1
TMA	N2-09-167-7101*	1	0
Weston	9209L785 and 9209L845	2	2

* Case also contains validated samples from Springs sampling round.

Data qualifiers assigned to the gross alpha and gross beta results for these cases are summarized in Table 5-1.

5.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for one of these three packages (N2-09-095-7086). A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

5.1.3 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.

5.1.4 Data Quality Objectives Not Met

Poor precision resulted in qualification of 20 gross alpha results as estimates (J or UJ). Poor accuracy resulted in qualification of 1 gross alpha result. The affected sample is not included in the group of 20 samples whose results were qualified due to poor precision. Results for the two samples analyzed by Weston were qualified as estimates (J or UJ) because no QA/QC sample data were reported.

5.2 INSTRUMENT CALIBRATION ACCEPTABLE

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 was 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 data were qualified as a result of instrument calibration deficiencies.

5.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of alpha or beta emitting radionuclides. The sample activity as determined by sample analysis 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 deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated. Spiked sample results were provided from TMA. No spike sample results were provided from Weston.

5.3.1 Accuracy Not Acceptable for One TMA Sample Result

The accuracy was not acceptable for one gross alpha sample result, due to the laboratory control sample result falling outside the acceptable limits. Accuracy was acceptable for all TMA gross beta sample results.

5.3.2 Accuracy Not Evaluated for Weston Sample Results

Accuracy could not be determined for the Weston sample results, resulting in all results being qualified as estimates (J or UJ).

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5.4 PRECISION

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided 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 method 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 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA. Replicate sample results were provided from TMA. No replicate sample results were provided from Weston.

5.4.1 Precision Not Acceptable for Some TMA Sample Results

Gross alpha method precision could not be determined for the replicates in one of the three TMA packages evaluated. This discrepancy resulted in 20 gross alpha sample results being qualified as estimates (J or UJ). Method precision was acceptable for all gross beta replicates. No gross beta results were qualified due to precision.

5.4.2 Precision Not Evaluated for Weston Sample Results

Precision could not be determined for the Weston sample results, resulting in all results being qualified as estimates (J or UJ).

5.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all validated samples in each data delivery 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).

The MDA for one TMA gross alpha sample was greater than the CRDL, resulting in the sample result being qualified as an estimate at the detection limit (UJ).

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5.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and QA/QC data indicates that instrument performance was adequate for these analyses. Weston provided instrument continuing calibration information, which was also acceptable, but not QA/QC data. Weston's continuing calibration information was provided in supplemental data packages. Weston continuing calibration information pertinent to these cases is contained in the information identified as "Teledyne Supplemental Radiological Data to September 1992". There is no documentation in the original packages indicating the location of this continuing calibration information. The lack of Weston QA/QC data resulted in qualifying all associated sample results as estimates (J or UJ). No data were rejected, as the samples sent to Weston were identified as split samples; therefore, project QA/QC objectives were deemed to be met by QA/QC analyses performed by TMA.

5.7 DATA PACKAGES COMPLETE BUT REQUIRED INFORMATION FROM OTHER SOURCES

In addition to validating gross alpha and gross beta results for the five packages discussed above, data for gross alpha and gross beta analyses in each of the six Groundwater Round 3 radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 5-2. Chains of custody for thirteen of the eighteen samples in TMA Case Number N2-09-095-7086 were not contained in the delivered package. These chains of custody were found in a data package completely unrelated to this case. With this exception, all key deliverables were supplied by TMA as part of the case. Weston packages, when supplemental data (available in the "Teledyne Supplemental Radiological Data to September 1992") was included, contained all information except QA/QC data.

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

	Gross Alpha		Gross Beta	
Customer I.D. No.	Reported Results	Qualifier	Reported Results	Qualifier
TMA/Norcal case N2-09-019-7079				
* B075Z5	34	J	21	
* B07603	10	J	12	
* B07607	4.2	J	24	
* B07611	5.1	J	8.2	
* B07841	7.6	J	7.6	
* B075X9	4.6	J	8.4	
* B075Y3	8.2	J	8.9	
* B075Z1	28	J	16	
B075W3	-0.097	UJ	8.7	
B075W7	0.8	UJ	6.2	
B07615	0.14	UJ	5.7	
B07619	2.5	UJ	6.5	
B07631	2.4	UJ	8.9	
B07635	-0.74	UJ	6.2	
B07639	1.1	UJ	8.9	
B07643	3.8	J	8	
B07659	5.4	J	9.1	
B07679	2.9	J	5.7	
B07691	4.2	J	29	
B07695	0.33	UJ	5.9	
TMA/Norcal case N2-09-095-7086				
* B075Y7	15		21	
B075T3	14		14	
B075T7	93		41	
B075V1	-0.51	U	5.1	
B07623	1.3	U	4.8	
B07655	0.31	UJ	7	
B07699	-1	U	1.9	
B076B3	-0.045	U	6.1	
B07837	-0.64	U	4.1	
B07845	-0.64	U	0.2	U
B07849	-0.42	U	0.28	U
TMA/Norcal case N2-09-167-7101				
B075S9	71	J	63	
Weston 9209L785-B076B7 & 9209L845-B076C1				
B076B7	< 2.0	UJ	6.2	J
B076C1	8.4	J	14	J

* - Fully validated sample.

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Table 5-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Gross Alpha/Gross Beta
Data Package Completeness Verification Results

Sheet 1 of 2

Data Package Item	Case Number		
	N2-09-019-7079	N2-09-095-7086	N2-09-167-7101
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Identification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Identification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activities	Yes	Yes	Yes
Amount of (Check) Standard Used	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes
Efficiencies	Yes	Yes	Yes
Weight of Carriers Added, If Applicable	N/A	N/A	N/A
Results of Staticstical Test Used to Evaluate Instrument Reliability and Efficiency Checks	N/A	N/A	N/A
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes
Results of Statistical Test Used to Evaluate Instrument Background	N/A	N/A	N/A
Control Limits for Check Source and Background Counts	N/A	N/A	N/A
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA Method	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	N/A	N/A	N/A
Weights of Precipitates	N/A	N/A	N/A
Calculated Recoveries	N/A	N/A	N/A
Duplicates			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Aliquots of Samples	Yes	Yes	Yes
Weight of Solids Counted	Yes	Yes	Yes
Count Durations	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Calculated Precision	Yes	Yes	Yes
Laboratry Control Samples			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Calculation of Recoveries	Yes	Yes	Yes
Result of Analyses	Yes	Yes	Yes
Does Missing Items(s) Affect Data Quality	No	No	No

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Table 5-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Gross Alpha/Gross Beta
Data Package Completeness Verification Results

Sheet 2 of 2

Data Package Item	Case Number N2-09-047-7085	9209L785	9209L845
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Identification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Identification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activities	Yes	Yes	Yes
Amount of (Check) Standard Used	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes
Efficiencies	Yes	Yes	Yes
Weight of Carriers Added, If Applicable	N/A	Yes	Yes
Results of Staticstical Test Used to Evaluate Instrument Reliability and Efficiency Checks	N/A	Yes	Yes
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes
Results of Statistical Test Used to Evaluate Instrument Background	N/A	Yes	Yes
Control Limits for Check Source and Background Counts	N/A	Yes	Yes
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA Method	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	N/A	N/A	N/A
Weights of Precipitates	N/A	N/A	N/A
Calculated Recoveries	N/A	N/A	N/A
Duplicates			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Aliquots of Samples	Yes	No	No
Weight of Solids Counted	Yes	No	No
Count Durations	Yes	No	No
Sample Identifications	Yes	No	No
Calculated Precision	Yes	No	No
Laboratry Control Samples			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Calculation of Recoveries	Yes	No	No
Result of Analyses	Yes	No	No
Does Missing Items(s) Affect Data Quality	No	Yes	Yes

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6.0 STRONTIUM 90 DETERMINATION DATA VALIDATION AND LIMITATIONS

6.1 SUMMARY

6.1.1 Six Sample Delivery Groups

Sample results for strontium 90 (Sr90) analyses for the following five radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N2-09-019-7079	20	8
TMA	N2-09-095-7086*	11	1
TMA	N2-09-167-7101*	1	0
Weston	9209L785 and 9209L845	2	2

* Case also contains validated samples from Springs sampling round.

Data qualifiers assigned to the Sr90 results for these cases are summarized in Table 6-1.

6.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for one of these three packages (N2-09-095-7086). A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

6.1.3 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.

6.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 6-1. An arbitrary criterion was established to reject results with more than three deficiencies. No results were found meeting this criterion.

6.1.5 Data Quality Objectives Not Met

Poor precision resulted in qualification of 32 of the 34 Sr90 results evaluated. Twenty of these 32 sample results were qualified due to poor accuracy. Both Weston sample results were qualified due to lack of QA/QC information.

6.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the low background counting system used for Sr90 determination is capable of producing acceptable and reliable analytical data. The initial calibration was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

6.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of beta emitting radionuclides. The sample activity as determined by sample analysis 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 deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated. Spiked sample results were provided by TMA. No spike sample results were provided by Weston.

6.3.1 Accuracy Not Acceptable for Some TMA Sample Results

The accuracy was not acceptable for 20 Sr90 sample results due to laboratory control sample results falling outside the acceptable limits. The accuracy reported (32 percent) was significantly below the acceptable accuracy (50 percent). All sample results were significantly below the MDA, and results were qualified as estimates (UJ).

6.3.2 Accuracy Not Evaluated for Weston Sample Results

Accuracy could not be evaluated for the Weston data, resulting in all results being qualified as estimates (UJ).

6.4 PRECISION

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided 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 method 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 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA. Replicate sample results were provided by TMA. No replicate sample results were provided by Weston.

6.4.1 Precision Not Acceptable for All TMA Sample Results

Strontium 90 precision could not be determined for the replicates in any of the three TMA packages evaluated. This trend resulted in 32 strontium 90 results being qualified as estimates (UJ).

6.4.2 Precision Not Evaluated for Weston Sample Results

Precision could not be evaluated for the Weston data, resulting in all results being qualified as estimates (UJ).

6.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all validated samples in each data delivery 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).

In some cases, the reported strontium 90 results and the recalculated results differed by a significant margin. The causes of this difference are apparently due to:

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1) the use of different methods for determining limiting values for the least square algorithm; and 2) compensation for the large inherent errors of this method. This difference was most apparent when negative values were reported. Because of the probable sources of differences, and based on a review and acceptance of the general method used, no strontium 90 results have been qualified for this report.

6.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and QA/QC data indicates that instrument performance was adequate for these analyses. Weston provided instrument continuing calibration information, which was also acceptable, but no QA/QC data. Weston's continuing calibration information was provided in supplemental data packages. Weston's continuing calibration information pertinent to these cases is contained in the "Teledyne Supplemental Data to September 1992". There is no documentation in the original packages indicating the location of this continuing calibration information. The lack of Weston QA/QC data resulted in qualifying all associated data as estimates (UJ). No data were rejected, as the samples sent to Weston were identified as split samples; therefore, project QA/QC objectives were deemed to be met by QA/QC analyses performed by TMA.

6.7 QUALIFIERS CHANGED FROM PRELIMINARY REPORT

In the preliminary QA reports, some sample results were identified as both estimated and rejected. This was in error. All samples indicating both conditions are qualified as estimates (J or UJ).

6.8 DATA PACKAGES COMPLETE BUT REQUIRED INFORMATION FROM OTHER SOURCES

In addition to Sr90 results for the five packages discussed above, data for Sr90 analyses in each of the six Groundwater Round 3 radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 6-2. Chains of custody for thirteen of the eighteen samples in TMA Case Number N2-09-095-7086 were not contained in the delivered package. These chains of custody were found in a data package completely unrelated to this case. With this exception, all key deliverables were supplied by TMA as part of each case. Weston packages, when supplemental data from the "Teledyne Supplemental Data to September 1992" was included, contained all information except QA/QC data.

Table 6-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Strontium 90 Analysis and Qualifier Summary

Customer I.D. No.	Strontium 90 Reported Results	Qualifier
TMA/Norcal case N2-09-019-7079		
* B075Z5	0.044	UJ
* B07603	0	UJ
* B07607	0.092	UJ
* B07611	0.048	UJ
* B07841	-2	UJ
* B075X9	0.19	UJ
* B075Y3	-1.1	UJ
* B075Z1	0.28	UJ
B075W3	0.004	UJ
B075W7	0.069	UJ
B07615	-1.2	UJ
B07619	-0.66	UJ
B07631	-1.4	UJ
B07635	0.57	UJ
B07639	-0.18	UJ
B07643	0.15	UJ
B07659	-0.29	UJ
B07679	-1.1	UJ
B07691	0	UJ
B07695	0.041	UJ
TMA/Norcal case N2-09-095-7086		
* B075Y7	-0.12	UJ
B075T3	0.21	UJ
B075T7	4.1	J
B075V1	-0.3	UJ
B07623	-1	UJ
B07655	-0.01	UJ
B07699	0.12	UJ
B076B3	-2	UJ
B07837	-0.13	UJ
B07845	0	UJ
B07849	0.079	UJ
TMA/Norcal case N2-09-167-7101		
B075S9	1	UJ
Weston 9209L785-B076B7 &		
Weston 9209L845-B076C1		
B076B7	< 0.6	UJ
B076C1	< 0.7	UJ

* - Fully validated sample.

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Table 6-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Strontium 90
Data Package Completeness Verification Results

Sheet 1 of 2

Data Package Item	Case Number		
	N2-09-019-7079	N2-09-095-7086	N2-09-167-7101
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Standard Used	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes
Effciencies	Yes	Yes	Yes
Weight Carriers Added, If Applicable	Yes	Yes	Yes
Results of Staticstical Test Used to Evaluate Instrument Reliability and Efficiency Checks	Yes	Yes	Yes
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes
Results of Statistical Test Used to Evaluate Instrument Background	Yes	Yes	Yes
Control Limits for Check Source and Background Counts	N/A	N/A	N/A
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA Method	No	No	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	Yes	Yes	Yes
Weights of Precipitates	Yes	Yes	Yes
Calculated Recoveries	Yes	Yes	Yes
Duplicates			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Aliquuots of Samples	Yes	Yes	Yes
Weight of Solids Counted	Yes	Yes	Yes
Count Durations	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Calculated Precision	Yes	Yes	Yes
Laboratry Control Samples			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Calculation of Recoveries	Yes	Yes	Yes
Result of Analyses	Yes	Yes	Yes
Does Missing Item(s) Affect Data Quality	No	No	No

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Table 6-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Strontium 90
Data Package Completeness Verification Results

Sheet 2 of 2

Data Package Item	Case Number		
	N2-09-047-7085	9209L785	9209L845
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	No	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Standard Used	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes
Effciencies	Yes	Yes	Yes
Weight Carriers Added, If Applicable	Yes	Yes	Yes
Results of Staticstical Test Used to Evaluate Instrument Reliability and Efficiency Checks	Yes	Yes	Yes
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes
Results of Statistical Test Uesd to Evaluate Instrument Background	Yes	No	No
Control Limits for Check Source and Background Counts	N/A	No	No
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA Method	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	Yes	Yes	Yes
Weights of Precipitates	Yes	Yes	Yes
Calculated Recoveries	Yes	Yes	Yes
Duplicates			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Aliquuots of Samples	Yes	No	No
Weight of Solids Counted	Yes	No	No
Count Durations	Yes	No	No
Sample Identifications	Yes	No	No
Calculated Precision	Yes	No	No
Laboratry Control Samples			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Calculation of Recoveries	Yes	No	No
Result of Analyses	Yes	No	No
Does Missing Item(s) Affect Data Quality	No	Yes	Yes

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7.0 ISOTOPIC URANIUM DETERMINATION DATA VALIDATION AND LIMITATIONS

7.1 SUMMARY

7.1.1 Five Sample Delivery Groups

Sample results for isotopic uranium for the following five radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N2-09-019-7079	20	8
TMA	N2-09-095-7086*	11	1
TMA	N2-09-167-7101*	1	0
Weston	9209L785 and 9209L845	2	2

* Case also contains validated samples from the Springs sampling round.

Data qualifiers assigned to isotopic uranium results for these cases are summarized in Table 7-1.

7.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for one of these three packages (N2-09-095-7086). A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

7.1.3 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.

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7.1.4 Data Quality Objectives Generally Met

Poor precision resulted in qualification of one uranium 235 (U235) result. Poor accuracy resulted in qualifying 20 additional U235 results. Data for two samples analyzed by Weston were qualified because no QA/QC sample results were reported.

7.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the alpha spectroscopy system used for isotopic uranium determination is capable of producing acceptable and reliable analytical data. The initial calibration was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency for each alpha energy, system resolution, and the full-width at half maximum for each peak. In addition, the isotopic uranium method employs the addition of a National Institute of Standards and Testing (NIST) traceable uranium 232 internal reference standard. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

7.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of alpha emitting radionuclides. The sample activity as determined by sample analysis 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 deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated. Spiked sample results were provided by TMA. No spike sample results were provided by Weston.

7.3.1 Accuracy Unacceptable for Some TMA U235 Sample Results

Twenty U235 results were qualified as estimated (J or UJ) due to poor accuracy. Accuracy was acceptable for all U234 and U238 results.

7.3.2 Accuracy Not Evaluated for Weston Sample Results

Accuracy could not be evaluated for the Weston data, resulting in all results being qualified as estimates (J or UJ).

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7.4 PRECISION

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided 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 method 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 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA. Replicate samples results were provided by TMA. No replicate sample results were provided by Weston.

7.4.1 Precision Unacceptable for One TMA U235 Sample

Method precision could not be determined for U235 replicates in one package, affecting one sample result, which was qualified as an estimate (J).

Method precision for one other case was slightly high (38 percent) when compared to the limit (35 percent). Review of raw data and data computations resulted in accepting these data with no qualifications.

7.4.2 Precision Not Evaluated for Weston Sample Results

Precision could not be evaluated for the Weston data, resulting in all results being qualified as estimates (J or UJ).

7.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all validated samples in each data delivery 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).

7.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and QA/QC data indicates that instrument performance was adequate for these analyses. Weston provided instrument continuing calibration information, which was also acceptable, but not QA/QC data. Weston's continuing calibration information was provided in supplemental data packages. Weston's continuing calibration information pertinent to these case is contained in the "Teledyne Supplemental Data to September 1992". There is no documentation in the original packages indicating the location of this continuing calibration information. The lack of Weston QA/QC data resulted in qualifying all associated data. No data were rejected, as the samples sent to Weston were identified as split samples; therefore, project QA/QC objectives were deemed to be met by QA/QC analyses performed by TMA.

7.7 QUALIFIER CHANGES FROM PRELIMINARY REPORT

Qualifiers previously assigned to three U233 and two U238 sample results in case N2-09-019-7079 in the preliminary report have been removed. The U233 samples are B075W7 (7079-005), B07639 (7079-003), and B07695 (7079-012). The U238 samples are B07695 (7079-012) and B07635 (7079-002). These samples were originally identified as estimates (J) as the sample result was greater than the MDA but less than the CRDL. This is not an acceptable reason for qualification.

7.8 DATA PACKAGES COMPLETE BUT REQUIRED INFORMATION FROM OTHER SOURCES

In addition to validating gross alpha and gross beta results for the five packages discussed above, data for gross alpha and gross beta analyses in each of the six radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 7-2. Chains of custody for thirteen of the eighteen samples in TMA Case Number N2-09-095-7086 were not contained in the delivered package. These chains of custody were found in a data package completely unrelated to this case. With this exception, all key deliverables were supplied by TMA in each case. Weston packages, when supplemental data from the "Teledyne Supplemental Data to September 1992" was included, contained all information except QA/QC data.

Table 7-1. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Isotopic Uranium
Analysis and Qualifier Summary

Customer I.D. No.	U234 Reported Results	U234 Qualifier	U235 Reported Results	U235 Qualifier	U238 Reported Results	U238 Qualifier
TMA/Norcal case N2-09-019-7079						
* B075Z5	0.64		0.078	UJ	0.47	
* B07603	0.54		0.065	UJ	0.4	
* B07607	2.8		0.089	UJ	2.4	
* B07611	3.4		0.2	J	3.7	
* B07841	7.3		0.39	J	8.1	
* B075X9	6.6		0.3	J	7.4	
* B075Y3	4.3		0.37	J	4.8	
* B075Z1	13		1.1	J	11	
B075W3	0.02	U	0	UJ	0.02	U
B075W7	0.11		0	UJ	0.033	U
B07615	1.2		0.042	UJ	1.1	
B07619	2.1		0.11	UJ	1.8	
B07631	2.3		0.3	J	1.6	
B07635	0.04	U	0.019	UJ	0.14	
B07639	0.13		0	UJ	0.08	U
B07643	2.3		0.055	UJ	1.8	
B07659	6.7		0.5	J	5.6	
B07679	1.6		0.06	UJ	1.5	
B07691	2		0.1	J	1.8	
B07695	0.098		0.022	UJ	0.12	
TMA/Norcal case N2-09-095-7086						
* B075Y7	68		8.7		49	
B075T3	7.7		0.64		5.7	
B075T7	8.5		0.7		7.5	
B075V1	0.18		0.05	U	0.33	
B07623	1.2		0.12	U	1.5	
B07655	0.2		0.054	U	0.25	
B07699	0.016	U	0.019	U	0.078	U
B076B3	0.093		0.021	U	0.025	U
B07837	0.38		0.07	U	0.2	U
B07845	0.37		0	U	0.36	
B07849	0.39		-0.033	U	0.19	U
TMA/Norcal case N2-09-167-7101						
B075S9	60		12	J	43	
Weston 9209L785-B076B7 & 9209L845-B076C1						
B076B7	NR	NA	< 0.08	UJ	< 0.08	UJ
B076C1	NR	NA	0.34	J	8.6	J

* - Fully validated sample.

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Table 7-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Isotopic Uranium
Data Package Completeness Verification Results

Sheet 1 of 2

Data Package Item	Case Number		
	N2-09-019-7079	N2-09-095-7086	N2-09-167-7101
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Spectra, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Counted (Precipitated or Deposited)	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Standard Used	N/A	N/A	N/A
Raw Data including Spectra or Counts per Channel	Yes	Yes	Yes
Kev/channel	N/A	N/A	N/A
Count Duration of Standards	N/A	N/A	N/A
Effciencies	Yes	Yes	Yes
Raw Data of Background Counts, Dates Counted, and Duration of Counts	N/A	N/A	N/A
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA of Method	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Duplicates			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Amounts of Samples Counted	Yes	Yes	Yes
Count Durations	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Calculated Precision	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	Yes	Yes	Yes
Weights of Precipitates or Solids Counted	Yes	Yes	Yes
Calculated Recoveries	Yes	Yes	Yes
Laboratry Control Samples			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Calculation of Recoveries	Yes	Yes	Yes
Result of Analyses	Yes	Yes	Yes
Does Missing Item(s) Affect Data Quality	No	No	No

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Table 7-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Isotopic Uranium
Data Package Completeness Verification Results

Sheet 2 of 2

Data Package Item	Case Number		
	N2-09-047-7085	9209L785	9209L845
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Spectra, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Counted (Precipitated or Deposited)	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Standard Used	N/A	X	X
Raw Data including Spectra or Counts per Channel	Yes	Yes	Yes
Kev/channel	N/A	N/A	N/A
Count Duration of Standards	N/A	N/A	N/A
Effciencies	Yes	No	No
Raw Data of Background Counts, Dates Counted, and Duration of Counts	N/A	No	No
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA of Method	Yes	No	No
Amounts of Reagents Used in Blank	Yes	No	No
Duplicates			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Amounts of Samples Counted	Yes	No	No
Count Durations	Yes	No	No
Sample Identifications	Yes	No	No
Calculated Precision	Yes	No	No
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	Yes	N/A	N/A
Weights of Precipitates or Solids Counted	Yes	N/A	N/A
Calculated Recoveries	Yes	N/A	N/A
Laboratry Control Samples			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Calculation of Recoveries	Yes	No	No
Result of Analyses	Yes	No	No
Does Missing Item(s) Affect Data Quality	No	Yes	Yes

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8.0 GAMMA SPECTROSCOPY DETERMINATION DATA VALIDATION AND LIMITATIONS

8.1 SUMMARY

8.1.1 Five Sample Delivery Groups

Sample results for gamma spectroscopy for the following five radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N2-09-019-7079	20	8
TMA	N2-09-095-7086*	11	1
TMA	N2-09-167-7101*	1	0
Weston	9209L785 and 9209L845	2	2

* Case also contains validated samples from the Springs sampling round.

Data qualifiers assigned to the gamma spectroscopy these cases are summarized in Table 8-1.

8.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for one of these three packages (N2-09-095-7086). A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

8.1.3 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.

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8.1.4 Data Quality Objectives Generally Not Met

Data quality objectives were generally not met. Inability to determine analytical precision resulted in all TMA sample results being qualified. Samples analyzed by Weston were qualified because no QA/QC samples were reported.

8.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the gamma spectroscopy system used is capable of producing acceptable and reliable analytical data. The initial calibration was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency for each gamma energy, system resolution, and the full-width at half maximum for each peak. Initial calibration was performed for each counting geometry used during analysis of Westinghouse Hanford samples. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

8.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of gamma emitting radionuclides. The sample activity as determined by sample analysis 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 deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated. Spiked sample results were provided by TMA. No spike sample results were provided by Weston.

8.3.1 Accuracy Acceptable for All TMA Sample Results

The accuracy was acceptable for all TMA gamma spectroscopy sample results.

8.3.2 Accuracy Not Evaluated for Weston Sample Results

Accuracy could not be evaluated for the Weston cases, resulting in all results being qualified as estimates (J or UJ).

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8.4 PRECISION

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided 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 method 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 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA. Replicate sample results were provided by TMA. No replicate sample results were provided by Weston.

8.4.1 Precision Could Not Be Evaluated for TMA Samples

Precision for the TMA results could not be evaluated because radionuclide quantities present in the duplicate samples analyzed were less than the MDA, thus preventing calculation of precision information. As a result, all TMA sample results were qualified as estimated.

8.4.2 Precision Not Evaluated for Weston Sample Results

Precision could not be evaluated for the Weston cases, resulting in all results being qualified as estimated (UJ).

8.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all validated samples in each data delivery 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).

The MDA for iron 59 exceeded the CRDL. In that all results were near background levels, no iron 59 data were qualified based upon the MDA exceeding the CRDL.

8.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and QA/QC data indicates that instrument performance was adequate for these analyses. Weston provided instrument continuing calibration information but not QA/QC data. Weston's continuing calibration information was provided in supplemental data packages. Weston's continuing calibration information pertinent to these cases is contained in the "Teledyne Supplemental Data to September 1992". There is no documentation in the original packages indicating the location of this continuing calibration information. The lack of QA/QC data resulted in qualifying all associated data. No data were rejected, as the samples sent to Weston were identified as split samples; therefore, project QA/QC objectives were deemed to be met by QA/QC analyses performed by TMA.

8.7 QUALIFIERS CHANGED FROM PRELIMINARY REPORT

Further review of the precision data for these analyses indicated that the precision did not meet criteria. As a result, all gamma spectroscopy sample results which were previously unqualified were qualified as estimates (J or UJ).

8.8 DATA PACKAGES COMPLETE BUT REQUIRED INFORMATION FROM OTHER SOURCES

In addition to validating gamma spectroscopy results for the five packages discussed above, data for gamma spectroscopy results in each of the six Groundwater Round 3 radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 8-2. Chains of custody for thirteen of the eighteen samples in TMA Case Number N2-09-095-7086 were not contained in the delivered package. These chains of custody were found in a data package completely unrelated to this case. With this exception, all key deliverables were supplied by TMA in each case. Weston packages, when supplemental data from the "Teledyne Supplemental Data to September 1992" was included, contained all information except QA/QC data.

9 3 1 2 9 6 9 2 1 2 4

Table 8-1. 300-FF-5 Operable Unit Remedial Investigation Round 3 Groundwater Gamma Spectroscopy Analysis and Qualifier Summary

Customer I.D. No.	Cobalt 60		Cesium 137		Thorium 228	
	Reported Results	Qualifier	Reported Results	Qualifier	Reported Results	Qualifier
TMA/Norcal case N2-09-019-7079						
* B075Z5	15.000	UJ	14.000	UJ	22.000	UJ
* B07603	14.000	UJ	10.000	UJ	17.000	UJ
* B07607	15.000	UJ	14.000	UJ	20.000	UJ
* B07611	12.000	UJ	7.000	UJ	13.000	UJ
* B07841	14.000	UJ	12.000	UJ	29.000	UJ
* B075X9	16.000	UJ	11.000	UJ	17.000	UJ
* B075Y3	16.000	UJ	10.000	UJ	17.000	UJ
* B075Z1	16.000	UJ	13.000	UJ	19.000	UJ
B075W3	12.000	UJ	12.000	UJ	29.000	UJ
B075W7	18.000	UJ	11.000	UJ	20.000	UJ
B07615	9.000	UJ	10.000	UJ	19.000	UJ
B07619	19.000	UJ	13.000	UJ	19.000	UJ
B07631	16.000	UJ	11.000	UJ	30.000	UJ
B07635	12.000	UJ	9.500	UJ	19.000	UJ
B07639	15.000	UJ	9.400	UJ	17.000	UJ
B07643	9.900	UJ	8.800	UJ	14.000	UJ
B07659	14.000	UJ	15.000	UJ	19.000	UJ
B07679	13.000	UJ	13.000	UJ	22.000	UJ
B07691	18.000	UJ	12.000	UJ	23.000	UJ
B07695	17.000	UJ	14.000	UJ	20.000	UJ
TMA/Norcal case N2-09-095-7086						
* B075Y7	15.000	UJ	15.000	UJ	20.000	UJ
B075T3	11.000	UJ	11.000	UJ	20.000	UJ
B075T7	20.000	UJ	13.000	UJ	20.000	UJ
B075V1	16.000	UJ	12.000	UJ	18.000	UJ
B07623	15.000	UJ	11.000	UJ	20.000	UJ
B07655	12.000	UJ	12.000	UJ	21.000	UJ
B07699	12.000	UJ	8.100	UJ	14.000	UJ
B076B3	12.000	UJ	11.000	UJ	19.000	UJ
B07837	12.000	UJ	15.000	UJ	20.000	UJ
B07845	12.000	UJ	11.000	UJ	15.000	UJ
B07849	9.800	UJ	11.000	UJ	20.000	UJ
TMA/Norcal case N2-09-167-7101						
B075S9	15.000	UJ	9.300	UJ	16.000	UJ
Weston 9209L785-B076B7 & 9209L845-B076C1						
B076B7	< 9.0	UJ	< 8.0	UJ	< 10.0	UJ
B076C1	< 6.0	UJ	< 7.0	UJ	< 10.0	UJ

* - Fully validated sample.

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Table 8-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Gamma Spectroscopy
Data Package Completeness Verification Results

Sheet 2 of 2

Data Package Item	Case Number		
	N2-09-047-7085	9209L785	9209L845
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Spectra, Printouts of Counts per Channel, Notebook Pages)	Yes	N/A	N/A
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Standard Used	N/A	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Effciencies and/or Geometry and Matrix Factors	Yes	Yes	Yes
Raw Data of Background Counts, Dates Counted, and Duration of Counts	Yes	Yes	Yes
Kev/channel	Yes	Yes	Yes
FWHM	Yes	Yes	Yes
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA of Method		X	X
Amounts of Reagents Used in Blank	Yes	N/A	N/A
Raw Data	Yes	No	No
Duplicates			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Amounts of Samples	Yes	No	No
Count Durations	Yes	No	No
Sample Identifications	Yes	No	No
Results of Analyses and Calculated Precision	Yes	No	No
Raw Data	Yes	No	No
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	N/A	N/A	N/A
Weights of Precipitates or Solids Counted	N/A	N/A	N/A
Calculated Recoveries	N/A	N/A	N/A
Laboratry Control Samples			
Detector Identification	Yes	No	No
Date of Analysis	Yes	No	No
Calculation of Recoveries	Yes	No	No
Result of Analyses	Yes	No	No
Does Missing Item(s) Affect Quality	No	Yes	Yes

JOB8\297850\GW38-2.wk1

Table 8-2. 300-FF-5 Operable Unit Remedial Investigation
Round 3 Groundwater Gamma Spectroscopy
Data Package Completeness Verification Results

Sheet 1 of 2

Data Package Item	Case Number		
	N2-09-019-7079	N2-09-095-7086	N2-09-167-7101
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Spectra, Printouts of Counts per Channel, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Standard Used	N/A	N/A	N/A
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Effciencies and/or Geometry and Matrix Factors	Yes	Yes	Yes
Raw Data of Background Counts, Dates Counted, and Duration of Counts	Yes	Yes	Yes
Kev/channel	Yes	Yes	Yes
FWHM	Yes	Yes	Yes
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA of Method			
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Raw Data	Yes	Yes	Yes
Duplicates			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Amounts of Samples	Yes	Yes	Yes
Count Durations	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Results of Analyses and Calculated Precision	Yes	Yes	Yes
Raw Data	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	N/A	N/A	N/A
Weights of Precipitates or Solids Counted	N/A	N/A	N/A
Calculated Recoveries	N/A	N/A	N/A
Laboratry Control Samples			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Calculation of Recoveries	Yes	Yes	Yes
Result of Analyses	Yes	Yes	Yes
Does Missing Item(s) Affect Quality	No	No	No

JOBS\297850\GW38-2.wk1

9.0 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 1990a. EPA Contract Laboratory Program Statement of Work for Organic Analyses, Multi-Media, Multi-Concentration. U.S. Environmental Protection Agency, Washington, D.C.

EPA 1990b. EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-Media, Multi-Concentration. 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.

ROUND3.FR

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APPENDIX A

FIELD PRECISION DOCUMENTATION

This appendix contains a copy of the original field duplicate and field split precision calculations performed during the validation process.

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Calculations

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Job No. 2978-50

Project 300-FF-5 Data Validation

Date ~~Tab~~ 1/25/93

Calculations for Total Metals — Groundwater Round 3

Made by Chris Russell

Field Duplicate

Case:	CRDL	399-4-12 (9/9/92) N2.09.074 B07841 mg/L	N2.09.074 B07603 mg/L	%RPD or ±CRDL	399-1-9 (9/15/92) N2.09.124 B07837	N2.09.124 B07SV1
Aluminum	200	21.4 U	21.4 U	NA		
Antimony	60	16.9 U	16.9 U	NA		
Arsenic	10	3.3 J	4.1 J	±CRDL ✓		
Barium	200	38.4	37.1	±CRDL ✓		
Beryllium	5	0.40 U	0.4 U	NA		
Cadmium	5	1.0 U	1.0 U	NA		
Calcium	5000	39600	42900	8.0% ①		
Chromium	10	4.5 U	4.5 U	NA		
Cobalt	50	2.7 U	2.7 U	NA		
Copper	25	3.5 U	3.5 U	NA		
Iron	100	11.6 U	11.6 UJ	NA		
Lead	3	2.2	5.6	>±CRDL		
Magnesium	5000	7850	8350	±CRDL ✓		
Manganese	15	4.7 U	4.7 U	NA		
Mercury	0.2	0.20 U	0.20 U	NA		
Nickel	40	5.4 U	5.4 U	NA		
Potassium	5000	4450	4590	±CRDL ✓		
Selenium	5	R	R	NA		
Silver	10	2.5 UJ	2.5 UJ	NA		
Sodium	5000	16900	17400	±CRDL ✓		
Thallium	10	3.8 UJ	3.8 UJ	NA		
Vanadium	50	8.0	10.2	±CRDL ✓		
Zinc	20	2.6 J	3.2 J	±CRDL ✓		

These samples were not included in the validated data
CMR

exceeds criteria

NA - not applicable

① $\frac{|39600-42900|}{(39600+42900)/2} * 100 = \frac{3300}{41250} * 100 = 8.0\%$

~~② value is >±CRDL, but sample concentrations are still 45 ug~~

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Calculations

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Job No. 2978-50

Project 300-FF-5 Data Validation

Date 1/25/93

Calculations for Filtered Metals - Groundwater Round 3

Made by Clare Russell

Field Duplicate

	399-4-12 (9/9/92) Case: N2.09.074				399-1-9 (9/15/92) Case: N2.09.124	
	CRDL	B07842 µg/L	B07604 µg/L	% RPD OR ±CRDL	B07838	B075V2
Aluminum	200	21.4 U	21.4 U	NA		
Antimony	60	16.9 U	16.9 U	NA		
Arsenic	10	3.4	3.0	±CRDL ✓		
Barium	200	36.0	34.8	±CRDL ✓		
Beryllium	5	0.40 UJ	0.40 UJ	NA		
Cadmium	5	1.0 U	1.0 U	NA		
Calcium	5000	44900	44500	0.89% ①		
Chromium	10	4.5 U	4.5 U	NA		
Cobalt	50	2.7 U	2.7 U	NA		
Copper	25	3.5 UJ	3.5 UJ	NA		
Iron	100	11.6 U	11.6 U	NA		
Lead	3	2.8	3.7 J	±CRDL ✓		
Magnesium	5000	8680	8610	±CRDL ✓		
Manganese	15	4.7 U	4.7 U	NA		
Mercury	0.2	0.2 U	0.20 U	NA		
Nickel	40	5.4 U	5.4 U	NA		
Potassium	5000	4900	5010	±CRDL ✓		
Selenium	5	2.9 UJ	2.9 UJ	NA		
Silver	10	2.5 UJ	2.5 UJ	NA		
Sodium	5000	18000	18000	0% ②		
Thallium	10	3.8 UJ	3.8 UJ	NA		
Vanadium	50	8.5 U	11.4 U	NA		
Zinc	20	5.0	5.5 U	NA		

These samples were not included in the validated data. CRR

NA - not applicable

① $\frac{44900 - 44500}{44700} * 100 = 0.89\%$

② $\frac{18000 - 18000}{18000} * 100 = 0\%$

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Calculations

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Job No. 2978-50

Project 300-FF-5 DATA VALIDATION

Date 1/25/93

Calculations for Volatiles - Groundwater Round 3

Made by Clare Russell

Field Duplicate

	399-4-12 (9/9/92) A2-09-~~045~~ 030		%RPD	399-1-9 (9/15/92) A2-09-045	
	B07841	B07603		B07837	B075V1
methylene chloride	10 U	10 U	NA		
1,2-dichloroethene	10 U	10 U	NA		
trichloroethene	10 U	7 J (<CRQL)	NA		
tetrachloroethene	10 U	10 U	NA		
chloroform	3 J (<CRQL)	9 J (<CRQL)	± CRQL		

These samples were not included in the validated data.
CRR

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Calculations

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Job No. 2978-50

Project 300-FF-5 DATA VALIDATION

Date 1/25/93

Calculations for General Chemistry - ~~Groundwater~~ Round 3

Made by Clare Russell

Field Duplicate

	DL	399-4-12 (9/9/92) A2-09-030 B07841	B07603	% RPD
ammonia	0.05	0.05 UJ	0.05 UJ	NA
nitrate/nitrite	0.25	3.06 J	2.91 J	5.0% ①

~~399-4-11~~

399-1-9 (9/15/92) A2-09-045

B07837 B07V1

These samples were not included in the validated data.

Clare

NA - not applicable

① $\frac{[3.06-2.91]}{(3.06+2.91)/2} * 100 = \frac{0.15}{2.985} * 100 = 5.0\%$

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9 3 1 2 9 6 9 2 1 3 4

Calculations

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Job No. 2978-50

Project 300-FF-5 Data Validation

Date 1/25/93

Calculations for Total metals - Groundwater Round 3

Made by Clare Russell

Field Splits

Case:	CRDL	399-8-5B 9209L785 B07687 µg/L	N2.09.043 ~~A2.09.019~~ CWK B07663 µg/L	% RPD or ±CRDL	399-4-12 9209L845 B076C1 µg/L	N2.09.074 ~~A2.09.030~~ CWK B07603 µg/L	% RPD or ±CRDL
aluminum	200				49 U	21.4 U	NA
antimony	60				60 U	16.9 U	NA
arsenic	10				—	4.1 J	NA
barium	200				39.6	37.1	±CRDL ✓
beryllium	5				1 U	0.4 U	NA
cadmium	5				7 U	1.0 U	NA
calcium	5000				43600	42900	1.6 % ①
chromium	10				9 U	4.5 U	NA
cobalt	50				9 U	2.7 U	NA
copper	25				8 U	3.5 U	NA
iron	100				15 U	11.6 UJ	NA
lead	3				3 UJ	5.6	±CRDL ✓
magnesium	5000				8300	8350	±CRDL ✓
manganese	15				4 U	4.7 U	NA
mercury	0.2				0.1 U	0.2 U	NA
nickel	40				20 U	5.4 U	NA
potassium	5000				4260	4590	±CRDL ✓
selenium	5				—	R	NA
silver	10				10 U	2.5 UJ	NA
sodium	5000				17500	17400	±CRDL ✓
thallium	10				—	3.8 UJ	NA
vanadium	50				11.4	10.2	±CRDL ✓
zinc	20				9.9	3.2 J	±CRDL ✓

No sample was not included in the validated samples. CWK

NA - not applicable

① $\left|\frac{43600-42900}{(43600+42900)/2}\right| * 100 = \frac{700}{43250} * 100$

$= 1.6\%$

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Calculations

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Job No. 2978-50

Project 300-FF-5 Data Validation

Date 1/25/93

Calculations for Filtered Metals - Groundwater Round 3

Made by Clare Russell

Field Splits

	CRDL	92091845 B076C2 µg/L	~~N2~~ N209074 B07604 µg/L	% RPD or ±CRDL
aluminum	200	49 U	21.4 U	NA
antimony	60	60 U	16.9 U	NA
arsenic	10	—	3.0	NA
barium	200	38.2	34.8	±CRDL ✓
beryllium	5	1 U	0.40 UJ	NA
cadmium	5	7 U	1 U	NA
calcium	5000	43200	44500	3.0% (1)
chromium	10	9 U	4.5 U	NA
cobalt	50	9 U	2.7 U	NA
copper	25	8 U	3.5 UJ	NA
iron	100	15 U	11.6 U	NA
lead	3	2 U	3.7 J	±CRDL ✓
magnesium	5000	8210	8610	±CRDL ✓
manganese	15	4 U	4.7 U	NA
mercury	0.2	0.1 U	0.2 U	NA
nickel	40	20 U	5.4 U	NA
potassium	5000	4630	5010	±CRDL ✓
selenium	5	—	2.9 UJ	NA
silver	10	10 U	2.5 UJ	NA
sodium	5000	17300	18000	±CRDL ✓
thallium	10	—	3.8 UJ	NA
vanadium	50	10.5	11.4 U	±CRDL ✓
zinc	20	9.9	5.5 U	±CRDL ✓

Other set of field splits

B076B8 92091785 and B07664 N209043

399-8-5B

This sample was not included in the validated samples. CRR

NA - not applicable

(1) $\frac{43200 - 44500}{(43200 + 44500)/2} * 100 =$

$\frac{1300}{43850} * 100 = 3.0\ \%$

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Calculations

HARTCROWSER

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Job No. 2978-50

Project 300-FF-5 Data Validation

Date 1/25/93

Calculations for Volatiles - Groundwater Round 3

Made by Clare Russell

Field Splits

	~~9209L845~~ ~~B076C23~~	A2.09.030 B076C43	9209L845 B076C1	% RPD or ± CRQL
methylene chloride		10 U	10 U	NA
1,2-dichloroethene		10 U	10 U	NA
trichloroethene		7 J	6 J	± CRQL (15 %)
tetrachloroethene		10 U	10 U	NA
acetone		10 U	5 J	± CRQL
chloroform		9 J	9 J	± CRQL (0% RPD)

NA - not applicable

~~There were no other samples~~

There was one other set of field split samples:

B07667 9209L785 and B07663 A2.09.019

This sample was not included in the validated samples.

CMR

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Calculation

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Job No. 2978-50

Project 300-FF-5 Data Validation

Date 1/25/93

Calculations for General Chemistry — Groundwater Round 3

Made by Clare Russell

Field Splits

	DL	A2.09.030 B07603	92091845 B07601	% RPD or ± DL
ammonia	0.05	0.05 UJ	0.10 U	NA
nitrate/nitrite	0.25	2.91 J	3.4	15.5 ①

NA - not applicable

① $\left|\frac{(2.91-3.4)}{(2.91+3.4)/2}\right| * 100 = \frac{0.49}{3.155} * 100 = 15.5\%$

There was one other set of field ~~dupl~~ split samples:

B07687 and B07663

92091785 A2.09.019

This sample was not included in the validated samples. CMR

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List attachments.: NA

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Patent - General Counsel	[X]	[]	S.W. Berglin	G. Stone for	3/4/93
Legal - General Counsel	[X]	[]	S.W. Berglin	per General Counsel 2/14/93	
Applied Technology/Export Controlled Information or International Program	[]	[X]			
WHC Program/Project	[]	[X]			
Communications	[]	[X]			
RL Program/Project	[]	[X]			
Publication Services	[X]	[]	L. Hermann	L. Hermann	3/4/93
Other Program/Project	[]	[X]			

Information conforms to all applicable requirements. The above information is certified to be correct.

	Yes	No
References Available to Intended Audience	[X]	[]
Transmit to DOE-HQ/Office of Scientific and Technical Information	[X]	[]

Author/Requestor (Printed/Signature): L.C. Hulstrom L.C. Hulstrom Date: 3/3/93

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Responsible Manager (Printed/Signature): R.A. Carlson R.A. Carlson Date: 3/3/93

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Part 1

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