5-409.17

Department of Energy

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1887

DEC 18 1998

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

DOE-0265-99

Dear Mr. Schneider:

RESPONSE TO THE OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENT ON THE CERTIFICATION REPORT FOR AREA 1, PHASE I SEDIMENT TRAPS 2 AND 3

The purpose of this letter is to submit, for your review and approval, a draft response to the Ohio Environmental Protection Agency (OEPA) comment on the Certification Report for the Area 1, Phase I (A1PI) Sediment Traps 2 and 3. The comment dealt with the "Unacceptably high percentage of data with a 'J' qualifier." Upon further evaluation of the data by the Data Validation Group, it was found that the Counting Uncertainty (CU) rather than the Total Propagated Uncertainty (TPU) was used in calculating the Relative Error Ratio (RER) for the gamma spectrometry data. This error resulted in the larger number of reported "J" values in the summary results.

If you or your staff should have any questions, please contact Robert Janke at (513) 648-3124.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:R.J. Janke

Enclosure

Recycled and Recyclable

cc w/enclosure:
G. Jablonowski, USEPA-V, SRF-5J
J. Saric, USEPA-V, SRF-5J
R. Beaumier, TPSS/DERR, OEPA-Columbus
T. Schneider, OEPA-Dayton (total of 3 enclosues)
F. Bell, ATSDR
M. Schupe, HSI GeoTrans
R. Vandegrift, ODH
F. Barker, Tetra Tech
AR Coordinator, FDF/78

cc w/o enclosure:
N. Hallein, EM-42/CLOV
A. Tanner, OH/FEMP
D. Carr, FDF/52-2
J. Chiou, FDF/52-0
T. Hagen, FDF/65-2
J. Harmon, FDF/90
R. Heck, FDF/2
S. Hinnefeld, FDF/90
EDC, FDF/52-7

Commenting Organization: OEPA Commentor: OFFO
Section #: Appendix A Pg #: Line #: Code: C
Comment: The data have an unacceptably high percentage of data with a "J" qualifier. For some CUs all data for a given parameter are "J" qualified. This is particularly concerning for contaminants such as Ra-226, where the "J" value is very near the FRL and a small error may result in a an incorrect decision regarding the CU certification status. DOE should consider reanalysis of the data to reduce the number of "J" qualified data. An additional effort could include a discussion of the bias represented by the "J" qualifier. Specifically if the "J" results from negative uncertainty (i.e., the value is likely to be lower) then the concern over the CUs is substantially less. The certification report should be revised to incorporate a discussion of the "J" qualifiers and their potential impact on certification.

Response:

The following table summarizes the data validation qualifiers for the radiological data set submitted in Revision A November, 1998 Certification Report.

Parameter	Number "J"	Total Samples	Percentage "J"
Radium-226	31	78	39.7 %
Radium-228	27	78	34.6 %
Thorium-228	27	78	34.6 %
Thorium-232	27	78	34.6 %
Total Uranium	24	78	30.7 %
Total	136	390	34.9 %

Further review of the reasons for the qualification showed that for radium-226, radium-228, thorium-228, and thorium-232 the primary reason for the "J" qualification was due to duplicate precision from the internal laboratory duplicate and the field duplicate. The data validation criterion is based on the calculation of the relative error ratio (RER) which is calculated by dividing the absolute value of the difference between duplicates by the square root of the sum of the squared total propagated uncertainties (TPU). The RER is a statistical-based criterion; it is equivalent to the statistical comparison of two means. If the RER is greater than 2, all of the data in the batch associated with that duplicate are qualified as estimated (J). This acceptance criterion is defined in the SCQ.

Upon further review of the data in question by data validation, it was found that counting uncertainty (CU) rather than the TPU in calculating the RER for gamma spectrometry data. Because the CU is smaller than the TPU, the RER calculated in this way will be erroneously high, so consequently some duplicates that actually meet the RER criterion appeared to fail.

A related issue is that field duplicates have been evaluated using the same RER criterion. When a field duplicate failed the criterion, the entire batch was J-qualified. This conflicts with the Data Validation Plan included in Appendix D of the SCQ. Appendix D, Section 12.12.2 D states that "If the RER is greater than 2.0, the results of the field duplicate and its associated sample ONLY are to be qualified as estimated (J)." Other samples in the batch should not be qualified on the basis of the field duplicate RER.

Since the data was qualified incorrectly, the data set has been revised to reflect the correct application of the data validation criteria.

For total uranium the data was qualified because the elevated TPUs. If the TPU is greater than 50% of the sample activity the result is qualified as "J". Since the TPU values do not differ significantly from counting uncertainty values, when the sample concentration is low the TPUs are high relative to the sample result. Since the reported total uranium results are far below the FRL no further action is necessary.

Similarly, while some of the metals data was qualified, none of the results approach the FRL. Therefore, further reanalysis is not required.

Enclosed is the revised Appendix A with the new qualifiers. The following table summarizes the data validation qualfiers for the revised data set.

Parameter	Number "J"	Total Samples	Percentage "J"
Radium-226	6	78	7.7 %
Radium-228	3	78	3.8 %
Thorium-228	3	78	3.8 %
Thorium-232	3	78	3.8 %
Total Uranium	24	78	30.7 %
Total	39	390	10 %

Action: The above discussion will be included in the Draft Final Certification Report, including the revised Appendix A statistical tables.

PRELIMINARY

CU: A1P1-ST2-BB

Station Number	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Arsenic	Beryllium
A1P1-ST2-BB-01	1.36 -	1.35 -	1.33 -	1.35 -	2.84 U	8.00 -	0.98 U
A1P1-ST2-BB-02	1.12 -	1.13 -	1.11 -	1.13 -	5.73 J	5.90 U	0.70 U
A1P1-ST2-BB-02D	1.05 -	1.11 -	1.08 -	1.11 -	7.76 -	4.00 U	0.60 U
A1P1-ST2-BB-03	1.09 J	1.07 -	1.08 -	1.07 -	3.57 J	6.40 -	0.80 U
A1P1-ST2-BB-05	1.26 -	1.20 -	1.18 -	1.20 -	5.45 J	6.80 -	0.83 U
A1P1-ST2-BB-06	1.13 -	1.15 -	1.15 -	1.15 -	2.78 U	2.90 U	0.55 U
A1P1-ST2-BB-07	1.11 -	1.20 -	1.21 -	1.20 -	5.62 J	5.60 U	0.71 U
A1P1-ST2-BB-09	0.99 -	1.00 -	0.96 -	1.00 -	4.02 J	3.50 U	0.61 U
A1P1-ST2-BB-10	1.07 -	0.85 -	0.84 -	0.85 -	2.87 U	4.50 U	0.65 U
A1P1-ST2-BB-11	1.06 -	1.09 -	1.03 -	1.09 -	2.81 U	7.80 -	1.00 U
A1P1-ST2-BB-13	0.99 -	0.99 -	0.96 -	0.99 -	2.92 U	6.10 -	0.67 U
A1P1-ST2-BB-14	0.94 -	1.06 -	1.03 -	1.06 -	4.65 J	4.30 U	0.75 U
A1P1-ST2-BB-15	0.87 -	1.17 -	1.12 -	1.17 -	4.31 J	4.10 U	0.65 U
FRL	1.70	1.80	1.70	1.50	82.00	12.00	1.50
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	mg/kg	mg/kg
Confidence Level	95%	95%	95%	95%	95%	90%	90%
Max Result	1.36 @	1.35 @	1.33 @	1.35 @	7.76 @	8.00 @	1.0 U @
Standardized Skewness	--	--	--	--	--	--	--
W-Statistic Probability *	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12
Estimated Mean**	1.08	1.10	1.08	1.10	3.80	2.88	0.35
UCL of the Mean	--	--	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--	--	--
2x Rule - Pass / Fail	--	--	--	--	--	--	--
a posteriori Sample Size Calculation	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass

Note: Estimated Mean** = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
Results reported below the MDC were corrected to: "<MDC value> UJ"
The maximum value of the two duplicates was used in all statistical equations.
W-Statistic Probability* = This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.
@ - Maximum result below the FRL, Certification Statistics not calculated - Analyte passes certification.

PRELIMINARY

CU: A1P1-ST2-BM

Station Number	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Arsenic	Beryllium
A1P1-ST2-BM-01	1.40 -	1.20 -	1.20 -	1.20 -	8.20 -	5.30 -	0.44 -
A1P1-ST2-BM-02	1.40 -	1.20 -	1.20 -	1.20 -	8.00 -	4.20 UJ	0.21 J
A1P1-ST2-BM-02D	1.50 J	1.20 J	1.20 J	1.20 J	7.10 J	3.40 UJ	0.43 J
A1P1-ST2-BM-03	1.30 -	1.10 -	1.10 -	1.10 -	4.60 -	4.20 UJ	0.40 -
A1P1-ST2-BM-05	1.40 -	1.20 -	1.20 -	1.20 -	4.60 -	4.60 UJ	0.55 -
A1P1-ST2-BM-06	1.30 -	1.10 -	1.10 -	1.10 -	4.20 -	4.10 UJ	0.49 -
A1P1-ST2-BM-07	1.28 -	1.10 -	1.10 -	1.10 -	4.20 -	2.60 UJ	0.46 -
A1P1-ST2-BM-09	1.30 -	1.10 -	1.10 -	1.10 -	3.70 J	5.50 UJ	0.49 -
A1P1-ST2-BM-10	1.40 -	1.10 -	1.00 -	1.10 -	4.20 -	5.70 J	0.54 -
A1P1-ST2-BM-11	1.30 -	1.10 -	1.10 -	1.10 -	3.70 J	6.00 J	0.52 -
A1P1-ST2-BM-13	1.40 -	1.10 -	1.10 -	1.10 -	4.30 -	4.00 UJ	0.56 -
A1P1-ST2-BM-14	1.20 -	0.98 -	0.97 -	0.98 -	12.00 -	4.80 UJ	0.80 -
A1P1-ST2-BM-15	1.30 -	1.00 -	1.00 -	1.00 -	6.40 -	3.70 UJ	0.38 -
FRL	1.70	1.80	1.70	1.50	82.00	12.00	1.50
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	mg/kg	mg/kg
Confidence Level	95%	95%	95%	95%	95%	90%	90%
Max Result	1.50 @	1.20 @	1.20 @	1.20 @	12.00 @	6.00 @	0.80 @
Standardized Skewness	--	--	--	--	--	--	--
W-Statistic Probability *	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12
Estimated Mean**	1.34	1.10	1.10	1.10	4.45	2.20	0.51
UCL of the Mean	--	--	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--	--	--
2x Rule - Pass / Fail	--	--	--	--	--	--	--
a posteriori Sample Size Calculation	2 Pass	2 Pass	2 Pass	2 Pass	3 Pass	2 Pass	1 Pass

Note: Estimated Mean** = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
Results reported below the MDC were corrected to: "<MDC value> UJ"
The maximum value of the two duplicates was used in all statistical equations.
W-Statistic Probability* = This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.
@ - Maximum result below the FRL, Certification Statistics not calculated - Analyte passes certification.

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PRELIMINARY

CU: A1P1-ST2-SB

Station Number	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Arsenic	Beryllium
A1P1-ST2-SB-01	1.25 -	1.05 -	1.03 -	1.05 -	8.37 -	5.60 UJ	0.39 UJ
A1P1-ST2-SB-01D	1.28 -	1.08 -	1.08 -	1.08 -	6.06 -	5.90 UJ	0.46 UJ
A1P1-ST2-SB-02	1.28 -	1.03 -	1.03 -	1.03 -	4.26 -	6.40 U	0.48 UJ
A1P1-ST2-SB-03	1.32 -	1.17 -	1.13 -	1.17 -	2.89 -	10.30 U	0.45 UJ
A1P1-ST2-SB-05	1.35 -	1.15 -	1.13 -	1.15 -	4.62 -	5.00 U	0.50 UJ
A1P1-ST2-SB-06	1.30 -	1.09 -	1.07 -	1.09 -	4.58 J	7.40 U	0.58 J
A1P1-ST2-SB-07	1.36 -	1.22 -	1.21 -	1.22 -	4.73 -	7.00 U	0.48 J
A1P1-ST2-SB-09	1.43 -	1.12 -	1.12 -	1.12 -	5.80 U	7.90 U	0.69 J
A1P1-ST2-SB-10	1.34 -	1.09 -	1.08 -	1.09 -	3.66 J	6.80 U	0.42 UJ
A1P1-ST2-SB-11	1.35 -	1.14 -	1.13 -	1.14 -	5.37 -	7.00 U	0.44 UJ
A1P1-ST2-SB-13	1.36 -	1.14 -	1.15 -	1.14 -	3.07 -	7.60 U	0.57 J
A1P1-ST2-SB-14	1.38 -	1.15 -	1.15 -	1.15 -	5.14 -	6.40 UJ	0.42 UJ
A1P1-ST2-SB-15	1.34 -	1.16 -	1.15 -	1.16 -	5.47 -	8.40 UJ	0.59 J
FRL	1.70	1.80	1.70	1.50	82.00	12.00	1.50
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	mg/kg	mg/kg
Confidence Level	95%	95%	95%	95%	95%	90%	90%
Max Result	1.43 @	1.22 @	1.21 @	1.22 @	8.37 @	10.3 U @	0.69 @
Standardized Skewness	--	--	--	--	--	--	--
W-Statistic Probability *	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12
Estimated Mean**	1.34	1.13	1.12	1.13	4.60	3.50	0.25
UCL of the Mean	--	--	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--	--	--
2x Rule - Pass / Fail	--	--	--	--	--	--	--
a posteriori Sample Size Calculation	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass

Note: Estimated Mean** = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
Results reported below the MDC were corrected to: "<MDC value> UJ"
The maximum value of the two duplicates was used in all statistical equations.
W-Statistic Probability* = This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.
@ - Maximum result below the FRL, Certification Statistics not calculated - Analyte passes certification.

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PRELIMINARY

CU: A1P1-ST3-BB

Station Number	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Arsenic	Beryllium
A1P1-ST3-BB-01	1.11 -	1.26 -	1.27 -	1.26 -	9.80 U	9.60 J	0.89 J
A1P1-ST3-BB-02	1.41 -	1.14 -	1.17 -	1.14 -	1.92 U	8.80 J	0.70 J
A1P1-ST3-BB-02D	1.50 -	1.16 -	1.17 -	1.16 -	3.52 U	9.60 J	0.74 J
A1P1-ST3-BB-03	1.40 -	1.31 -	1.29 -	1.31 -	1.92 U	12.80 J	0.75 J
A1P1-ST3-BB-05	1.25 -	1.27 -	1.26 -	1.27 -	6.27 -	6.10 UJ	0.46 UJ
A1P1-ST3-BB-06	1.25 -	1.19 -	1.16 -	1.19 -	2.01 U	6.90 UJ	0.61 J
A1P1-ST3-BB-07	1.02 J	0.94 -	0.93 -	0.94 -	16.28 -	4.50 UJ	0.48 UJ
A1P1-ST3-BB-09	0.93 J	1.16 -	1.14 -	1.16 -	8.80 U	7.20 J	0.48 UJ
A1P1-ST3-BB-10	0.99 J	1.18 -	1.12 -	1.18 -	3.73 J	7.50 J	0.80 J
A1P1-ST3-BB-11	1.10 -	1.15 -	1.06 -	1.15 -	12.71 J	6.30 UJ	0.72 J
A1P1-ST3-BB-13	1.22 -	1.29 -	1.26 -	1.29 -	2.02 U	9.60 J	0.70 J
A1P1-ST3-BB-14	1.26 -	1.36 -	1.32 -	1.36 -	1.94 U	6.20 UJ	0.67 J
A1P1-ST3-BB-15	1.13 J	1.24 -	1.25 -	1.24 -	7.80 U	7.70 J	0.96 J
FRL	1.70	1.80	1.70	1.50	82.00	12.00	1.50
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	mg/kg	mg/kg
Confidence Level	95%	95%	95%	95%	95%	90%	90%
Max Result	1.50 @	1.36 @	1.32 @	1.36 @	16.28 @	12.80	0.96 @
Standardized Skewness	--	--	--	--	--	0.31	--
W-Statistic Probability *	--	--	--	--	--	0.119	--
Test Procedure	--	--	--	--	--	Wilcoxon SR	--
Sample Size	12	12	12	12	12	12	12
Estimated Mean**	1.18	1.21	1.18	1.21	3.82	7.35	0.71
UCL of the Mean	--	--	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--	0.003	--
Est. Mean - Pass / Fail	--	--	--	--	--	Pass	--
2x Rule - Pass / Fail	--	--	--	--	--	Pass	--
a posteriori Sample	3	2	2	3	3	4	2
Size Calculation	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Note: Estimated Mean** = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
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The maximum value of the two duplicates was used in all statistical equations.
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PRELIMINARY

CU: A1P1-ST3-BM

Station Number	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Arsenic	Beryllium
A1P1-ST3-BM-01	1.20 -	1.20 -	1.10 -	1.20 -	11.00 -	8.70 J	0.59 -
A1P1-ST3-BM-02	1.50 -	1.20 -	1.20 -	1.20 -	6.80 J	8.80 J	0.69 -
A1P1-ST3-BM-02D	1.50 -	1.10 -	1.10 -	1.10 -	4.70 -	9.00 J	0.71 -
A1P1-ST3-BM-03	1.40 -	1.20 -	1.10 -	1.20 -	3.10 J	10.60 J	0.62 -
A1P1-ST3-BM-05	1.40 -	1.10 -	1.10 -	1.10 -	5.60 -	9.60 J	0.54 -
A1P1-ST3-BM-06	1.30 -	1.00 -	1.00 -	1.00 -	7.90 -	5.10 J	0.67 -
A1P1-ST3-BM-07	1.40 -	1.20 -	1.20 -	1.20 -	3.30 -	10.00 J	0.57 -
A1P1-ST3-BM-09	1.40 -	1.10 -	1.10 -	1.10 -	6.30 -	7.50 J	0.45 -
A1P1-ST3-BM-10	1.50 -	1.20 -	1.10 -	1.20 -	5.00 -	10.30 J	0.64 -
A1P1-ST3-BM-11	1.40 -	1.10 -	1.10 -	1.10 -	5.00 -	10.00 J	0.51 -
A1P1-ST3-BM-13	1.30 -	1.10 -	1.10 -	1.10 -	6.30 -	8.10 J	0.50 -
A1P1-ST3-BM-14	1.30 -	1.10 -	1.10 -	1.10 -	7.00 -	7.60 J	0.40 -
A1P1-ST3-BM-15	1.30 -	1.10 -	1.10 -	1.10 -	5.00 -	8.10 J	0.50 -
FRL	1.70	1.80	1.70	1.50	82.00	12.00	1.50
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	mg/kg	mg/kg
Confidence Level	95%	95%	95%	95%	95%	90%	90%
Max Result	1.50 @	1.20 @	1.20 @	1.20 @	11.00 @	10.60 @	0.71 @
Standardized Skewness	--	--	--	--	--	--	--
W-Statistic Probability *	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12
Estimated Mean**	1.37	1.10	1.10	1.10	6.06	8.72	0.56
UCL of the Mean	--	--	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--	--	--
2x Rule - Pass / Fail	--	--	--	--	--	--	--
a posteriori Sample Size Calculation	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	1 Pass

Note: Estimated Mean** = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
Results reported below the MDC were corrected to: "<MDC value> UJ"
The maximum value of the two duplicates was used in all statistical equations.
W-Statistic Probability* = This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.
@ - Maximum result below the FRL, Certification Statistics not calculated - Analyte passes certification.

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PRELIMINARY

CU: A1P1-ST3-SB

Station Number	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Arsenic	Beryllium
A1P1-ST3-SB-01	1.33 -	1.08 J	1.05 J	1.08 J	5.56 J	6.80 J	0.63 J
A1P1-ST3-SB-01D	1.35 -	1.25 J	1.30 J	1.25 J	7.76 -	5.90 J	0.72 J
A1P1-ST3-SB-02	1.02 -	1.10 -	1.11 -	1.10 -	5.41 J	3.70 UJ	0.46 J
A1P1-ST3-SB-03	1.00 -	1.13 -	1.10 -	1.13 -	4.14 J	3.50 UJ	0.66 J
A1P1-ST3-SB-05	1.13 -	1.02 -	1.01 -	1.02 -	4.41 J	7.10 J	0.75 J
A1P1-ST3-SB-06	1.32 -	1.21 -	1.21 -	1.21 -	6.50 J	4.40 J	0.32 J
A1P1-ST3-SB-07	1.21 -	1.06 -	1.06 -	1.06 -	3.09 J	6.00 J	0.57 J
A1P1-ST3-SB-09	1.08 -	1.19 -	1.16 -	1.19 -	6.19 -	4.00 J	0.36 J
A1P1-ST3-SB-10	1.23 -	1.17 -	1.15 -	1.17 -	8.26 -	5.00 J	0.44 J
A1P1-ST3-SB-11	1.05 -	1.17 -	1.16 -	1.17 -	5.89 J	5.60 J	0.52 J
A1P1-ST3-SB-13	1.06 -	1.15 -	1.12 -	1.15 -	6.62 J	4.90 J	0.49 J
A1P1-ST3-SB-14	1.10 -	1.22 -	1.22 -	1.22 -	5.79 J	5.10 J	0.51 J
A1P1-ST3-SB-15	1.17 -	1.19 -	1.17 -	1.19 -	7.89 -	4.40 J	0.41 J
FRL	1.70	1.80	1.70	1.50	82.00	12.00	1.50
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	mg/kg	mg/kg
Confidence Level	95%	95%	95%	95%	95%	90%	90%
Max Result	1.35 @	1.25 @	1.30 @	1.25 @	8.26 @	7.10 @	0.75 @
Standardized Skewness	--	--	--	--	--	--	--
W-Statistic Probability *	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12
Estimated Mean**	1.14	1.15	1.15	1.15	5.99	4.74	0.52
UCL of the Mean	--	--	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--	--	--
2x Rule - Pass / Fail	--	--	--	--	--	--	--
a posteriori Sample Size Calculation	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass	2 Pass

Note: Estimated Mean** = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
Results reported below the MDC were corrected to: "<MDC value> UJ"
The maximum value of the two duplicates was used in all statistical equations.
W-Statistic Probability* = This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.
@ - Maximum result below the FRL, Certification Statistics not calculated - Analyte passes certification.

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