

Appendix D

Summary of Quality Assurance Crosscheck Analyses



Keeping Up With Regulatory Changes

Table D - 1

**Comparison of Radiological Results with Known Results of Crosscheck Samples
from the DOE Environmental Measurements Laboratory (EML)
Quality Assessment Program (QAP) 42**

Isotope	Matrix	Actual	Reported	Ratio	Accept ?	Analyzed by
Co-60	Air	3.76E+00	2.86E+00	0.76	Pass	EPI
Sr-90	Air	7.39E-01	6.40E-01	0.87	Yes	EPI
Sb-125	Air	9.42E+00	6.36E+00	0.68	Pass	EPI
Cs-137	Air	5.28E+00	4.22E+00	0.80	Pass	EPI
Cs-134	Air	5.75E+00	4.65E+00	0.81	Yes	EPI
Pu-238	Air	1.22E-01	1.40E-01	1.15	Pass	EPI
Pu-239	Air	6.20E-02	7.00E-02	1.12	Yes	EPI
Am-241	Air	1.77E-01	4.40E-01	2.49	No	EPI
U-234	Air	5.90E-02	1.30E-01	2.20	No	EPI
U-238	Air	2.00E-03	6.00E-03	3.00	No	EPI
U (µg)	Air	5.38E-01	8.00E-01	1.49	Pass	EPI
Gross Alpha	Air	3.22E+00	3.10E+00	0.96	Yes	EL
Gross Beta	Air	1.85E+00	2.20E+00	1.19	Yes	EL
K-40	Soil	3.84E+02	4.75E+02	1.24	Yes	EPI
Sr-90	Soil	1.13E+01	1.81E+01	1.60	Pass	EPI
Cs-137	Soil	2.66E+02	2.93E+02	1.10	Yes	EPI
Pu-238	Soil	3.20E+01	3.26E+01	1.02	Yes	EPI
Pu-239	Soil	6.76E+00	7.18E+00	1.06	Yes	EPI
Am-241	Soil	3.20E+00	4.06E+00	1.27	Yes	EPI
U-234	Soil	3.03E+01	2.75E+01	0.91	Yes	EPI
U-238	Soil	3.16E+01	2.66E+01	0.84	Yes	EPI
U (µg)	Soil	2.50E+00	2.29E+00	0.92	Yes	EPI
K-40	Veg	1.03E+03	1.32E+03	1.28	Pass	EPI
Co-60	Veg	9.60E+00	1.03E+01	1.07	Yes	EPI
Sr-90	Veg	5.12E+02	4.74E+02	0.93	Yes	EPI
Cs-137	Veg	1.17E+02	1.38E+02	1.18	Yes	EPI
H-3	Water	6.03E+01	4.40E+01	0.73	Pass	EPI
Co-60	Water	1.96E+02	2.03E+02	1.04	Yes	EPI
Sr-90	Water	2.40E+00	2.03E+00	0.85	Yes	EPI
Cs-134	Water	8.35E+01	8.73E+01	1.05	Yes	EPI
Cs-137	Water	7.68E+01	8.71E+01	1.13	Yes	EPI
Mn-54	Water	4.35E+01	4.82E+01	1.11	Yes	EPI
Pu-239	Water	5.91E-01	7.60E-01	1.29	Pass	EPI
Am-241	Water	1.33E+00	8.00E-01	0.60	Pass	EPI
U-234	Water	3.73E-01	3.00E-01	0.80	Pass	EPI
U (µg)	Water	3.00E-03	5.00E-03	1.73	No	EPI
Gross Alpha	Water	1.34E+03	1.75E+03	1.31	Pass	EPI
Gross Beta	Water	6.53E+02	8.98E+02	1.38	Pass	EPI
H-3	Water	6.03E+01	5.20E+01	0.86	Yes	EL
Co-60	Water	1.96E+02	2.10E+02	1.07	Yes	EL
Sr-90	Water	2.40E+00	3.10E+00	1.29	Pass	EL
Cs-137	Water	7.68E+01	8.30E+01	1.08	Yes	EL
Mn-54	Water	4.35E+01	4.80E+01	1.10	Yes	EL
Gross Alpha	Water	1.34E+03	1.50E+03	1.12	Yes	EL
Gross Beta	Water	6.53E+02	9.50E+02	1.45	Pass	EL

Units for air filters: Bq/filter; soil and vegetation: Bq/kg; water: Bq/L. Values for elemental uranium (listed in the table) reported in µg/filter, µg/g, or µg/mL. Samples analyzed by the WVDP Environmental Laboratory (EL) or Environmental Physics, Inc. (EPI).

Acceptance is based on reported-to-actual ratio, assigned statistically on a case-by-case basis. Yes indicates a ratio within warning limits; Pass indicates a ratio within control limits but outside warning limits; No indicates a ratio outside control limits.

Table D - 2

*Comparison of Radiological Results with Known Results of Crosscheck Samples
from the DOE Environmental Measurements Laboratory (EML)
Quality Assessment Program (QAP) 43*

Isotope	Matrix	Actual	Reported	Ratio	Accept ?	Analyzed by
Co-60	Air	3.26E+01	2.79E+01	0.86	Yes	EPI
Sr-90	Air	1.06E+00	1.50E+00	1.42	Yes	EPI
Sb-125	Air	1.14E+01	9.99E+00	0.88	Yes	EPI
Cs-137	Air	7.25E+00	6.43E+00	0.89	Yes	EPI
Cs-134	Air	1.79E+01	1.69E+01	0.94	Yes	EPI
Ru-106	Air	1.70E+01	1.31E+01	0.77	Yes	EPI
Pu-238	Air	9.60E-02	7.10E-02	0.74	Yes	EPI
Pu-239	Air	9.30E-02	8.10E-02	0.87	Yes	EPI
Am-241	Air	1.89E-01	1.81E-01	0.96	Yes	EPI
U-234	Air	5.20E-02	6.50E-02	1.26	Yes	EPI
U-238	Air	5.30E-02	5.00E-02	0.94	Yes	EPI
U	Air	1.07E-01	1.18E-01	1.10	Yes	EPI
Gross Alpha	Air	3.30E+00	3.20E+00	0.97	Yes	EL
Gross Beta	Air	1.12E+00	1.60E+00	1.43	Pass	EL
K-40	Soil	3.77E+02	4.17E+02	1.11	Yes	EPI
Sr-90	Soil	7.81E+00	2.22E+01	2.84	No	EPI
Cs-137	Soil	2.07E+02	2.29E+02	1.11	Yes	EPI
Pu-238	Soil	1.75E+01	1.59E+01	0.91	Yes	EPI
Pu-239	Soil	5.17E+00	4.59E+00	0.89	Yes	EPI
Am-241	Soil	1.76E+00	1.37E+00	0.78	Yes	EPI
U-234	Soil	2.95E+01	3.08E+01	1.04	Yes	EPI
U-238	Soil	3.04E+01	3.02E+01	0.99	Yes	EPI
U	Soil	5.82E+01	6.24E+01	1.07	Pass	EPI
K-40	Veg	3.52E+02	4.06E+02	1.15	Yes	EPI
Co-60	Veg	9.17E+00	7.45E+00	0.81	Pass	EPI
Sr-90	Veg	5.87E+02	7.50E+02	1.28	Pass	EPI
Cs-137	Veg	9.72E+01	1.13E+02	1.16	Yes	EPI
Pu-239	Veg	9.80E-01	1.02E+00	1.04	Yes	EPI
Am-241	Veg	5.34E-01	7.70E-01	1.44	Yes	EPI
H-3	Water	1.68E+02	1.70E+02	1.01	Yes	EPI
Co-60	Water	1.96E+02	2.04E+02	1.04	Yes	EPI
Sr-90	Water	2.00E+00	2.82E+00	1.41	Pass	EPI
Cs-137	Water	7.52E+01	8.17E+01	1.09	Yes	EPI
Mn-54	Water	4.49E+01	4.83E+01	1.08	Yes	EPI
Pu-238	Water	1.41E+00	1.30E+00	0.92	Yes	EPI
Pu-239	Water	2.72E-01	2.58E-01	0.95	Yes	EPI
Am-241	Water	1.95E+00	1.79E+00	0.92	Yes	EPI
U-234	Water	3.06E-01	3.45E-01	1.13	Yes	EPI
U-238	Water	3.11E-01	3.39E-01	1.09	Yes	EPI
U	Water	6.24E-01	6.98E-01	1.12	Yes	EPI
Gross Alpha	Water	1.31E+03	1.21E+03	0.92	Yes	EPI
Gross Beta	Water	4.10E+02	4.26E+02	1.04	Yes	EPI
H-3	Water	1.68E+02	1.50E+02	0.89	Yes	EL
Co-60	Water	1.96E+02	2.10E+02	1.07	Yes	EL
Sr-90	Water	2.00E+00	2.60E+00	1.30	Pass	EL
Cs-137	Water	7.52E+01	7.90E+01	1.05	Yes	EL
Mn-54	Water	4.49E+01	5.00E+01	1.11	Yes	EL
Gross Alpha	Water	1.31E+03	1.30E+03	0.99	Yes	EL
Gross Beta	Water	4.10E+02	5.50E+02	1.34	Yes	EL

Units for air filters: Bq/filter; soil and vegetation: Bq/kg; water: Bq/L. Samples analyzed by the WVDP Environmental Laboratory (EL) or Environmental Physics, Inc. (EPI).

Acceptance is based on reported-to-actual ratio, assigned statistically on a case-by-case basis. Yes indicates a ratio within warning limits; Pass indicates a ratio within control limits but outside warning limits; No indicates a ratio outside control limits.

Table D - 3

**Comparison of Radiological Results with Known Results of Crosscheck Samples
from the EPA National Exposure Research Laboratory,
Characterization Research Division (NERL-CRD)**

Sample	Analyte	Matrix	Actual	Reported	Accept ?	Analyzed by
PUW (March 1995)	Pu-239	Water	11.1	10.3	Yes	EPI
ABW (January 1995)	Alpha	Water	5.0	5.67	Yes	EL
	Beta	Water	5.0	10.33	Yes	EL
ABW (July 1995)	Alpha	Water	27.5	12.33	No	EL
	Beta	Water	19.4	22.67	Yes	EL
ABW (October 1995)	Alpha	Water	51.2	41.80	Yes	EL
	Beta	Water	24.8	28.67	Yes	EL
TRW (March 1995)	H-3	Water	7435.0	7522.33	Yes	EL
TRW (August 1995)	H-3	Water	4872.0	4846.67	Yes	EL
AF (August 1995)	Alpha	Filter	25.0	25.37	Yes	EPI
	Beta	Filter	86.6	72.67	Pass	EPI
	Sr-90	Filter	30.0	32.00	Yes	EPI
	Cs-137	Filter	25.0	27.33	Yes	EPI
PE-A (April 1995)	Alpha	Water	47.5	39.40	Yes	EL
	Ra-226	Water	14.9	12.90	Yes	EPI
	Ra-228	Water	15.8	19.50	Yes	EPI
	U (Nat)	Water	10.0	11.00	Yes	EPI
PE-B (April 1995)	Beta	Water	86.6	90.17	Yes	EL
	Sr-89	Water	20.0	21.00	Yes	EPI
	Sr-90	Water	15.0	21.33	Pass	EPI
	Co-60	Water	29.0	32.33	Yes	EL
	Cs-134	Water	20.0	18.33	Yes	EL
	Cs-137	Water	11.0	14.00	Yes	EL

Units are as follows: water: pCi/L; air filter: pCi/filter; milk: pCi/L; total K: mg/L.

Samples were analyzed by the WVDP Environmental Laboratory (EL) or Environmental Physics, Inc. (EPI), as indicated.

Explanation of code(s): PE-A = performance evaluation (alpha); PE-B = performance evaluation (beta); GAM = gamma in water; TRW = tritium in water; AF = air filter; PUW = plutonium in water; Milk = milk sample; ABW = alpha and beta in water.

Acceptance limits are statistically defined by NERL-CRD for individual analytes and matrices. Yes indicates a ratio within warning limits; Pass indicates a ratio within control limits but outside warning limits; No indicates a ratio outside control limits.

Table D - 3 (concluded)

*Comparison of Radiological Results with Known Results of Crosscheck Samples
from the EPA National Exposure Research Laboratory,
Characterization Research Division (NERL-CRD)*

Sample	Analyte	Matrix	Actual	Reported	Accept ?	Analyzed by
PE-A (October 1995)	Alpha	Water	99.4	91.40	Yes	EL
	Ra-226	Water	24.8	24.03	Yes	EPI
	Ra-228	Water	20.7	22.03	Yes	EPI
	U (Nat)	Water	27.0	27.50	Yes	EPI
PE-B (October 1995)	Beta	Water	123.5	129.03	Yes	EL
	Sr-89	Water	20.0	26.00	Pass	EPI
	Sr-90	Water	10.0	11.33	Yes	EPI
	Co-60	Water	49.0	53.67	Yes	EL
	Cs-134	Water	40.0	37.00	Yes	EL
	Cs-137	Water	30.0	31.67	Yes	EL
GAM (June 1995)	Co-60	Water	40.0	46.00	Pass	EL
	Zn-65	Water	76.0	82.67	Yes	EL
	Cs-134	Water	50.0	44.00	Pass	EL
	Cs-137	Water	35.0	37.67	Yes	EL
	Ba-133	Water	79.0	71.67	Yes	EL
GAM (November 1995)	Co-60	Water	60.0	63.67	Yes	EL
	Zn-65	Water	125.0	128.67	Yes	EL
	Cs-134	Water	40.0	35.67	Yes	EL
	Cs-137	Water	49.0	52.33	Yes	EL
	Ba-133	Water	99.0	92.33	Yes	EL
Milk (September 1995)	Sr-89	Milk	20.0	18.33	Yes	EPI
	Sr-90	Milk	15.0	14.67	Yes	EPI
	I-131	Milk	99.0	104.00	Yes	EPI
	Cs-137	Milk	50.0	53.00	Yes	EPI
	Total K	Milk	1654.0	NR	NA	EPI

Units are as follows: water: pCi/L; air filter: pCi/filter; milk: pCi/L; total K: mg/L.

Samples were analyzed by the WVDP Environmental Laboratory (EL) or Environmental Physics, Inc. (EPI), as indicated.

Explanation of code(s): PE-A = performance evaluation (alpha); PE-B = performance evaluation (beta); GAM = gamma in water; TRW = tritium in water; AF = air filter; PUW = plutonium in water; Milk = milk sample; ABW = alpha and beta in water. NR = Not reported; NA = Not available.

Acceptance limits are statistically defined by NERL-CRD for individual analytes and matrices. Yes indicates a ratio within warning limits; Pass indicates a ratio within control limits but outside warning limits; No indicates a ratio outside control limits.

Table D - 4

**Comparison of the West Valley Demonstration Project's
Thermoluminescent Dosimeters (TLDs) with the
Co-located Nuclear Regulatory Commission (NRC) TLDs**

NRC TLD#	WVDP TLD#	NRC mR/90days	WVDP mR/Qtr	LITCO mR/Qtr	WVDP/NRC Ratio	LITCO/NRC Ratio	WVDP/LITCO Ratio
<i>1st Quarter 1995</i>							
2	22	15.8	17.7	NA	1.12	NA	NA
3	5	17.1	16.7	NA	0.98	NA	NA
4	7	16.0	15.8	NA	0.99	NA	NA
5	9	16.2	16.1	NA	0.99	NA	NA
7	14	<i>Missing</i>	18.9	NA	NA	NA	NA
8	15	16.6	16.3	NA	0.98	NA	NA
9	25	30.5	26.2	NA	0.86	NA	NA
11	24	901.0	928.6	NA	1.03	NA	NA
<i>2nd Quarter 1995</i>							
2	22	17.7	17.9	19	1.01	1.07	0.94
3	5	16.8	17.2	17	1.02	1.01	1.01
4	7	17.1	16.3	16	0.95	0.94	1.02
5	9	<i>Damaged</i>	17.3	17	NA	NA	1.02
7	14	16.0	17.8	15	1.11	0.94	1.19
8	15	16.7	22.2	17	1.33	1.02	1.31
9	25	31.9	25.2	24	0.79	0.75	1.05
11	24	828.0	795.1	769	0.96	0.93	1.03
<i>3rd Quarter 1995</i>							
2	22	17.7	24.2	23	1.37	1.30	1.05
3	5	19.0	25.4	25	1.34	1.32	1.02
4	7	18.4	20.2	21	1.10	1.14	0.96
5	9	18.0	22.5	21	1.25	1.17	1.07
7	14	19.3	24.1	24	1.25	1.24	1.00
8	15	19.2	23.0	22	1.20	1.15	1.05
9	25	29.4	37.4	34	1.27	1.16	1.10
11	24	767.0	935.3	942	1.22	1.23	0.99
<i>4th Quarter 1995</i>							
2	22	17.7	NA	15	NA	0.85	NA
3	5	16.2	NA	15	NA	0.93	NA
4	7	16.7	NA	15	NA	0.90	NA
5	9	19.5	NA	14	NA	0.72	NA
7	14	<i>Missing</i>	NA	15	NA	NA	NA
8	15	15.5	NA	13	NA	0.84	NA
9	25	29.3	NA	22	NA	0.75	NA
11	24	818.0	NA	757	NA	0.93	NA

Ratios of results are listed for each set of co-located TLDs.

"Missing" or "Damaged" indicates that a TLD was no longer in place or damaged so that no analysis could be performed at the time of collection. NA = not available.

During 1995, processing of TLDs by analytical laboratories was changed: For the first three quarters of 1995 TLDs were processed at the WVDP. In the second quarter two sets of TLDs were deployed; the second set was analyzed by LITCO, Inc. an off-site subcontractor. Both WVDP and LITCO results are presented for the second and third quarters of 1995; LITCO results alone are presented for the fourth quarter.