

October 10, 2012

Mr. Kevin Ramsey
 Senior Project Manager
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 U.S. Nuclear Regulatory Commission
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**SUBJECT: COMPARISON OF RESULTS FOR QUARTER 1 SURFACE WATER
 SPLIT SAMPLES COLLECTED AT THE NUCLEAR FUEL SERVICES
 SITE, ERWIN, TENNESSEE
 DCN: 5198-SR-01-0**

Dear Mr. Ramsey:

Oak Ridge Associated Universities (ORAU), under the Oak Ridge Institute for Science and Education (ORISE) contract, has completed the collection, sample analysis, and review of split surface water sample results collected at the Nuclear Fuel Services site in Erwin, Tennessee.

Please contact me at 865.574.0685, or Erika Bailey at 865.576.6659, if you have any questions.

Sincerely,



David A. King, CHP, PMP
 Sr. Health Physicist/Project Manager
 Independent Environmental Assessment
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DAK:fr

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**COMPARISON OF RESULTS FOR QUARTER 1 SURFACE WATER
SPLIT SAMPLES COLLECTED AT THE NUCLEAR FUEL SERVICES SITE
ERWIN, TENNESSEE**

Oak Ridge Associated Universities (ORAU), under the Oak Ridge Institute for Science and Education (ORISE) contract, collected split surface water samples with Nuclear Fuel Services (NFS) representatives on August 22, 2012. Representatives from the U.S. Nuclear Regulatory Commission and Tennessee Department of Environment and Conservation were also in attendance. Samples were collected at four surface water stations, as required in the approved Request for Technical Assistance number 11-018. These stations included Nolichucky River upstream (NRU), Nolichucky River downstream (NRD), Martin Creek upstream (MCU), and Martin Creek downstream (MCD).

Both ORAU and NFS performed gross alpha and gross beta analyses, and Table 1 presents the comparison of results using the duplicate error ratio (DER), also known as the normalized absolute difference. A $DER \leq 3$ indicates that, at a 99% confidence interval, split sample results do not differ significantly when compared to their respective one standard deviation (sigma) uncertainty (ANSI N42.22). The following equation presents the DER calculation.

$$DER = \frac{|P - S|}{\sqrt{U_P^2 + U_S^2}}$$

Where:

- P = NFS primary sample result
- S = ORAU split sample result
- U_p = NFS primary sample one sigma uncertainty
- U_s = ORAU split sample one sigma uncertainty

The NFS split sample report does not specify the confidence level of reported uncertainties (NFS 2012a, 2012b). Therefore, standard two sigma reporting is assumed and uncertainty values were divided by 1.96.

A comparison of split sample results, using the DER equation, indicates one set with a DER greater than 3. A DER of 3.1 is calculated for gross alpha results from ORAU sample 5198W0003 and NFS sample MCU-310212003. The ORAU result is 0.98 ± 0.30 pCi/L (value ± 2 sigma) compared to the NFS result of -0.08 ± 0.60 pCi/L. Relatively high DER values are not unexpected for low (e.g.,

background) analyte concentrations analyzed by separate laboratories, as is the case here. It is noted, however, NFS uncertainties are at least twice the ORAU uncertainties, which contributes to the elevated DER value. Differences in ORAU and NFS minimum detectable activities are even more pronounced, as presented in Table 1.

In conclusion, comparison of ORAU and NFS split samples produces reasonably consistent results for low (e.g., background) concentrations.

REFERENCES

ANSI N42.22. Traceability of Radioactive Sources to NIST and Associated Instrument Quality Control. American National Standards Institute.

NFS 2012a. File name "CAH-12-096_rev01.pfd" emailed by Galen Smith/NRC to David King/ORAU on September 26, 2012. Nuclear Fuel Services.

NFS 2012b. File name "MCD @ RR Trestle Re-analysis.pfd" emailed by Galen Smith/NRC to David King/ORAU on October 3, 2012. Nuclear Fuel Services.

Table 1. Quarter 1 Results for Split Samples Collected on August 22, 2012												
Quarter	Station	ORAU Sample	NFS Sample	Analyte	ORAU (pCi/L)			NFS (pCi/L)			DER	
					Result	Uncert.	MDC	Result	Uncert.	MDC	Value	≤ 3?
1	NRU	5198W0001	NRU-310212001	Gross Alpha	1.21	0.17	0.27	1.96	0.64	1.43	1.1	YES
				Gross Beta	2.15	0.25	0.71	1.19	0.50	1.52	1.7	YES
1	NRD	5198W0002	NRD-310212002	Gross Alpha	0.65	0.13	0.27	-0.12	0.27	1.54	2.5	YES
				Gross Beta	1.87	0.25	0.71	1.50	0.58	1.76	0.58	YES
1	MCU	5198W0003	MCU-310212003	Gross Alpha	0.98	0.16	0.27	-0.08	0.30	1.51	3.1	NO
				Gross Beta	2.19	0.26	0.71	1.35	0.56	1.73	1.4	YES
1	MCD	5198W0004	MCD-310212004	Gross Alpha	2.43	0.25	0.31	4.18	1.52	4.06	1.1	YES
				Gross Beta	3.35	0.28	0.72	1.42	0.82	2.68	2.2	YES

Uncert. = one sigma uncertainty
MDC = minimum detectable concentration