

August 15, 2013

Mr. Kevin Ramsey  
 Senior Project Manager  
 Fuel Manufacturing Branch  
 U.S. Nuclear Regulatory Commission  
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**SUBJECT: COMPARISON OF RESULTS FOR QUARTER 4 SURFACE WATER  
 SPLIT SAMPLES COLLECTED AT THE NUCLEAR FUEL SERVICES  
 SITE, ERWIN, TENNESSEE  
 DCN: 5198-SR-04-0**

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. Details of these activities are presented in the enclosed report.

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  
 and Verification Program

DAK:fs

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**COMPARISON OF RESULTS FOR QUARTER 4 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 June 12, 2013. Representatives from the U.S. Nuclear Regulatory Commission (NRC) and the 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 at a 99% confidence interval that 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 specifies 95% confidence level of reported uncertainties (NFS 2013). Therefore, standard two sigma reporting values were divided by 1.96.

In conclusion and as shown in Table 1, most DER values were less than 3 and results are consistent with low (e.g., background) concentrations. The gross beta result for sample 5198W0014 was the exception. The ORAU gross beta result of  $6.30 \pm 0.65$  pCi/L from location NRD is well above NFS's non-detected result of  $1.56 \pm 0.59$  pCi/L. NFS's data package includes no detected result for

any radionuclide at location NRD. At NRC's request, ORAU performed gamma spectroscopic analysis of sample 5198W0014 to identify analytes contributing to the relatively elevated gross beta results. This analysis identified detected amounts of naturally-occurring constituents, most notably Ac-228 from the thorium decay series, and does not suggest the presence of site-related contamination. The raw gamma spec data was transmitted to NRC via an August 12, 2013 e-mail, thus is not presented herein.

#### REFERENCES

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

NFS 2013. File name "June 2013 Sampling Event.pdf," e-mailed by Carol Hale/NFS to Jason Lee/ORAU on July 18, 2013. Nuclear Fuel Services.

Table 1. Quarter 4 Results for Split Surface Water Samples Collected on June 12, 2013

Quarter	Station	ORAU Sample	NFS Sample	Analyte	ORAU (pCi/L)			NFS (pCi/L)			DER	
					Result	Uncert.	MDC	Result	Uncert.	MDC	Value	≤ 3?
4	NRU	5198W0013	NRU	Gross alpha	0.19	0.19	0.31	0.226	0.452	1.79	0.1	YES
				Gross beta	2.24	0.52	0.76	1.17	0.74	2.46	1.2	YES
4	NRD	5198W0014	NRD	Gross alpha	0.31	0.22	0.32	1.23	0.55	1.54	1.6	YES
				Gross beta	6.30	0.65	0.76	1.56	0.59	1.78	5.4	NO
4	MCU	5198W0015	MCU	Gross alpha	0.35	0.23	0.32	0.171	0.398	1.66	0.4	YES
				Gross beta	2.06	0.52	0.76	1.74	0.67	2.05	0.4	YES
4	MCD	5198W0016	MCD @ RR Trestle	Gross alpha	1.11	0.36	0.37	2.04	0.65	1.38	1.2	YES
				Gross beta	2.33	0.53	0.77	1.44	0.58	1.75	1.1	YES

Uncert. = one sigma uncertainty; standard two sigma reporting for NFS data, thus the reported uncertainty values were divided by 1.96.  
MDC = minimum detectable concentration