

September 23, 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 5 SURFACE WATER  
 SPLIT SAMPLES COLLECTED AT THE NUCLEAR FUEL SERVICES  
 SITE, ERWIN, TENNESSEE  
 DCN: 5198-SR-05-0**

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 5 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 21, 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, all DER values were less than 3 and results are consistent with low (e.g., background) concentrations. No additional analyses are recommended at this time based on these results.

## REFERENCES

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

NFS 2013. File name "NFS LAB DATA FOR Q5.pdf," e-mailed by Carol Hale/NFS to Jason Lee/ORAU on September 20, 2013. Nuclear Fuel Services.

Table 1. Quarter 5 Results for Split Surface Water Samples Collected on August 21, 2013

Quarter	Station	ORAU Sample	NFS Sample	Analyte	ORAU (pCi/L)			NFS (pCi/L)			DER	
					Result	Uncert.	MDC	Result	Uncert.	MDC	Value	≤ 3?
5	NRU	5198W0017	NRU	Gross alpha	0.22	0.12	0.18	0.049	0.46	1.87	0.4	YES
				Gross beta	1.52	0.20	0.27	1.02	0.46	1.45	1.0	YES
5	NRD	5198W0018	NRD	Gross alpha	0.23	0.12	0.18	0.57	0.51	1.83	0.6	YES
				Gross beta	1.31	0.19	0.27	0.15	0.61	2.21	1.8	YES
5	MCU	5198W0019	MCU	Gross alpha	0.12	0.10	0.17	-0.51	0.37	1.90	1.7	YES
				Gross beta	1.08	0.18	0.27	0.14	0.46	1.65	1.9	YES
5	MCD	5198W0020	MCD @ RR Trestle	Gross alpha	1.22	0.21	0.21	2.46	0.76	1.99	1.6	YES
				Gross beta	1.96	0.21	0.27	2.58	0.69	2.00	0.9	YES

Uncert. = one sigma uncertainty is presented; standard two sigma is reported in NFS data, thus the licensee's uncertainty values were divided by 1.96.

Raw data are reported by analytical laboratories using a range of significant digits with individual values as low as the ten thousandths place (e.g., 0.000X); for ease of reference, all values are presented here using the format X.XX

MDC = minimum detectable concentration