

January 9, 2014

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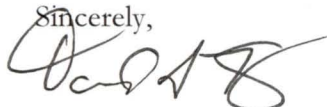
**SUBJECT: COMPARISON OF RESULTS FOR QUARTER 6 SURFACE WATER
SPLIT SAMPLES COLLECTED AT THE NUCLEAR FUEL SERVICES
SITE, ERWIN, TENNESSEE (DOCKET NO. 10-143; RFTA 11-018)
DCN: 5198-SR-06-0**

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 November 20, 2013 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
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DAK:fs

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Technical Review	TJK
Laboratory Review	WJH
Quality Review	EB
Group Manager Review	10/11

**COMPARISON OF RESULTS FOR QUARTER 6 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 November 20, 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 2014). Therefore, standard two sigma reporting 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 3.2 is calculated for gross alpha results from ORAU MCU sample 5198W0023 and NFS laboratory sample MCU-338099003. The ORAU result is 0.26 ± 0.16 pCi/L (value ± 1 sigma uncertainty) compared to the NFS result of -0.88 ± 0.32 pCi/L (value ± 1 sigma uncertainty).

A slightly elevated DER value is 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 approximately 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. These variances are likely due to differences in analytical laboratory methods and environments (e.g., count times, detector backgrounds).

In conclusion, comparison of ORAU and NFS split samples produces reasonably consistent results for low (e.g., background) concentrations, and no anomalous values are noted for this sampling period.

REFERENCES

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

NFS 2014. File name "NFS LAB DATA FOR Q6.pdf," e-mailed by Carol Hale/NFS to Jason Lee/ORAU on January 2, 2014. Nuclear Fuel Services.

Table 1. Quarter 6 Results for Split Surface Water Samples Collected on November 20, 2013

Quarter	Station	ORAU Sample	NFS Sample	Analyte	ORAU (pCi/L)			NFS (pCi/L)			DER	
					Result	Uncert.	MDC	Result	Uncert.	MDC	Value	≤ 3?
6	NRU	5198W0021	NRU	Gross alpha	0.38	0.18	0.25	-0.29	0.36	1.69	1.7	YES
				Gross beta	1.83	0.28	0.37	1.97	0.66	2.03	0.2	YES
6	NRD	5198W0022	NRD	Gross alpha	0.48	0.20	0.25	0.04	0.42	1.90	0.9	YES
				Gross beta	1.89	0.29	0.38	1.87	0.76	2.42	0.0	YES
6	MCU	5198W0023	MCU	Gross alpha	0.26	0.16	0.23	-0.88	0.32	1.88	3.2	NO
				Gross beta	1.72	0.28	0.37	0.87	0.66	2.23	1.2	YES
6	MCD	5198W0024	MCD @ RR Trestle	Gross alpha	1.09	0.30	0.31	1.44	0.65	1.98	0.5	YES
				Gross beta	2.80	0.32	0.38	2.33	0.65	1.94	0.6	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