



NUCLEAR FUEL SERVICES, INC.
a subsidiary of The Babcock & Wilcox Company

■ 1205 banner hill road ■ erwin, tn 37650 ■ phone 423.743.9141
■ www.nuclearfuelservices.com

21G-12-0039
GOV-01-55-04
ACF-12-0066
March 1, 2012

Director, Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

- References:
- 1) Docket No. 70-143; SNM-124
 - 2) Letter from B. Marie Moore to the NRC; submittal of North Site Decommissioning Plan, Revision 03, dated May 2, 2006 (21G-06-0049)
 - 3) Letter from the NRC; Acknowledgement and Acceptance of Revision 3 to North Site Decommissioning Plan, dated May 18, 2006 (TAC L31949)
 - 4) Letter from Mark P. Elliott to the NRC; Final Status Survey Final Report for Survey Units 2, 8, 9, 19, and 20, dated May 24, 2010 (21G-10-0082)
 - 5) Letter from the NRC; Acceptance for Review of Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated July 23, 2010 (TAC L32997)
 - 6) Letter from Mark P. Elliott to the NRC; Amendment 1 to Final Status Survey Final Report for Survey Units 2, 8, 9, 19, and 20, dated August 12, 2010 (21G-10-0159)
 - 7) Letter from the NRC; Request for Additional Information Concerning Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated November 15, 2010 (TAC L32997)
 - 8) Letter from Mark P. Elliott to the NRC; Response to the Request for Additional Information Concerning Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated February 18, 2011 (21G-11-0025)
 - 9) Letter from the NRC; NRC Staff Evaluation of NFS Responses to RAIs Regarding Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated May 5, 2011

Subject: Response to the NRC Staff Evaluation of NFS Responses to RAIs Regarding Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated May 5, 2011

Nuclear Fuel Services, Inc. (NFS) hereby submits the attached responses to the NRC Staff Evaluation of NFS Response to RAIs Regarding Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated May 5, 2011, (Reference 9).

NUSSO1

If you or your staff have any questions, require additional information, or wish to discuss this further, please contact me, or Mr. Scott Morie, Decommissioning Environmental Unit Manager at (423) 735-5616. Please reference our unique document identification number (21G-12-0039) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.



Mark P. Elliott, Director
Quality, Safety, and Safeguards

CSM/pdj

Attachment: Response to the NRC Staff Evaluation of NFS Responses to RAIs
Regarding Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20,
dated May 5, 2011

Copy:

Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Avenue NE,
Suite 1200
Atlanta, GA 30303-1257

Ms. Denise Edwards
Project Inspector
U.S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Avenue NE,
Suite 1200
Atlanta, GA 30303-1257

Mr. Kevin Ramsey
Project Manager
Fuel Manufacturing Branch
Fuel Facility Licensing Directorate
Division of Fuel Cycle Safety and
Safeguards
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Galen Smith
Senior Resident Inspector
U.S. Nuclear Regulatory Commission

Attachment

Response to the NRC Staff Evaluation of
NFS Responses to RAIs Regarding
Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20,
dated May 5, 2011

6 pages to follow

**Response to the NRC Staff Evaluation of NFS Responses to RAIs Regarding
Final Status Survey Report for Survey Units 2, 8, 9, 19, and 20, dated May 5, 2011**

RAI #1: The Technical Methodology Employed for Treatment of Hard-to-Detect Radionuclides

NFS RESPONSE:

NFS' proposal in response to the NRC's RAI was designed to address the NRC's concern about the long standing process that NFS has used in its approved Decommissioning Plan (DP) to account for the dose contribution from hard-to-detect radionuclides. Historically, NFS has collected representative samples from survey units (SU) undergoing Final Status Survey (FSS). Each sample was analyzed for the easy to detect nuclides. Approximately ten percent of those same samples were analyzed for both the easy to detect and the hard-to-detect suite of radionuclides, a full suite of analytes representing each of the radionuclides for which a DCGL was derived. From these analyses, a surrogate ratio was calculated establishing the means of inferring the concentration of each hard-to-detect radionuclide from its associated surrogate radionuclide concentration. In this way, the hard-to-detect radionuclides were inferred directly from the FSS sample data. The issue raised by the NRC was the lack of sufficient statistical correlation between the readily detected and hard-to-detect radionuclides.

NFS acknowledges the lack of strong statistical correlation between the surrogate and inferred radionuclides. It is noteworthy, however, to consider that the reason for the lack of correlation is that the so-called hard-to-detect radionuclides are present in such low concentrations (relative to their respective DCGLs) that they are frequently reported with activities well below the detection limit for the analytical method.

The method that was proposed to address the NRC's concern was designed to preserve the basic methodology and concept that is approved in the DP while eliminating the reliance on a correlation ratio to infer the concentrations of hard-to-detect radionuclides. We note in the NRC's evaluation of NFS' response to this RAI and the proposed new method to account for the hard-to-detect radionuclides that the NRC continues to have concerns with the proposed methodology. It appears to NFS that the NRC's concerns relate primarily to two factors:

- 1) lack of conformance with NRC guidance on methodology and basis for discounting the need to measure hard-to-detect radionuclides (NUREG-1757, Vol. 2, Rev. 1, Section 3.3),
- 2) the fact that the historical method used by NFS has relied upon a relatively small subset of samples collected explicitly from the SU under investigation during the FSS rather than from the NFS North Site as a whole.

In light of the NRC's ongoing concerns, NFS has reconsidered the method we proposed earlier in our initial response to RAIs. NFS is now proposing to revise its FSS methodology to follow explicitly the guidance on conditions under which radionuclides may be considered insignificant and thereafter be eliminated from further consideration (NUREG-1757, Vol. 2, Rev. 1, Section 3.3). The NUREG guidance indicates the basis for determining that a radionuclide (or suite of radionuclides) is an insignificant contributor. It states: "NRC staff considers radionuclides ... that contribute no greater than 10% of the dose criteria to be insignificant contributors." NFS understands this guidance applies in aggregate to the suite of radionuclides that are considered to be insignificant dose contributors. It is also intended as an *a priori* assessment and decision process; that is, the technique is applied in advance of the performance of the FSS such that the insignificant radionuclides may be eliminated from further detailed evaluations.

NFS recognizes that the threshold for determination that a radionuclide (or suite of radionuclides) is an insignificant contributor is 10%. Furthermore, NFS hereby commits that those radionuclides that it identifies as insignificant contributors produce on average and in aggregate less than 10% of the applicable 25 mrem/y dose limit applicable to the SUs undergoing decommissioning on the NFS North Site.

To determine the *a priori* potential for identified radionuclides of concern to produce dose at the NFS North Site, NFS filtered the existing characterization data set to obtain the subset of samples from across the entire NFS North Site for which an analysis of each of the 13 radionuclides of concern was performed (all samples on which a full analytical suite of analyses was performed). This approach is a departure from the method we previously used in which the surrogate ratios (or DCGL de-rating factor) was determined from data derived from the subset of samples that were submitted for the full suite of radionuclide analyses in a given SU under investigation.

Using the composite dataset collected from across the entire North Site, as suggested in the NRC's evaluation of NFS' response to RAIs, results in a robust dataset upon which a demonstration of insignificant contribution to dose can be made. A total of 226 such samples exist. In addition to the characterization samples collected from the impacted areas, NFS evaluated the mean isotopic activity concentrations measured in the more than 400 samples collected from the reference background area. From these samples, the individual radionuclides' contributions to the dose limit were calculated by comparing the mean isotopic activity to the corresponding DCGL for that isotope (**Table 1**). Table 1 identifies the subset (suite) of radionuclides from among the complete list of radionuclides of concern for the North Site that NFS has determined to be insignificant contributors to dose in accordance with the guidance provided in NUREG-1757, Vol. 2, Rev. 1, Section 3.3.

Table 1. Assessment of Radionuclides' Contributions to Dose

Isotope	Average Activity Concentration on North Site (pCi/g, Gross) ⁽¹⁾	Average Activity Concentration from RBA (pCi/g)	Average Activity Concentration on North Site (pCi/g, Net)	DCGL (pCi/g)	Average Dose Contribution (as % of DCGL)	Sum of Net Mean Dose Contribution (Suite of Insignificant Contributors)	
Pu-238	0.011	0.000	0.011	155.00	0.01%	1.40%	0.35 mrem/y
Pu-239/240	0.417	0.000	0.417	140.00	0.30%		
Pu-241	0.877	0.000	0.877	4365.00	0.02%		
Pu-242	0.018	0.000	0.018	148.00	0.01%		
Tc-99	0.454	0.000	0.454	414.00	0.11%		
Th-230	0.842	1.502	-0.660	17.00	0.00%		
U-233/234	6.989	1.417	5.572	642.00	0.87%		
U-238	1.551	1.297	0.254	306.00	0.08%		
Note (1) - Uncorrected for reference area background contribution							

From the computed values presented in **Table 1**, it is evident that the suite of hard-to-detect radionuclides identified in the DP as radionuclides of concern produce, in aggregate, just 1.4% of the applicable dose limit of 25 mrem/y.

An additional criterion identified in NUREG-1757, Vol. 2, Rev. 1, Section 3.3 for concluding that a radionuclide (or suite of radionuclides) is insignificant stems from the potential that "remediation techniques (or other activities or processes) may increase concentrations above those previously deemed insignificant." NFS has considered the remedial action processes and methods that are in use and described in the DP as they relate to this criterion. NFS' remedial action plans call for the use of simple bulk soil excavation as the remediation technique. This remedial action technique does not result in an increase in the concentrations of radionuclides deemed insignificant. Consequently, NFS concludes that the remediation techniques employed at the North Site will not impact the validity of the selection of radionuclides deemed insignificant.

Based on this evaluation,

- 1) NFS concludes that it is appropriate to deem the isotopes listed in Table 1, above, as insignificant contributors to dose at the NFS North Site.
- 2) NFS commits to de-rate the DCGLs for the remaining radionuclides (Am-241, Th-232, and U-235) by 1.4% (0.35 mrem/y). The mechanics of this de-rating will likely be accomplished by simply de-rating the sum-of-fractions (SOF) compliance metric by 1.4%. In other words, the SOF compliance metric will become 0.986.
- 3) NFS proposes that the radionuclides in Table 1 be deselected from further consideration.

NFS notes that in their evaluation, the NRC staff suggests that NFS should “provide and commit to a plan for confirmation, or adjustment if needed, of the contributions of hard-to-detects, based on FSS data.” Based upon the guidance contained in NUREG-1757, Vol. 2, Rev. 1, Section 3.3, a plan such as this is not called for. Furthermore, such a plan would inherently rely on the same survey unit specific data subset that NFS has been collecting in accordance with its approved DP and implementing Characterization Work Plan and with which the NRC has had questions. NFS is therefore asking for NRC concurrence that sampling of hard-to-detect radionuclides can be terminated for future final status work at the North Site based on the above discussion.

RAI #3: The Selection of Survey Boundaries for Survey Unit 19

NFS RESPONSE:

NFS will split the survey unit and is asking for NRC concurrence on the following strategy for that survey unit division.

The northwest half of SU19 and the holding pond area are not perfectly aligned. Precisely removing the pond area, outlined in blue in Figure 1 Location of Pond in SU19, would create a number of technical challenges. Precise removal would leave 3 coreholes in the northwest corner of SU19 orphaned from the rest of the SU19 data in the southeast half of the remaining survey unit. The mathematical models used in the approved SubSurface DCGL methodology cannot accommodate groups of samples that are in two different spatial locations. Also, these samples cannot be combined with other adjacent survey units because those units have greatly different corehole spacing. Therefore, NFS proposes that SU19 be split into two distinct survey units using the boundaries shown in Figure 2 Proposed Division of SU19.

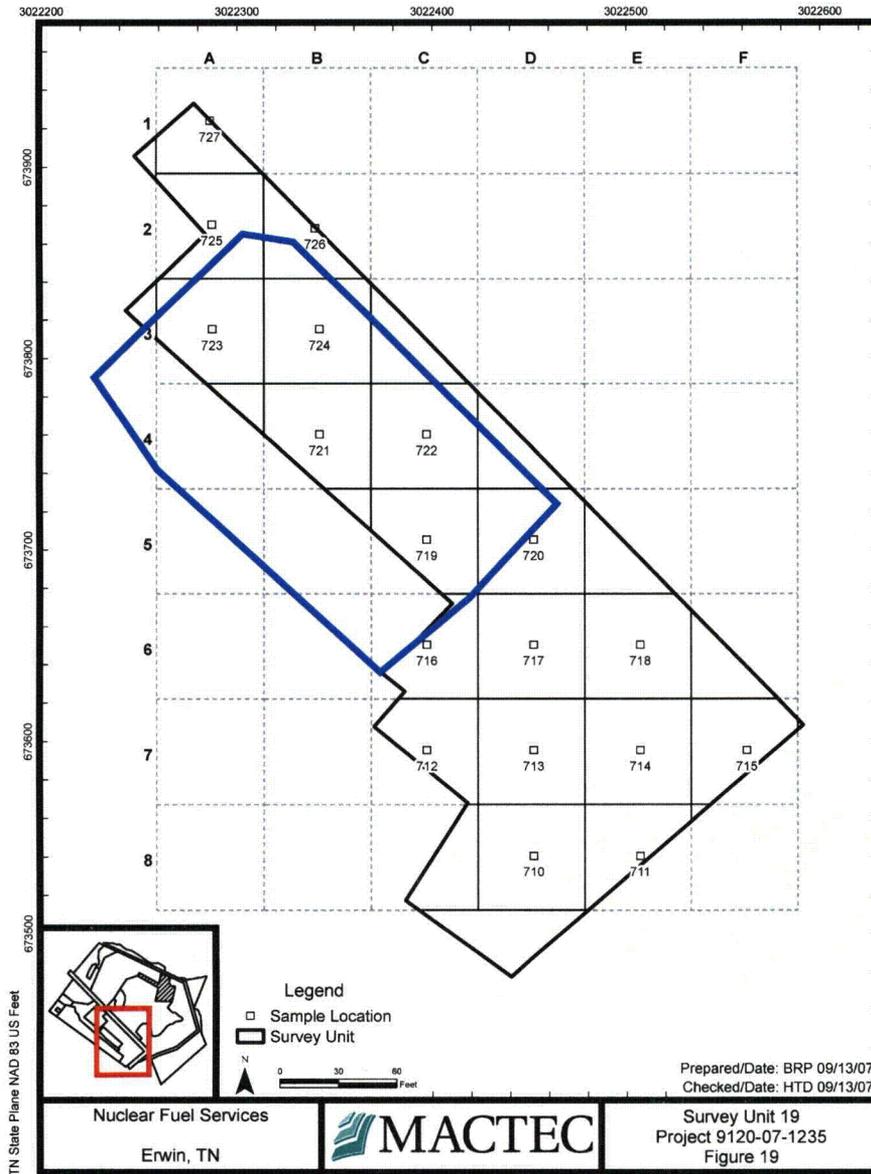


Figure 1 Location of Pond in SU19

While the proposed division of SU19 does not perfectly match the boundaries of the pond area, it is important to note that every sample collected in all of SU19 passes the surface soil DCGL.

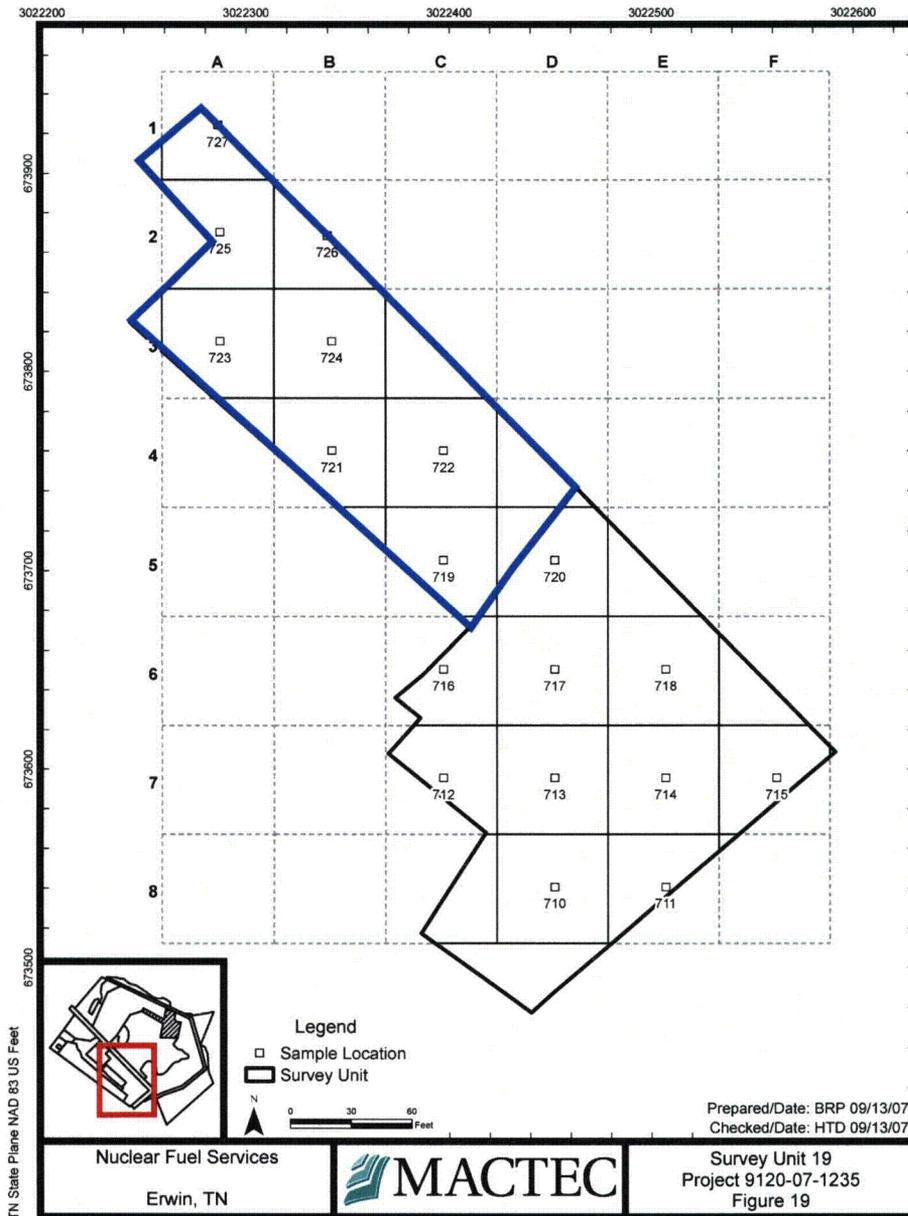


Figure 2 Proposed Division of SU19