

From: [Ramsey, Kevin](#)
To: [Wheeler, Jennifer K.](#); CSMorie@nuclearfuelservices.com; jeffrey.lively@amec.com; [Schmidt, Duane](#)
Cc: [Ryder, Christopher](#)
Subject: Final summary of 9/11/12 meeting with NFS
Date: Tuesday, September 25, 2012 10:28:00 AM

On September 11, 2012, NRC staff met with staff from Nuclear Fuel Services (NFS) to discuss information needed to complete the review of final status survey reports. The following individuals participated:

Kevin Ramsey, NRC/NMSS
Duane Schmidt, NRC/FSME
Jennifer Wheeler, NFS
Scott Morie, NFS
Jeff Lively, NFS Contractor
Javid Kelly, NFS Contractor
Alejandro Lopez, NFS Contractor

How NFS reduced the historical data set:

NFS explained that the scanning methodology originally approved in Section 5 of the 1999 Decommissioning Plan (DP) wasn't working in the field. That is why NFS developed the alternate method now approved as Appendix B of the DP. The 1999 DP was partially based on the July 1999 North Site Characterization Report dataset, consisting of 16,815 representative data points collected across 24 acres. NFS began remediation of the North Site following approval of the 1999 DP and continued until sometime in 2005 at which time it was determined that a different approach was needed. In 2006, NFS provided contractor MACTEC with 23,429 historical analytical sample values that had been collected to date from the NFS North Site. The dataset including the original 1999 dataset and thousands of additional data points collected during characterization and remediation activities, which were primarily collected at biased sample locations. A significant quantity of soil had been excavated and removed from the North Site during the remediation period between 1999 and 2005. As a consequence, many of the data points in the database were no longer representative of the radiological conditions at the North Site. To understand which data were relevant to, and representative of, the existing conditions at the North Site, a topographic land survey was conducted by NFS to identify where soil had been removed. The survey map was imported into SADA software along with the 23,429 historical analytical sample values to evaluate the location of data points relative to excavated areas and to ultimately produce a reduced dataset. Of the 23,429 samples, 19,107 samples were determined to be representative of the soils remaining on the North Site in 2006. These 19,107 sample data points were utilized during the design of the 2007 Characterization Plan which implemented the alternative method from Appendix B of the DP. Analytical samples not used were removed from the dataset because they were located within the top 3 feet of previously excavated areas and thus predate the post-remediation radiological conditions in those areas.

A detailed explanation of this process was included in the MACTEC 2007 Characterization Plan which was provided to the NRC's regional office but which was never officially submitted to the NRC. Subsequently, the MACTEC 2007 Characterization Plan was converted into a NFS controlled document (the NFS North Site Characterization Work

Plan), and Revision 7 was submitted to the NRC in June 2011. However, much of the background information, and description of the development of the representative dataset provided above wasn't completely incorporated because the background information wasn't needed to supervise work. This sequence of events left a hole in the logic and bases for some of the characterization design decisions within the documented record as provided to the NRC.

ACTION ITEM: NFS agreed to submit the background information.

Demarcation of Survey Units:

NFS explained that it started defining survey units using MARSSIM guidance on areas impacted, areas not impacted and areas of deposition. This included a security zone, burial grounds, and ponds. It was noted that some areas already excavated and decommissioned by NFS in the past were excluded from this characterization. Survey unit demarcation was performed by evaluating each of the impacted areas with respect to historical uses, potential or known levels of residual radioactivity and variance in the survey data, spatial distribution of residual radioactivity, identified impacts, and other characteristics such as naturally-distinguishable portions. That is why some survey units have strange shapes (bisecting ponds, etc.). It was noted that the document providing the background information discussed above (MACTEC 2007 Characterization Plan) also includes the information regarding survey unit demarcation.

ACTION ITEM: NFS agreed to submit the background information.

Hard-to-Detect Nuclides:

NFS explained that the current characterization uses the technique already approved in Section 5 of the Decommissioning Plan when it defined the method to determine surrogate ratios for the Appendix B method. The methodology involved a "full suite" analysis of 10 percent of the samples to establish the 95% UCL of the mean ratio values of the surrogate: "hard-to-detect" (HtD) as measured in the final characterization data set from a specific survey unit under consideration. The surrogate ratios were then used to infer the concentrations of HtD in each sample from the survey unit.

In addressing the NRC's concern that there was an apparent lack of statistical correlation between several of the surrogates and HtD radionuclides, NFS acknowledged that the statistical basis for the inference method detailed in the DP was dubious. Because the survey units are in Final Status Survey condition, having already been remediated, NFS noted that it will likely never be able to demonstrate a good statistical correlation between a surrogate and the associated HtD radionuclides because the HtD nuclides exist at near zero concentrations and by their nature, the HtD nuclides can't be detected with a high degree of confidence at such small levels. In a written response to the NRC RAIs, NFS previously proposed an alternative method that avoided the use of a correlation value by de-rating the sum-of-fractions (SOF, the composite DCGL) using the maximum sample result of each of the hard-to-detects. However, NFS reported that the results using this approach were less conservative than the original method used. This is because the statistical variance in the surrogate ratios is quite large (owing to poor correlation) and the 95% UCL of the mean is conservatively skewed high as a result. In consideration of this, NFS would prefer not to change the approved method used to define the surrogate ratios

as presently described in the DP. NFS acknowledges that the method is not ideal, but it is conservative.

To add “weight of evidence” that the HtD radionuclides in soils at the North Site are not significant contributors to potential future dose, NFS provided two sets of summary data assembled from across the North Site. NFS pointed to Tables 4-1 and 4-2 in the July 1999 North Site Characterization Report which showed the median gross value of hard-to-detect nuclides summed together was less than 10 percent of the SOF (composite DCGL). NRC staff asked about the mean values. NFS stated that the mean wasn’t provided in the 1999 dataset, but it believes using the median is reasonable because most of the high sample data is from soil that has since been excavated so it is unlikely that significant hot spots remain that would skew the data. NRC staff disagreed with use of median values, as the distribution may be skewed and a mean value is more representative to average dose. NFS noted that it used the mean in the reduced data set of the 2007 Characterization Plan. Evaluations of different parameters consistently find that hard-to-detect nuclides don’t contribute a significant portion to the Mean Dose Contribution (SOF). NRC agreed that Table 1 from the additional information submitted by letter dated March 1, 2012, for Survey Units 2, 8, 9, 19, and 20, provided a basis to find that the surrogate ratios were reasonable.

ACTION ITEM: In future final status survey reports, NFS will include 2 additional tables; cumulative hard-to-detect nuclide data to date, and hard-to-detect nuclide data for the individual survey unit(s). The tables will include the Sum of Net Mean Dose Contribution calculation.

Surface Scans:

As a response to NRC RAIs, NFS initiated a surface scan of Survey Unit 1. As discussed above, NFS was historically unable to obtain good results using the original scanning method of the 1999 DP. Instead, NFS performed a surface survey of Survey Unit 1 by completing the following:

1. Scanned the ground surface using spectroscopy detection equipment and software that reduced noise in the gamma spectrum.
2. Collected a static measurement at each corehole location by measuring a large area around the core hole (stationary detector positioned 2 meters high).
3. Collected samples of the surface soil (surface to 15cm depth) at each corehole location.

NFS then compared the results from all 3 measurements and provided a report of the surface survey results to the NRC.

NFS noted that the report for the surface survey didn’t address hard-to-detect nuclides because it was relying on Final Status Survey Reports for the Subsurface Characterization submitted previously for Survey Units 1 and 2. NFS believes that the surface scans should be used to confirm variance across the survey unit only. Once a lack of variance is confirmed, the soil sample results should be used for contamination levels. NFS acknowledged that the surface survey report addressing the previous RAI should not have been submitted as a stand-alone report, but rather, it should be viewed as an Addendum to the Subsurface Characterization FSS Reports.

With regard to problems meeting the minimum detectable concentration (MDC) levels, NFS

stated that some samples were not counted long enough and they just needed to be recounted. It was unclear whether the samples had been recounted.

ACTION ITEM: NFS will follow-up on the results of recounted soil samples and submit its findings to NRC. NFS will re-name the surface survey report for Survey Units 1 and 2 as an Addendum to the Survey Unit 1, 3 and 10 Final Status Survey Report and the Survey Unit 2, 8, 9, 19, and 20 Final Status Survey Report, as appropriate.

Kevin M. Ramsey
Senior Project Manager
Fuel Manufacturing Branch
U.S. NRC
301-492-3123