ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

April 11, 2011

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U.S. Nuclear Regulatory Commission
Division of Waste Management
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SUBJECT: DOE CONTRACT NO. DE-AC05-06OR23100
COMMENTS ON THE AMBROSIA LAKE MILL (SUA-1473) SECTION 4
DOSE ASSESSMENT, AMBROSIA LAKE, NEW MEXICO
(DOCKET NO. 040-8905; RFTA NO. 11-011)
DCN: 2045-DR-01-0

Dear Dr. McLaughlin:

The Oak Ridge Institute for Science and Education (ORISE) has reviewed the subject document for the Rio Algom Mining, LLC facility in Ambrosia Lake, New Mexico. Observations, responses, and comments are enclosed for your consideration.

Please contact me at 865.576.5073 or Wade Adams at 865.576.0065 should you have any questions or require additional information.

Sincerely,

Timothy J. Vitkus, CHP
Assoc. Director/Survey Operations Director
Independent Environmental
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TJV:fr

Enclosure

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COMMENTS ON THE AMBROSIA LAKE MILL (SUA-1473) SECTION 4 DOSE ASSESSMENT AMBROSIA LAKE, NEW MEXICO

GENERAL DISCUSSION OF RESPONSES

At the request of the U.S. Nuclear Regulatory Commission (NRC), the Oak Ridge Institute for Science and Education (ORISE) performed a technical review of Rio Algom Mining, LLC's *Review of Section 4 Soil Data and Associated Reports Related to the Soil Decommissioning Plan, December 2010*. Additionally, the following documents were also used as references during the review.

1) *Soil Decommissioning Plan: Rio Algom Mining LLC, Ambrosia Lake Facility, Grants, New Mexico. May 1, 2006*.

2) Letter from T. Fletcher (RAM) to T. McLaughlin (NRC), RE: *License SUA-1473, Docket No. 40-8905, Clarification Soils Decommissioning Plan. October 15, 2008*.

There were three primary sections of the report evaluated. These were 1) **Comments on Soil Decommissioning Plan**, 2) **ORISE Confirmatory Sampling Report**, and 3) **Radiological Dose Assessment**. The review resulted in the following observations and comments.

OBSERVATIONS, RESPONSES, AND/OR COMMENTS

OBSERVATION 1:

One of the principle tenets repeated throughout the document is the report author's statement regarding inclusion of gross concentration values in the unity rule [sum-of-ratios (SOR)] calculation. This discussion begins on page 5 of the **Comments on Soil Decommissioning Plan** section and continues in the **ORISE Confirmatory Sampling Report** section. The report essentially petitions for subtracting a background value from the sample results, then calculating the SOR using the basic derived concentration guideline levels ($DCGL_W$s). The report recommends this approach both for the site's data and for the ORISE confirmatory data.

COMMENT 1:

ORISE agrees that the suggested approach could have been applied for the site, provided an appropriate background evaluation had been performed and reasonable average background values

determined. However, the site's Decommissioning Plan (DP), specifically Section 5.1, as well as other referenced correspondence commits to the $DCGL_W$s that include background contributions. As such, the ORISE confirmatory survey was designed to evaluate compliance with those specific $DCGL_W$s and equivalently compared with the licensee's results. Table 1 of the report shows a surface soil mean concentration SOR of 1.27, which exceeds the release criteria. As such, the recommendation of changing how compliance is demonstrated leads to the impression that a "pick and choose" approach is being suggested.

PATH FORWARD 1:

ORISE cannot recommend a specific path forward based on the DP's compliance commitments without regulatory approval of a revised decommissioning plan.

OBSERVATION 2:

Within, the **ORISE Confirmatory Sampling Report** section, the report identifies that a discussion was not included as to how the initial number of confirmatory measurement grids was established.

RESPONSE 2:

The number of confirmatory measurements/samples, using the Ranked Set Sampling (RSS) method, is typically generated based on the site's final status survey (FSS) data. However, ORISE was not provided with the site's FSS data prior to mobilization. Therefore, during the data quality objectives (DQO) planning process, the ORISE project team relied upon characterization data provided within the DP, an expected estimate of the site SOR mean concentration level and variability that was based on professional judgment and extensive experience, and a conservative acceptable half-width of the desired confidence interval relative to what the site would report. The initial input parameters assumed that remediation would have resulted in a mean concentration of no more than 0.7 of the $DCGL_W$ SOR value of 1 and that the variability of the concentration would be approximately 0.5 in terms of a unity standard deviation. These inputs were considered conservative and allowed for a relatively large uncertainty for comparison of the confirmatory survey mean concentration and the site-reported mean concentration. This initial iteration resulted in 6 samples being required on a per-area basis collected from a random RSS investigation population of 18 locations. This coincides with the actual sample plan ultimately implemented. However, during the initial DQO phase, the

planning team elected to reduce the acceptable half-width to account for the unknown actual FSS conditions and a possible higher mean concentration relative to the $DCGL_W$. This iteration resulted in the 27 planned samples to be collected from an RSS population of 81 grids that was provided in the confirmatory survey plan. As the confirmatory survey report notes, this secondary plan could not be implemented due to site logistics and the survey reverted to the original DQO output with NRC's concurrence. The difference between the 90 grid/30 samples in the survey plan and the 81 grid/27 sample in the report was the inclusion of additional assumed judgmental locations.

OBSERVATION 3:

The **ORISE Confirmatory Sampling Report** section next questioned the precision of the confirmatory survey mean concentration that resulted from the reduction in the sampling population.

RESPONSE 3:

ORISE performed a retrospective evaluation of the plan that was implemented. This evaluation determined that the confirmatory survey was adequate to estimate the mean concentration with a more restrictive maximum acceptable confidence interval half-width of 0.5 and with a unity standard deviation as high as 1.6. One would not expect a standard deviation of this magnitude for sites that have been remediated below the $DCGL_W$. The retrospective confirmatory survey data raw statistics resulted in a mean SOR concentration of 1.26, median SOR concentration of 0.64 and a standard deviation of 1.5.

Secondly, with the mean concentration provided in the report, ORISE directly compared the confirmatory site mean of 1.26 to the site's Table 1 summary mean SOR, which was 1.27. This demonstrates the adequacy of the confirmatory survey plan to assess the mean using the RSS random sample *N* of 18 as compared with the Table 1 *N* of 60.

OBSERVATION 4:

The report states within the **ORISE Confirmatory Sampling Report** section that the variability between Ra-226 and Th-230 concentrations is not constant over the site, assumes gamma measurements were only sensitive to the Ra-226 concentrations, that the correlation with the RSS

approach was therefore invalidated, and infers that simple random sampling would have been the preferable confirmatory approach.

RESPONSE 4:

ORISE does not agree with the assumptions or inferences stated in the report. First, RSS is random sampling, but also includes allowances for applying professional judgment. Another advantage of the approach is the opportunity to investigate a much larger initial population. This large initial population is a primary factor for enabling a reduction in samples over simple random sampling. Secondly, RSS does not require an exact correlation with concentrations, rather a relative qualitative assessment of general magnitude. ORISE has extensive experience evaluating sites with only Th-230 as a contaminant of concern, as well as sites containing Th-230 combined with highly variable concentrations of Ra-226 and/or natural uranium. This experience has demonstrated that the presence of the combination of contaminants results in a combined gamma fluence that enables sufficient differentiation from background conditions. Furthermore, the RSS designs allows for either minimal or substantial ranking error.

OBSERVATION 5:

The final observation is a general discussion of the report's **Radiological Dose Assessment** with specific points provided for consideration. The reviewer's interpretation is that the report is essentially proposing to demonstrate compliance with a dose assessment method versus derived concentration guideline values. The NRC's guidance on this approach is detailed in Section 2.5 of the *Consolidated Decommissioning Guidance: Characterization, Survey and Determination of Radiological Criteria; NUREG 1757, Vol. 2, Rev. 1*. As discussed within Comment 1, this can be interpreted again as a "pick and choose" response to unsatisfactory FSS results relative to commitments already made for demonstrating compliance. The use of available site data to demonstrate compliance with the dose assessment method has multiple concerns. These are:

1) The DP was designed for one method. That method was a fundamental compliance unit of 100 m^2 and an FSS to assess compliance relative to 100 m^2 areas. Therefore, what assurance is there that the FSS DQOs were appropriate for performing a dose assessment with the data generated?

2) As a general note, had the site elected to use the existing data in the Wilcoxon Ranked Sum test evaluation, the null hypothesis would not have been rejected and the conclusion would be that the site does not meet the 25 mrem/y dose criteria.

3) The dose assessment has not addressed allowance for elevated measurement comparisons. The confirmatory survey identified numerous (33% of the 100 m^2 grid blocks) with elevated concentrations above what would be considered the $DCGL_W$, with one confirmatory sample at 6-times the $DCGL_W$. As these samples were 4-point composite samples, there is a possibility that the hot spot levels were as much as 24-times the $DCGL_W$.

4) The dose assessment, as discussed in Observation 5.3, did not include $DCGL_{EMC}$s. Therefore, the reviewer is unable to assess the adequacy of the dose assessment which used an average concentration for the Section 4 area rather than area weighted concentrations.