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DRAFT MEMO

TO: Mound Work Group

FROM: Ron Buchanan, SC&A

DATE: October 4, 2011

SUBJECT: SC&A's Response to NIOSH Evaluation of Remaining Neutron Issues at the Mound Laboratory

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There are three remaining open action items related to neutrons at Mound. These issues are listed below, along with the most recent actions related to them.

1. **Action item -** The Mound Work Group (WG) recommended that NIOSH compare the two MCNP analyses and determine the reason(s) for the difference in results. NIOSH should respond that they either disagree with adjustment factors or that they will make revisions to their current approach.

   a. SC&A issued "Draft White Paper: Sensitivity of NTA Film to Neutron Sources at Mound Laboratory," Rev. 1, on July 22, 2010. This report concluded:

      For periods from August 1949 until January 24, 1956, the correction factors listed in Table 2 for the "observer" exposed to ^{210}Po-Be shielded by 8 inches of water should be applied to neutron doses during each period listed at the top of this table. From January 24, 1956, until August 8, 1965, the correction factors listed in Table 2 for the "observer" exposed to $^{238}PuF_4$ shielded by 8 inches of water should be used. From August 8, 1965, until the end of 1977, the correction factors listed in Table 3 for the "observer" exposed to $^{238}PuF_4$ shielded by 8 inches of water should be applied to neutron doses during each period listed at the top of this table.

   b. NIOSH issued "NIOSH Evaluation of NTA Neutron Film Fading at Mound: Response to SC&A Issues and Recommendations" in December, 2010. This report concluded:

      NIOSH disagrees that 8-inches of water shielding is a reasonable assumption. Based on information gathered in discussions with Mound workers during outreach meetings we continue to believe that 4-inches of water shielding is a reasonable and claimant-favorable assumption. Furthermore, as we have stated in the past, negotiations over the numerical value of the correction factors are not a legitimate SEC issue, but rather it is an issue more appropriately considered in the TBD context. Nevertheless, discussions of this issue have continued to be pursued.

However, we also note that in either case the correction factors are almost the same. So strictly in the interest of coming to agreement we accept this SC&A recommendation and will apply the 8-inch water shielding correction factors published in Tables 2 and 3 of the SC&A report and reproduced in the third column of the Table 1.

SC&A Response to Action Item #1
SC&A agrees with NIOSH's decision on this issue.

2. **Action item –** NIOSH is to respond to the WG questions concerning NTA film track fading and adjustment factors.

   a. SC&A issued "Draft White Paper: Sensitivity of NTA Film to Neutron Sources at Mound Laboratory," Rev. 1, on July 22, 2010. This report concluded:

      Based on this derivation, we predict fading of 34% after 1 week and 87% after 2 weeks, a minor discrepancy with the Mound report.

      and,

      Given the range of results of the track fading studies and our subsequent analysis, we recommend that the most claimant-favorable correction factors be applied to the neutron doses prior to July 15, 1968. The Mound procedure to correct future NTA film reports—applying a correction of 33% to 1-week films, and 56% to 2-week and 4-week films—is consistent with the assumption that the entire dose is received at the beginning of the 1-week or 2-week monitoring periods, but that it is delivered uniformly during each workday to workers on a 4-week monitoring schedule. This suggests that the study cited in the dosimetry supervisor's July 15, 1968, memo may have involved exposing films daily for a 4-week period, with results that were in complete agreement with our analysis of the July 1, 1968, report. The corrections that were applied by Mound following July 15, 1968, should be applied retrospectively to earlier neutron doses measured at Mound. These corrections are in addition to the correction factors derived from Tables 2 and 3.

   b. NIOSH issued, "NIOSH Evaluation of NTA Neutron Film Fading at Mound: Response to SC&A Issues and Recommendations" in December 2010.

      i. This report noted, "NIOSH believes that an error exists in the SC&A analysis when they state, "Based on this derivation, we predict fading of 34% after 1 week and 87% after 2 weeks."
      ii. As a result, this report then concluded, "In light of the publication by Kahle et al. (1969) and the apparent error in the SC&A analysis, NIOSH continues to support

the fading values of 33% in the first week after exposure and 56% after two weeks."

c. Bob Anigstein of SC&A sent an e-mail to the Mound WG on December 29, 2010, stating:

> *I have just reviewed the report, "NIOSH Evaluation of NTA Neutron Film Fading at Mound: Response to SC&A Issues and Recommendations, December, 2010" (the footer has a date of November 3, 2010). NIOSH highlighted a typo on p. 9 of my and Dick Olsher's "Draft White Paper: Sensitivity of NTA Film to Neutron Sources at Mound Laboratory," Rev. 1, dated July 22, 2010. Our report erroneously stated that the predicted fading of NTA film after 2 weeks is 87%. The correct value is 57%, which is obtained from our Equation 6, and is consistent with the 56% reported by Mound.*

d. Given that the apparent discrepancy between value of the fading correction factors NIOSH proposed to be applied to NTA film results, and the values calculated by SC&A was the result of a typographical error, it appears to NIOSH that we and SC&A are in agreement on this issue. We therefore propose that the Mound Working Group discuss this issue for possible closure.

SC&A Response to Action Item #2

SC&A agrees with NIOSH's decision on this issue, but SC&A notes that while the Mound TBD-6, page 30, recommends these fading values be applied for NTA film for the period 1949–1976, NIOSH's Mound neutron evaluation white papers of March 18, 2009, and December 9, 2009, both recommend 9%/wk fading correction factor.

3. **Action Item -** Review NTA data for 1951–1960.

a. SC&A has expressed concerns about NIOSH's proposed strategy to use categorical data from the Health Physics Progress reports for this time period. SC&A also suggested that we use the actual neutron dosimetry data to make a neutron coworker model.

b. NIOSH maintains that the use of categorical data is both viable and claimant-favorable. However, in the interest of coming to closure on this issue, we investigated the possibility of using the actual neutron dosimetry data, as suggested by SC&A. Unfortunately; we have been unable to locate the cycle-by-cycle neutron dosimetry results for this time period in spite of multiple records searches requested of DOE Legacy Management. In the interest of completeness, we have one more request pending with DOE Albuquerque Operations Office, but we are not optimistic that this request will produce the required records. In the event that it does, we will revisit this issue. In the absence of this data, NIOSH plans to use the approaches we have previously proposed.

c. NIOSH also notes that the time period in question (1951–1960) largely overlaps the currently existing SEC classes for the Mound Laboratory, which includes all workers who meet the usual SEC criteria. Should the Working Group adopt SC&A's position on this issue—that the methods NIOSH proposes for estimating unmonitored neutron dose are unacceptable—it would not result in the addition of any workers to the SEC (except for any hypothetical worker who began employment in the beginning of 1960 and doesn't qualify for the current 1959–1980 SEC class). On the other hand, should such a SEC basis be adopted, the result would be to deny unmonitored neutron exposure to the workers who don't qualify for the current SEC classes.

SC&A Response to Action Item #3

SC&A does not see that the lack of badge cycle data is needed to use the neutron dose data already available. NIOSH lists matched neutron-photon doses for each year for 1949–1977 in Table 4-4, page 21, of their December 9, 2009, white paper. These individual NTA recorded neutron doses could be used to create a coworker database, instead of using the categorical data presently recommended by NIOSH. The number of matched neutron-photon pair data in Table 4-4 appear be sufficient to provide reasonable neutron dose statistics for coworker purposes.