MEMO

DATE: November 24, 2015

TO: Subcommittee on Dose Reconstruction

FROM: Doug Farver and Robert Anigstein, SC&A

SUBJECT: Responses to 17th Set Blind Remaining Issues

In an e-mail to Chair of the Dose Reconstruction Subcommittee (DRSC), David Kotelchuck, dated November 5, 2015, Grady Calhoun (CDC/NIOSH/DCAS) provided responses to the unresolved issues pertaining to blind dose reconstructions of cases 037069 (Allied Chemical) , 016735 (X-10) , and 037053 (RFP).

A. 037069 (Allied Chemical) – Based on a question raised by Bob Anigstein, Grady will determine if NIOSH included dose from the inhalation of radium for this case.

NIOSH response
The values SC&A quotes are averages for Central Florida Phosphate rock from one study. The 1263 Bq/kg U-238 average has a one sigma uncertainty of 442 Bq/kg. The 1460 Bq/kg Ra-226 has an uncertainty of 287. Meanwhile, the Northern Florida phosphate rock had an average of 692 Bq/kg U238 and 642 Bq/kg Ra-226. So the ratio in northern Florida is less than one according to SC&A's reference. The one sigma uncertainty for the northern numbers was 352 and 307 respectively. Based on this, the ratio is not statistically different than 1.0 at either Florida location.

Also, NIOSH used OTIB-43, which uses a favorable U-238 concentration of 45.8 pCi/g for the phosphate rock. This is about 1695 Bq/kg. Since we assumed equilibrium, we used the same 1695 Bq/kg for Ra-226. SC&A's reference values are 1263 U-238 and 1460 Ra-226. So SC&A's reference indicates we are favorable with our Ra-226 intake.

SC&A Response
The standard deviation of the 13 analyses that are listed by Hull and Burnett (1996, Table 1) represents the spread of the individual measurements, not the uncertainty of the average. The latter value is denoted by the standard error of the mean, which is given by

$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$, where $\sigma_{\bar{x}}$ = standard error of the mean, σ = standard deviation, and n = number

of analyses. The uncertainty of the mean of the [238]U analyses is thus $\dfrac{442}{\sqrt{13}}$ = 122.6 Bq/kg,

while the corresponding uncertainty in the mean [226]Ra activity concentration is 79.6 Bq/kg. The difference between the mean of the [226]Ra values and that of the [238]U is 1,460 – 1,263 = 197 Bq/kg, which is greater than the sum of the standard errors and is statistically significant. The reason for basing our analysis on the phosphate rock from Central Florida was that, not knowing the origin of the phosphate at Allied Chemical &

Dye, we picked the source that leads to the most claimant-favorable results. However, if NIOSH uses a ^{226}Ra activity concentration of 1,695 Bq/kg, that is even more claimant favorable, so the issue becomes moot.

    B. 016735 (X-10) – NIOSH will provide us with a definition of who is considered a "craftworker" in order to determine if it is appropriate to assign the EE an occupational medical lumbar spine dose.

       NIOSH provided an extended response to the X-10 case lumbar spine examination concerns in a responses titled *016735 Blind Audit Responses-lumbar.*

SC&A Response
The NIOSH response addresses two concerns: (1) if the EE qualified as a craft worker, and (2) assigning annual vs. pre-employment lumbar scans from 1950–1953. Based on the discussion during the September 24th DRSC teleconference, SC&A believes the Part 1 requires additional discussion with the DRSC. SC&A is satisfied with the Part 2 response; however, we recommend that Table 3-2 be updated to clarify that craft workers from 1950–1953 received preplacement rather than annual lumbar scans.

    C. 037053 (RFP) – SC&A has not received the version of IMBA that includes the ability to calculate doses associated with americium ingrowth.

       NIOSH response
       We are continuing to try to get this software. This is not as available as we would like it to be due to problems with the ownership and distribution.

This remains an ongoing issue. SC&A cannot recalculate our internal dose until we get this updated software.