MEMORANDUM

TO: URAWE Work Group
FROM: SC&A, Inc.
DATE: June 3, 2016
SUBJECT: SC&A's Review of NIOSH's White Paper Addressing Issues on the Coworker Model for United Nuclear Corporation

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Relevant Background Information

The United Nuclear Corporation (UNC) Work Group (WG) met on September 7, 2012. During the meeting, there was a discussion regarding the validity of the coworker model that was designed to assign internal doses to workers during a 1961-through-1962 gap in monitoring at UNC. Prior to the meeting, SC&A had compared the coworker internal dose model against bioassay samples taken between December 1962 and the end 1965 for two highly exposed operators (SC&A 2009). This comparison indicated that the coworker model would not have bound the intake values calculated for these operators using their personal monitoring data.

During the WG meeting, the National Institute for Occupational Safety and Health (NIOSH) did agree to change their UNC Site Profile guidance to specify the use of the 95th percentile coworker values for the 1961–1962 monitoring gap. However, in order to validate the coworker model, NIOSH was tasked to review SC&A's Integrated Modules for Bioassay Analysis (IMBA) runs for the two UNC operators to determine (1) if NIOSH could reproduce SC&A's calculated intake values, and (2) if these operators' bioassay data were included in the coworker model. In response to this task, NIOSH published *White Paper Addressing Issues on the Coworker Model for United Nuclear Corporation* in February 2014.

Results of NIOSH White Paper

Based on NIOSH's review of the bioassay data and SC&A's IMBA runs associated with Operator AAA and Operator BBB (arbitrary identifiers) for the periods pre-June 1963 and post-June 1963, NIOSH drew the following conclusions:

- A comparison of NIOSH and SC&A intake values calculated using IMBA for the two operators was reasonably close, with the exception of Type S intakes for pre-June 1963. NIOSH's Type S pre-June 1963 intakes were a factor of 10 higher than SC&A's values. This discrepancy was due to a transcription error by SC&A in copying IMBA output values into the SC&A report. The actual SC&A analysis produced similar results to NIOSH's IMBA calculations.

- The calculated intakes for both workers during the pre-June 1963 period are higher than the coworker 95th percentile value. This is due to the fact that, although most of the operators' data were included in the coworker model, several values were omitted.

- A comparison of the data sets used for the coworker model and the pre-June 1963 data for Operators AAA and BBB showed that, overall, seven results (50%) were missing [range 173–2,380 disintegrations per minute per liter (dpm/L)]. NIOSH concluded that

some values were omitted because they were deemed contaminated or false positives. For example, a 2,380 dpm/L reading appeared to be artificially high when compared to the result from samples taken about one month before and after.

- If the missing seven results (four results from Operator AAA and three results from Operator BBB) were added to the coworker data set for pre-June 1963, the Type S geometric mean (GM) would increase from 12,590 disintegrations per minute per day (dpm/d) to 14,572 dpm/d, and the Type M GM would increase from 872 dpm/d to 944 dpm/d.

- NIOSH also noted that, after the current UNC site profile was written [NIOSH 2011; also referred to as the technical basis document (TBD)], additional bioassay data became available. When the additional bioassay sample results were analyzed, it was determined that these data would cause the TBD intake values to decrease, and, therefore, the data were not incorporated into the TBD.

SC&A's Response to NIOSH's White Paper

SC&A reevaluated their initial IMBA runs for the two operators and has concluded that there was a transcription error in the reporting of Type S pre-June 1963 results. SC&A's actual results should have been reported as 426,670 dpm/d for Operator AAA and 208,880 dpm/d for Operator BBB. These values are consistent with the NIOSH-calculated values of 437,900 dpm/d and 187,800 dpm/d for Operators AAA and BBB, respectively.

SC&A concludes that the current internal coworker model is valid and being applied appropriately, based on the following:

(1) SC&A reassessed the bioassay data and concludes that the omission of the highest sample result for each of the operators may be attributable to a false positive, based on bioassay results from samples taken shortly before and after.

(2) NIOSH has agreed to use the 95th percentile coworker values for the 1961–1962 gap in monitoring.

(3) NIOSH chose not to include the additional bioassay samples in the coworker model, which would have reduced the overall distribution due to the low values of many of the samples.

References

NIOSH 2011. *Technical Basis Document for the United Nuclear Corporation, Hematite, Missouri*, DCAS-TKBS-0008, Revision 0, Division of Compensation Analysis and Support, Cincinnati, Ohio. March 21, 2011.

NIOSH 2014. *White Paper Addressing Issues on the Coworker Model for United Nuclear Corporation*, National Institute for Occupational Safety and Health. February 2014.

SC&A 2009. *Review of the Site Profile for the United Nuclear Corporation, Missouri, Battelle-TBD-6001, Appendix D,* SCA-TR-SP2009-0004, SC&A, Inc., Vienna, Virginia. September 10, 2009.