



## MEMORANDUM

TO: GJOO Work Group  
FROM: SC&A, Inc.  
DATE: September 27, 2016  
SUBJECT: SC&A Review of NIOSH July 2016 Finding Response

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On May 17, 2016, SC&A submitted SCA-TR-2016-SEC006, *A Focused Review of the NIOSH SEC Evaluation Report for Grand Junction Operations Office, Addendum to Petition SEC-00175* (SC&A 2016). The report summarized the issues addressed in the original Special Exposure Cohort (SEC)-00175 petition evaluation report (ER) (NIOSH 2011) and SCA-TR-PR2015-0093 (SC&A 2015) and evaluated the changes identified in the National Institute for Occupational Safety and Health's (NIOSH's) March 12, 2015, addendum to the ER (NIOSH 2015). SC&A identified one finding in that report, as follows.

SC&A noted that, on page 29 of the ER addendum (NIOSH 2015), NIOSH states:

*The document, Technical Basis for Bioassay Sampling for Sample Preparation Plant and Grand Junction Vicinity Property Workers (UNC Geotech, 1990), lays out the implementation of DOE Order 5840.11 for monitoring workers. In the document, it specifies that bioassay shall be collected if exposure indicates that a worker could be exposed to inhalation intake during the year that exceeded 200 DAC-hours. In addition, it indicates that a monitoring program must be in place for all workers that have the potential for 40 DAC-hours. Since this document was issued in early 1990, it is assumed that full implementation was not until the end of the year. Therefore, starting in 1991, it is assumed that unmonitored radiation workers would not have exceeded 200 DAC-hours in a given year (if they had they would have then been placed on a bioassay program). In addition, it is assumed that non-radiation workers would not have exceeded 40 DAC-hours in a given year. This document also reiterates that the controlling radionuclide was Thorium-230. The limiting DAC for Thorium-230 is 3.00E-12  $\mu\text{Ci}/\text{mL}$  (Heffelfinger, 1981). The isotopic ratios of the different radionuclides found in various uranium source materials processed at the Grand Junction Facility Sampling Plant after 1985 have been well characterized (Donivan, 1987). These ratios may be used to assign intakes of these other radionuclides, as a function of the Th-230 intake. [emphasis added]*

Based on a review of the ER addendum and documents cited, SC&A concluded:

*Although the technical basis document for bioassay programs (Geotech 1990) describes how the program **should** operate to detect intakes resulting in a dose of 100 mrem, no document or database was presented containing air monitoring results, sample locations,*

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*workers present, etc. to demonstrate that the workplace controls described in the technical basis document had actually been implemented. SC&A does not believe NIOSH has shown sufficient workplace air monitoring data to support its assertion that unmonitored radiation workers would not have exceeded 200 DAC-hours or that non-radiation workers would not have exceeded 40 DAC-hours in a given year.*

SC&A initiated the following finding:

**Finding 1: Workplace air monitoring data do not support the assumption that unmonitored radiation workers would not have exceeded 200 derived air concentration (DAC)-hours or that non-radiation workers would not have exceeded 40 DAC-hours in a given year.**

On July, 20, 2016, NIOSH provided a response to this finding (see Attachment 1) in which it cited 10 documents to support its position. The response concludes with the following:

*The available data indicate that by 1991 Grand Junction had a robust monitoring and dose assessment program that controlled exposures to well below 200 DAC-hours per year. NIOSH concludes that the 10% DAC air monitoring threshold in place in 1991 bounds intakes for individuals who may have been exposed occasionally without being assessed by bioassay sampling.*

SC&A reviewed NIOSH's response and the 10 documents cited. This memo summarizes each document and assesses the overall relevancy of these documents to the original finding.

- (1) Site Research Database (SRDB) Ref. ID 97791: *Technical Basis Document for Internal Dosimetry*, UCRL-CR-104682, Revision 1, prepared by David P. Hickman for Chem-Nuclear Geotech, Inc., September 1991.

According to the Executive Summary of the document:

*This document provides the technical basis for the Chem-Nuclear Geotech (Geotech) internal dosimetry program. Geotech policy describes the **intentions** of the company in complying with radiation protection standards and the "as low as reasonably achievable" (ALARA) program. It uses this policy and applicable protection standards to derive acceptable methods and levels of bioassay to assure compliance. [emphasis added]*

The document describes biokinetic and dosimetric models, dose conversions factors, derived bioassay limits, and internal dosimetry program protocols. It does not contain any site-specific air monitoring or DAC-hour tracking information and does not reference any Grand Junction Operations Office-specific documents.

- (2) SRDB Ref. ID 97811: *Radiation Work Permits*, UNC Geotech Procedure No. HSSHP-0501, effective September 5, 1990.

This procedure describes the generation, use, and termination of radiation work permits (RWPs). It describes the preparation, disposition, and termination of RWPs at UNC Geotech.

The procedure states that RWPs are required for all work in any area in which the following conditions exist:

- loose surface contamination levels greater than those specified in Attachment 4 to the procedure
- airborne radioactivity greater than 10% (0.1) of a DAC
- radiation levels greater than 2.0 milliroentgen per hour at 30 cm (~12 inches) from the source of radiation
- unknown radiological conditions in the area to be entered
- when specified by Radiological and Environmental Safety to ensure proper accountability of personnel radiation exposure

This procedure does not contain any workplace air monitoring data or DAC-hour tracking information, and it does not reference any site-specific information.

- (3) SRDB Ref. ID 97763: This document contains a cover letter, a report titled *1991 Geotech Internal Dose Assessment Report for the Grand Junction Projects Office*, dated March 20, 1992, and a follow-up cover letter and report.

The report is divided into three sections. Section 1 concerns Geotech workers occupationally exposed due to radon chamber entries in 1991. It states:

*This section fulfills the internal dose assessment requirements of DOE Order 5480.11, Radiation Protection for Occupationally Exposed Workers, sections 9.m.(2)(a) and (c), for individuals employed by Geotech who were occupationally exposed to radon and radon progeny due to Radon Chamber entries at the Grand Junction Projects Office (GJPO) in 1991.*

Sections 9.m(2)(a) and (c) of DOE Order 5480.11 (DOE 1988) describe the recordkeeping requirements. Section 9.m states:

*m. Records. As a minimum, the records specified below of the radiation protection program and dosimetry records for all individuals for whom monitoring is provided shall be generated and maintained, commencing with the effective date of this Order. Information and data developed pursuant to this Order shall be retained consistent with the requirements of DOE 1324.2A, RECORDS DISPOSITION.*

Sections 9.m(2)(a) and (c) of DOE Order 5480.11 concern the individual occupational dose records for internal exposure and summation of internal and external dose equivalents and do not address air monitoring requirements. However, Section 9.m(3) contains the radiological monitoring and area control records. It specifically states:

*Monitoring and Area Control Records. Records that establish the conditions under which individuals were exposed, such as **facility radiological conditions (as generated by the monitoring programs)** and surveys for the release of personal*

*property and workplace surfaces, shall be kept to provide a chronological, historical record pursuant to Section 5 of ANSI N13.6-1972. [emphasis added]*

A compliant radiological protection program was required to maintain the records containing air monitoring results, sample locations, workers present, etc. to demonstrate that the workplace controls described in the technical basis document had actually been implemented.

Section 2 of the 1991 Geotech internal dose assessment report contains 1991 internal doses for [REDACTED] individuals with suspected intakes of [REDACTED] in 1990. No bioassay or air monitoring data are provided, and the intake date is prior to the 1991 date proposed by NIOSH.

Section 3 of the report lists the names of individuals for which bioassay analyses are in progress at the analytical laboratory. The follow-up report issued on August 17, 1992, lists the name of the individuals that had pending bioassay analyses and gives their 1991 internal dose, shown as zero for each individual.

- (4) SRDB Ref. ID 89872: *Building 7 Health and Safety*. This document contains 161 separate documents totaling 1,358 pages.

The document dates range from 1989 to 2002. Only 3 of the 161 documents were originated before 1992:

- pages 2–13, “Linoleum Sample, GJPO Building 7 Requisition Number 3611,” December 22, 1989
- page 19, “Asbestos Abatement of Building 7,” April 19, 1991
- pages 14–15, “Ceiling Tile, GJPO Building 7 Request Number 6031,” May 9, 1991

The document does not contain any air monitoring, DAC-hour tracking, or dose assessment results from 1991.

- (5) SRDB Ref. ID 89938: *Building Health and Safety*. This document contains 66 separate documents totaling 1,488 pages.

The document dates range from 1972 to 2000. Six of the documents were originated before 1992:

- pages 1204–1248, “Results of a Radiometric Survey of the AEC Compound and its Perimeter,” November 9, 1972
- pages 1174–1175, “Chem Lab Safety/Industrial Hygiene/Radiological Inspection,” April 24, 1980
- pages 1197–1203, “Radiometric Survey of the Grand Junction Facility,” May 1, 1982
- pages 1262–1264, “Final Report on PCB Usage at the Grand Junction Area Office Facility,” June 1, 1982
- pages 1160–1168, “Historical Survey of the Grand Junction Projects Office Facility – Hazardous (Non-Radioactive Wastes),” February 27, 1987

- pages 193–882, “Radiological Survey Maps for Building 20,” May 15, 1990

Beginning on page 171, there are a few radiological surveys for Building 20 from 1989 that are part of the RWP Building 20 Trench from November 2001 (pages 163–192), and additional radiological surveys from Building 20 on pages 191–245 from May 1990 through May 1992. SC&A reviewed the radiological surveys for Building 20. Only one air sample result was listed on page 205 for Building 20, dated September 11, 1990. The radiological survey on May 15, 1990 (beginning on page 193), indicates that air samples were obtained weekly. However, no air sample results were found.

- (6) SRDB Ref. ID 90154: *Building 7A Health and Safety*. This document contains nine RWPs from Building 7A Sample Plant, totaling 363 pages.

All of the RWPs are dated January through June 2001.

- (7) SRDB Ref. ID 90155: *Building 7, Phase II Health and Safety*. This document contains 23 separate documents totaling 1,519 pages.

The document dates range from 1980 to 1999. Four of the documents were originated before 1997:

- pages 1482–1487, “Material Safety Data Sheets, Pennzoil Products Company,” March 16, 1989
- pages 1490–1506, “Material Safety Data Sheets,” February 28, 1990
- pages 1488–1489, “Material Safety Data Sheets, Valvoline, Inc.,” April 11, 1990
- pages 1480–1481, “Material Safety Data Sheets, Valvoline, Inc.,” December 20, 1990

- (8) SRDB Ref. ID 90508: *Bioassay Records, June – July 1997*. This document contains 14 separate documents totaling 76 pages.

The documents include bioassay results, internal dose assessments, and air monitoring results for [REDACTED] individuals involved in an incident in 1997.

- (9) SRDB Ref. ID 93707: *Radiological Access and Frisking Building 35 August 1998 – September 1998*. This document contains four separate documents totaling 53 pages.

These four documents include radiological access and frisking logs from Building 35 during August and September 1998 and radiological survey maps for Building 35 from September 1998.

- (10) SRDB Ref. ID 93816: *Building 7 Decontamination and Decommissioning Radiological Survey Data, Sampling Data, RWPs, and Health and Safety Evaluations*. This document contains 124 separate documents totaling 1,369 pages.

The document dates range from 1989 to 2001. Seven of the documents were originated before 1992:

- pages 3–13, “Petrology Request 3611: Linoleum Sample for Asbestos Identification, GJPO Building 7,” December 22, 1989

- page 2, “Linoleum Sample, GJPO Building 7,” December 22, 1989
- pages 32–33, “Airborne Radioparticulate Sampling Data Sheet GJPO Building 7 Room 108,” May 21, 1991
- page 19, “Asbestos Abatement of Building 7,” April 19, 1991
- pages 14–15, “Ceiling Tile, GJPO Building 7,” May 9, 1991
- page 478, “Asbestos Building Summary Log Building 7,” June 1, 1991
- pages 34–35, “Airborne Radioparticulate Sampling Data Sheet GJPO Building 7 Attic,” June 28, 1991

SC&A reviewed the two air sampling data sheets for breathing zone air samples obtained May 21 and June 28, 1991, in Building 7, Room 108 and the attic, respectively. Both samples were collected for 20 minutes. The May 21 sample result had a net count rate less than the background measurement. The June 28 sample result had a background count rate of 0.23 counts per minute (cpm) compared with the sample count rate of 0.30 cpm, yielding a net count rate of 0.07 cpm. When converted to air concentration, the sample result is less than the lower limit of detection.

Overall, SC&A did not find any information in the documents cited by NIOSH to support its position that in 1991, the Grand Junction Operations Office had a robust monitoring and dose assessment program that controlled exposures to well below 200 DAC-hours per year.

## References

ANSI N13.6-1966 (R1972). *Practice for Occupational Radiation Exposure Record Systems*, American National Standards Institute, New York, New York. [SRDB Ref. ID 021974]

DOE 1988. *Radiation Protection for Occupational Workers*, DOE Order 5480.11, U.S. Department of Energy. December 21, 1998. Available at <https://www.directives.doe.gov/directives-documents/5400-series/5480.11-BOrder>

Donivan 1987. *Uranium Reference Materials*, DOE/ID/12584-9; Stephen Donivan and Ronald Chessmore, Grand Junction Projects Office, U.S. Department of Energy. July 1987. [SRDB Ref. ID 140369]

Geotech 1990. *Technical Basis for Bioassay Sampling for Sample Preparation Plant and Grand Junction Vicinity Property Workers*, UNC Geotech. March 1990. [SRDB Ref. ID 100231]

Heffelfinger 1981. *Environmental Protection, Safety, and Health Protection Program for DOE Operations*, DOE 5480.1 Chg 6, William S. Heffelfinger, U.S. Department of Energy, Washington, DC. August 13, 1981. [SRDB Ref. ID 11593]

NIOSH 2011. *SEC Petition Evaluation Report for Petition SEC-00175, Grand Junction Operation Office*, Revision 0, National Institute for Occupational Safety and Health. January 11, 2011.

NIOSH 2015. *Addendum to SEC Petition Evaluation Report, Petition SEC-00175, Grand Junction Operation Office*, Revision 0, National Institute for Occupational Safety and Health. March 12, 2015.

SC&A 2015. *A Review of NIOSH's Program Evaluation Report DCAS-PER-047, Grand Junction Operations Office*, SCA-TR-PR2015-0093, Revision 01, SC&A, Inc., Vienna, Virginia. February 10, 2015.

SC&A 2016. *A Focused Review of the NIOSH SEC Evaluation Report for Grand Junction Operations Office, Addendum to Petition SEC-00175*, SCA-TR-2016-SEC006, SC&A, Inc., Vienna, Virginia. May 17, 2016.

## Attachment 1 NIOSH Grand Junction Finding Response

**From:** Tomes, Thomas P. (CDC/NIOSH/DCAS) [REDACTED]  
**Sent:** Wednesday, July 20, 2016 10:22 AM  
**To:** Field, Robert W. (CDC/NIOSH/DCAS); Roessler, Genevieve S. (CDC/NIOSH/DCAS); Valerio, Carmela Loretta R. (CDC/NIOSH/DCAS)  
**Cc:** Katz, Ted (CDC/NIOSH/OD); Neton, Jim (CDC/NIOSH/DCAS); [REDACTED]; Lin, Jenny (CDC/OCCO/OGC)  
**Subject:** Grand Junction Finding Response

To Grand Junction Work Group:

NIOSH has reviewed SC&A's May 2016 report *A Focused Review of the NIOSH SEC Evaluation Report for Grand Junction Operations Office, Addendum to Petition SEC-00175*. The report contained one Finding, which is copied below along with a response from NIOSH.

Tom Tomes  
Health Physicist  
National Institute for Occupational Safety and Health  
Office of Compensation Analysis and Support  
[REDACTED] (office Wednesday, Thursday, and Friday)  
[REDACTED] (telework Monday and Tuesday)  
[REDACTED]

**Finding 1: *Workplace air monitoring data do not support the assumption that unmonitored radiation workers would not have exceeded 200 DAC-hours or that non-radiation workers would not have exceeded 40 DAC-hours in a given year.***

NIOSH Response: NIOSH has found no database or documents from Grand Junction that contain annual DAC-hour totals based on tracking air concentration and time exposed, although NIOSH has documents from the 1990s that describe certain tasks, associated DAC-hours and requests for bioassay. Although NIOSH has no comprehensive database of annual DAC-hour tracking there are documents and data that demonstrate the site implemented a robust monitoring program by 1991 to implement requirements of DOE Order 5480.11. That program ensured monitoring was performed in areas with potential to exceed 10% DAC (derived air concentration), the annual equivalent of 200 DAC-hours, as well as the collection of bioassay samples to assess dose at much lower levels. SRDB Ref ID 97791 contains a copy of the 1991 site *Technical Basis Document for Internal Dosimetry*; it indicates air sampling was required in any occupied area that had the potential to exceed 10% of the DAC. Ref ID 97811 contains a procedure issued in 1990 specifying requirements for Radiation Work Permits (RWPs). Ref ID 97763 contains a compilation of dose assessment for 1991. That file includes annual effective dose equivalents for [REDACTED] cases assessed in 1990 ([REDACTED] off-site intakes) that required an annual dose assessment; a list of 156 workers who had pending bioassay results as of March 1992; and an August 1992 follow-up report indicating that the pending bioassay results were all below the trigger level for occupational exposure and dose assessment. Other documents are available in the SRDB that show various examples in the 1990s of requirements in RWPs, requirements for Rad Tech coverage, respiratory protection when breaching contaminated surfaces, and various documents of surface contamination and air concentration data. Some examples of monitoring include Ref IDs 89872, 89938, 90154, 90155, 90508, 93707, 93816. The available data indicate that by 1991 Grand Junction had a robust monitoring and dose assessment program that controlled exposures to well below 200 DAC-hours per year. NIOSH concludes that the 10% DAC air monitoring

threshold in place in 1991 bounds intakes for individuals who may have been exposed occasionally without being assessed by bioassay sampling.