NIOSH's Response to SC&A's Review of the SEC-00109 LANL Addendum

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Background

- NIOSH issued Addendum to SEC-00109 petition evaluation addressing 1996 - 2011: April 24, 2017
- SC&A was tasked with reviewing the NIOSH addendum: May 4, 2017
- SC&A issued their review of the NIOSH addendum: July 27, 2017

Summary of NIOSH's Addendum

- If a site was compliant with the federal regulation 10 CFR 835, then workers should have been appropriately monitored and their records should have been retained
- If those two requirements were met, then dose reconstruction is feasible
  - NIOSH would review the radiation protection program (RPP) required for a site and determine when DOE approved the RPP
  - NIOSH would review the DOE noncompliance tracking system (NTS) and the Occurrence Reporting system (ORPS) for noncompliance issues associated with 10 CFR 835

Summary of SC&A's Review

- Program compliance with 10 CFR 835, while necessary under DOE's Price Anderson regulatory framework is not sufficient for demonstrating that actual radiation program practice is adequate
- Reliance on oversight findings based on non-compliances or incidents is likewise necessary, but not sufficient, for validating that LANL or any DOE contractor had implemented 10 CFR 835 in a complete and substantive manner
- SC&A also indicated inadequate consideration was given to exposures and missed dose from radionuclides other than those that were well documented (e.g., plutonium, tritium, etc.), especially MFAP

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- Based on the SC&A review and the Advisory Board's reaction, NIOSH decided to re-evaluate our approach for the 10 CFR 835 time period
- NIOSH concurs with SC&A's assessment that: compliance with the 10 CFR 835 milestone may not be sufficient for demonstrating actual implementation of the requirements; and reliance on oversight findings may not be sufficient for validating LANL had fully implemented 10 CFR 835
- NIOSH determined that to increase the "weight of the evidence" additional data analysis would be required

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- The white paper responded to SC&A's specific findings and then provided the additional analysis to support the "weight of the evidence"
- The white paper also includes a table in Appendix A titled *SEC-00109 LANL Petitioner Issues*
- The table includes:
  - The petitioner issues and NIOSH's response
  - The forum the issue brought up (e.g., Petition, meetings, etc.)
  - Supporting documents provided in that forum

NIOSH Response to SC&A issues

- Technical Capabilities to Monitor for MFAP
  - Germanium detectors had been widely used at LANL for in-vivo measurements since the mid-1970s
    - LANL used Germanium Detectors extensively for Whole Body counts of LANSCE workers starting March 1979
  - It is true Phoswich detectors were used as late as 1998, they were used in conjunction with germanium detectors and not exclusively relied upon
    - Over 7000 MFAP in-vivo records using germanium detectors for primarily LANSCE employees

NIOSH Response to SC&A issues cont.

- Technical Capabilities to Monitor for MFAP (continued)
  - Use of exotic radionuclides at LANL were rare especially up into the 1990s
- As pointed out in SC&A's memorandum, LANL noted that its internal dosimetry programs are established on an as-needed basis and monitoring is only required for radiological workers likely to receive 100 mrem annually from internal exposures

Additional “Weight of the Evidence”

- In the white paper, NIOSH re-visited LANL’s fields monitoring program
  - Were the contamination controls and monitoring practices in place to identify and control potential areas where workers could exceed 100 mrem CEDE?
- NIOSH also compared the available bioassay data for monitored LANL workers to the 100 mrem CEDE monitoring threshold
  - How do the doses of the individuals who the site felt were most likely to be exposed above 100 mrem CEDE compare to that threshold?

LANL Field Monitoring Program

Health Physics field monitoring and contamination control program

- Over 60 procedures addressing radiological protection
  - Covering program administration, exposure and contamination control, monitoring, instrumentation, protective equipment, emergency response, and the As Low As Reasonably Achievable (ALARA) program.
- Additionally area-specific procedures and instructions existed

LANL Field Monitoring Program cont.

- NIOSH has captured a number of field monitoring data at LANL for the period under evaluation including:
  - Radiological Work Permits (RWP)
  - Monthly/Quarterly Contamination Surveys
  - Area-specific contamination surveys
  - Area-specific monitoring data quarterly reviews
  - Air sample analysis data
  - Air sampling/monitoring technical evaluations
  - Airborne radioactivity investigation reports

LANL Field Monitoring Program cont.

- NIOSH attempted to review work controls established by reviewing RWP
- During NIOSH's multiple data captures, NIOSH found many boxes of LANL RWPs
  - NIOSH did not capture all but what we feel is a representative sample (several hundred)
  - NIOSH focused on finding RWPs that involved non-routine radionuclides
    - Many RWPs for common radionuclides were also collected

LANL Field Monitoring Program cont.

- General statements can be made from reviewing the RWP's
  - Most require pre-job and/or post-job contamination surveys
  - Most of them specified respiratory protection
  - Most of them required RCT coverage and included stop work or hold points for additional evaluation
  - Most of the work areas included continuous air monitors (CAMs)
  - Many required job-specific air monitoring or breathing-zone air monitoring and associated monitoring were included
  - Several required nasal smears

LANL Field Monitoring Program cont.

- The RWPs generally did not include bioassay requirements. The RWPs appear to have been designed to minimize the likelihood of intakes via engineering controls, PPE, and respiratory protection
- The RWPs were also designed to detect material release via air monitoring and smear surveys
  - Elevated surface or airborne contamination would trigger an assessment of the need for bioassay
- In the white paper NIOSH provided a couple of examples from occurrence reports where field indicators, including CAM alarm, personnel contamination surveys, and nasal smears led to bioassay

Comparison of Monitored Worker Dose to 100 mrem CEDE

- LANL noted that its internal dosimetry monitoring programs are established on an as-needed basis and monitoring is only required for radiological workers likely to receive 100 mrem annually from internal exposure
- LANL further notes:
  - *LANL has in in-vivo monitoring program established for fission and activation products, and has historically used in vivo monitoring for these radionuclides. A spectral analysis of each count was performed by the in vivo staff. During this review, all peaks were identified and quantified*

Comparison of Monitored Worker Dose to 100 mrem CEDE cont.

- NIOSH reviewed the LANL Bioassay Repository Database (ORAUT-)TIB-0063). The database includes 106,950 in-vivo records
  - Pu-239 and Am-241 make up 82% of the records
  - U-234 and Th-234 make up 10% of the records
  - Bulk of the remaining 7000+ records is primarily comprised of fission and activation product radionuclides for LANSCE employees that were acquired via germanium detectors

Comparison of Monitored Worker Dose to 100 mrem CEDE cont.

Primary Radionuclides (Tritium, Plutonium, and Uranium)

- There are over 450,000 LANL urinalysis records for 1945 through 2008
- As previously mentioned there are over 100,000 in-vivo records
- The data are presented and evaluated in the *Internal Dosimetry Coworker Data for LANL* (ORAUT-OTIB-0062)
- Tables 5-1 through 5-7 of the white paper are tables taken from OTIB-0062. They show for the primary radionuclides:
  - Dose for monitored workers generally goes down over time
  - Dose for monitored workers are less than 100 mrem CEDE with one exception

Appendix A – LANL Petitioner Issues and Resolutions

- A number of issues have been identified by the petitioner over the course of several years
- The petitioner has provided a vast amount of supporting documents in support including:
  - Petition with 102 page written narrative
  - CD with a number of documents
- The petitioner has also been very active in Advisory Board meetings and work group meeting
- Appendix A identifies the petitioner issues and provides NIOSH's response to those issues

Conclusion

- The field monitoring and contamination control programs at LANL were well-established and formalized by January 1, 1996 to ensure areas where workers were likely to exceed 100 mrem CEDE were well identified and controlled
- Based on review of existing bioassay results, workers monitored for the primary radionuclides were unlikely to have received intakes exceeding 100 mrem CEDE
- Based on the routine monitoring and contamination control established NIOSH has no reason to believe intakes of exotic radionuclides for unmonitored workers would be different