SC&A Review of Los Alamos National Laboratory Internal Dose Topics (RPRT-0103)

Bob Barton, SC&A, Inc.

Advisory Board on Radiation and Worker Health, Los Alamos Work Group

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SC&A's Findings and Observations Regarding Review of RPRT-0103: Review of Potential Exposure to Exotic Radionuclides Using Radiological Work Permit Data at Los Alamos National Laboratory

RPRT-0103 Finding 7: Adequate implementation of monitoring regarding exotic radionuclides

- **Finding 7.** SC&A finds that RPRT-0101 and RPRT-0103 do not demonstrate that nonroutine job-specific bioassays were adequately evaluated for potential operational exposures to exotics, and that Los Alamos National Laboratory (LANL) monitoring programs were being adequately implemented to ensure that unmonitored workers were unlikely to receive intakes resulting in 100 millirem (mrem) committed effective dose equivalent (CEDE).
- **Basis:**
  - While NC ID 484 did reference routine bioassay programs for plutonium, identified deficiencies (e.g., missing radiological work permit (RWP) bioassays) directly impact adequacy and completeness of bioassays for other exposures at LANL, notably for exotics, including mixed activation products (MAPs) and mixed fission products (MFPs).
  - 100 mrem/year is bounding for exotic radionuclide exposure sources if (1) it can be demonstrated that nonroutine, RWP-driven, job specific bioassays are sufficiently complete (and representative) for exposure sources, and (2) bioassay enrollments and job-specific bioassay requirements applying that monitoring threshold were adequately implemented. SC&A finds that the sampling reviews and program evaluations in RPRT-0101 and RPRT-0103 do not provide these demonstrations for exotics.

RPRT-0103 Finding 8: Procedural structure of exotic radionuclide monitoring program

- **Finding 8.** The results in RPRT-0102 for routine plutonium monitoring are not transferable to nonroutine, job-specific sampling for exotics, which was much more discretionary and based on individual line management or radiological control technician judgments about job-related exposure potential.
- **Basis.** Presumption of compliance with Title 10 of the Code of Federal Regulations (10 CFR) Part 835 already settled; should not assume monitoring was adequate on Jan. 1, 1996, and that robustness of plutonium monitoring is transferable to monitoring for exotic radionuclides.
  - NC ID 484 (1999 LANL self-assessment) demonstrated wide deficiencies in routine bioassay monitoring programs, including workers being on inappropriate bioassay programs.
  - Work with exotic radionuclides was intermittent, often experimental and bench scale, and very job specific at LANL; may have involved Johnsons Control subcontractors who lacked adequate enrollment.

RPRT-103 Observations 7–9: Analysis of work permits

- **Observation 7.** During the period of interest from 1996 to 2005, SC&A identified 34 RWPs covering 147 workers who had tritium bioassay specified. Of these 147 RWP worker combinations, SC&A found that approximately 73% were appropriately monitored throughout the assumed job period, 5% were partially monitored, and 22% were unmonitored.
- **Observation 8.** SC&A identified a single RWP covering 10 workers that specified uranium monitoring in addition to plutonium urinalysis. [Redacted] of the 10 workers did not have [redacted] monitoring identified, [redacted] of 10 only had [redacted] monitoring, and [redacted] had unclear records due to an [redacted].
- **Observation 9.** SC&A identified 24 individuals with positive nasal contaminations and evaluated their internal monitoring records. The number of individuals with followup monitoring varied from 14 to 17 (58% to 71%) depending on certain assumptions about undated records and potentially invalid positive nasal swipes.

LANL self-assessments after 1995

- **LANL self-assessment, submitted to the U.S. Department of Energy (DOE) as NC ID 484 (1999):** Found potential data gaps for bioassay enrollments and RWP job-specific bioassay participation for primary radionuclides such as plutonium, raising broader concerns and questions regarding sitewide bioassay data completeness.
- **DOE-Los Alamos Area Office programmatic assessment of LANL internal dosimetry program, January–February 2001:** Found "the majority of the line managers interviewed had not performed the annual review of the status of personnel in the routing [sic, routine] bioassay program as required by the requirements in LIR 402-706-01.1 [LANL's monitoring procedure]."
- **NC ID 1219, February 2002:** Found software connectivity issues had led to incorrect listings of dosimetry assignments with 23 workers (about a quarter of those sampled) on less conservative dosimetry as required by 10 CFR 835.402(a)(1) and 835.402(c)(1).

NIOSH "weight of evidence" conclusion in RPRT-0101

"In this report, the ORAU [Oak Ridge Associated Universities] Team has discussed the LANL radiological control program and demonstrated that contamination was well controlled in TA-3, TA 48, and TA-53. Data evaluated in Section 3.0 shows that LANL controlled routine contamination that could lead to doses greater than 100 mrem at all three TAs [technical areas]. While data used in the report are not the total set of data collected by LANL, the weight of evidence supports that premise. The ORAU Team has shown that LANL operated a radiation protection and control program that included the use of portal monitors to identify and remediate workplace radiological contamination. LANL Health Physics responded to even small levels of contamination."

RPRT-0103: SC&A conclusions

- SC&A agrees that LANL performed routine contamination control and monitored its workers for radiological conditions for specific work covered by the RWPs selected.
- However, SC&A disagrees that this very limited and subjective review of radiological control technician coverage and contamination control functions addresses the fundamental issue raised by NC ID 484 as it pertains to exotic radionuclides:
  - From a data analysis standpoint, does the bioassay incompleteness identified in the limited sampling in 1999 reflect a broader incompleteness in LANL's bioassay monitoring for 1996–2000?
  - From a program standpoint, did LANL line management adequately perform facility and job exposure characterizations to identify needed bioassays and ensure proper bioassay enrollment of workers for potential internal exposures, notably, for exotics?

SC&A Summary Conclusions Regarding SEC-0109 Internal Dose Topics for the Los Alamos National Laboratory (1996–2005)

SC&A's recommended basis for "weight of evidence"

SC&A believes any such "weight of evidence" argument needs to be founded on objective evidence that is based on more independent and evaluative considerations:

- Actual validated operational practice or experience, versus program descriptions, procedures, or organizational intent
- Objective and representative sampling versus subjective or selective sampling of monitoring results: data should be representative of time, location, and job tasks
- Independent or external means of assessing radiological control program performance should be emphasized

SC&A overall summary conclusion

LANL-wide programmatic implementation of the requirement at 10 CFR 835.402(c)(1) for monitoring of potential internal exposures of 100 mrem/year CEDE, the basis for NIOSH's proposed bounding dose for unmonitored workers during 1996–2005, is found to be of questionable adequacy, with major deficiencies not corrected until at least the end of 2000. This inadequacy undercuts the use of that threshold dose as bounding for unmonitored worker exposure to mixed activation products (MAPs), mixed fission products (MFPs), and other exotic radionuclides.

Questions?