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**Draft**

**REVIEW OF RESPONSIVENESS TO WORKER COMMENTS  
FOR LOS ALAMOS NATIONAL LABORATORY**

**Contract No. 211-2014-58081  
SCA-TR-RC2014-0002, Revision 2**

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<b>S. Cohen &amp; Associates:</b>  <i>Technical Support for the Advisory Board on  Radiation &amp; Worker Health Review of NIOSH  Dose Reconstruction Program</i>	Document No. SCA-TR-RC2014-0002
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Task Manager:  _____ Date: _____ Joseph Fitzgerald	Supersedes:  Rev. 1
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### Record of Revisions

Revision Number	Effective Date	Description of Revision
0 (Draft)	05/14/2014	Initial issue
1 (Draft)	06/05/2014	Revision 1 addresses two errors in percentages on page 26.
2 (Draft)	06/11/2014	Revision 2 incorporates an Addendum at the end of the document providing summary results for NIOSH consideration of technical information.

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## ABBREVIATIONS AND ACRONYMS

ATL	Advanced Technologies and Laboratories International, Inc.
ABRWH or Advisory Board	Advisory Board on Radiation and Worker Health
CFR	Code of Federal Regulation
CMR	Chemistry and Metallurgy Research
DCAS	Division of Compensation Analysis and Support
D&D	Decontamination and Decommissioning
DOE	(U.S.) Department of Energy
DR	dose reconstruction
EEOICPA	Energy Employees Occupational Illness Compensation Program Act of 2000
ER	Evaluation Report
FRC	Federal Records Center
LANL	Los Alamos National Laboratory
LANSCCE	Los Alamos Neutron Science Center
MAP	Mixed Activation Products
NIOSH	National Institute for Occupational Safety and Health
NTS	Nevada Test Site
OCAS	Office of Compensation and Analysis Support
ORAU	Oak Ridge Associated Universities
ORAUT	Oak Ridge Associated Universities Team
OTS	Outreach Tracking System
PPE	Personal Protective Equipment
RFP	Rocky Flats Plant
SC&A	S. Cohen and Associates (SC&A, Inc.)
SEC	Special Exposure Cohort
SNL	Sandia National Laboratory
SRDB	Site Research Database
TA	Technical Area
TBD	Technical Basis Document
TLD	thermoluminescent dosimeter
TopHat	Toxicological Profile and Health Assessment Toolkit

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WISPR            Worker Input to Site Profile Revisions  
WOWG            Worker Outreach Work Group

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## EXECUTIVE SUMMARY

The Worker Outreach Work Group (WOWG) of the Advisory Board on Radiation and Worker Health (ABRWH or Advisory Board) defined four objectives in its charter, of which one addressed whether or not the National Institute for Occupational Safety and Health (NIOSH), through its Division of Compensation Analysis and Support (DCAS), is “giving thorough consideration to information received from workers through the worker outreach efforts.” As a follow-up to the *Pilot Review of Responsiveness to Rocky Flats Plant Worker Comments*, conducted by S. Cohen and Associates (SC&A 2012), the current review evaluates the disposition of information received from workers and representatives in regard to Los Alamos National Laboratory (LANL). Whereas the pilot review included assessment of NIOSH’s direct feedback to commenters, the scope of the current review is focused on what consideration was given to that information. The review seeks to determine the extent to which DCAS has documented, considered, and incorporated into technical documents the substantive information received. NIOSH issued two revised technical basis documents (TBDs) for the LANL site profile while SC&A’s review was in progress, and these documents were evaluated as sources of NIOSH consideration.

The scope of the Rocky Flats Plant (RFP) Pilot Review was quite broad in terms of venues, issues, and timeframe of comment receipt. This breadth of scope served to raise awareness of the many pathways through which substantive site information may be communicated to DCAS, and the difficulty of assuring that all information is evaluated on the basis of its technical relevance and significance, regardless of venue. The vast majority of comments evaluated for the RFP Pilot Review were received from 2004 through 2007, an early stage of development for the outreach program, and not necessarily indicative of current practice. The selection of the LANL site, with its recent Work Group review activity, was expected to shed light on the effectiveness of improvements that had been implemented within the Worker Outreach program over time. However, the actual timeframe represented by the LANL comments and interviews was not as current as expected. While the timeframe open to consideration extended from June 2005 through August 2012, the actual period represented by the comments did not change significantly from the pilot review. Ninety-eight percent (98%) of comments for the RFP pilot review were received prior to 2008. Ninety-five percent (95%) of comments evaluated for the LANL review were received prior to 2009. Since OCAS-PR-010, *Data Access and Interview Procedures* (OCAS 2009a), and OCAS-PR-012, *Worker Outreach Program* (OCAS 2009b), were originally issued in 2009, this follow-up study provides a limited glimpse of the impact of programmatic changes over time.

The LANL Worker Outreach review sought to evaluate NIOSH’s evolving documentation practices, including the completeness of meeting files in the Outreach Tracking System (OTS), documented communications, site expert validation of interview notes, and the identification and resolution of Action Items. Several Worker Outreach meetings have been held to gather input for the LANL site profile and the SEC evaluation. When SC&A identified comment sources and collected comments for review, meeting minutes were available for 12 of the 15 meeting sessions held during the evaluated period. Minutes of the remaining three sessions have subsequently been added to OTS. In contrast, the number of site expert interviews available on the SRDB is quite small and is heavily focused on acquisition and interpretation of monitoring

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records. While general site-related interviews appear to have been conducted for the SEC-00109 petition evaluation, they are not readily identifiable in the SRDB or SEC Viewer databases, and they do not appear to constitute a significant data source for the evaluation reports (NIOSH 2009, NIOSH 2012). SC&A is unable to estimate the completeness of NIOSH’s interview documentation or site expert validation of interview notes in any quantitative fashion.

Another facet of outreach documentation considered in the LANL review is the generation of Action Items in the OTS. Some SC&A conclusions for individual comments (Comments 1, 6, 23, 24, and 77) noted that NIOSH’s apparent interest in further follow-up was not identified as an Action Item. In retrospect, SC&A recognizes that NIOSH had no programmatic expectation to document “Action Items” in 2005 and 2008, when the LANL Worker Outreach meetings were held. While certain discussions might appear to warrant Action Items under the current procedure, this guidance was not in effect during the timeframe of the LANL outreach meetings.

The other key element of the Worker Outreach review is NIOSH’s consideration of technical information provided by the commenters. Evidence available to SC&A for review includes direct responses to the commenters (documented in transcripts and correspondence), follow-up interviews, retrieval of site records, transcripts of Advisory Board and Work Group meetings, discussion papers, and technical work documents. The outreach review process also solicits direct input from DCAS, primarily through the NIOSH Evaluation Comment field in the individual comment review form. All of these sources of evidence were assessed separately and contributed to a general assessment of NIOSH’s overall responsiveness for each comment.

SC&A found that many (but not all) of the technical statements and input found their way into NIOSH technical documents and were adequately addressed. SC&A found some evidence of NIOSH responsiveness to technical issues and information for 90% of the comments, and over 80% were incorporated to some degree in LANL technical documents and SEC Evaluation Reports (ERs). Less than 3% of the comments were assessed as non-responsive. Twelve (12) comments were assessed as having negative, incomplete, or inconclusive NIOSH responsiveness (15% of the comment evaluations). Timeliness of responses was not evaluated.

One concern noted by SC&A is a tendency for NIOSH to use an LANL SEC class as a blanket response when evidence of consideration is not readily available. Several classes have been added to the SEC and now include all LANL workers through 1995. SC&A has referenced ERs and revised TBDs as evidence of consideration for multiple comments and issues addressed in these documents (even when the issue was addressed in very general terms or long after the comment was received). However, the recommendation of an SEC class, in itself, does not effectively demonstrate consideration of all substantive issues and concerns that occurred during the covered period.

Again, while notable, these stood out as exceptions to a posture of overall responsiveness and may reflect a yet evolving interpretation of worker outreach responsibilities at an early timeframe of the EEOICPA program.

As noted in previous reviews of the outreach program (SC&A 2007, SC&A 2010a, SC&A 2012), NIOSH has historically lacked a comprehensive application for logging and tracking the

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disposition of technical information and concerns presented by commenters through all available venues of communication. The TopHat and WISPR databases served this function for comments received at Worker Outreach meetings from approximately 2004 through 2008, but the full spectrum of comments was not captured programmatically, and the contents of these databases are no longer available to SC&A. Only legacy Action Items from WISPR have been included in the current OTS database. In the absence of systematic documentation of comments and their disposition, NIOSH’s investigations are difficult to associate with inputs received, and “responsiveness” can often be assessed only in general terms. While there is value in observing that most substantive issues were ultimately considered, the review cannot conclusively assess NIOSH’s actual responsiveness to the specific comments received.

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## 1.0 INTRODUCTION

A principal part of the mission defined for the Advisory Board on Radiation and Worker Health's (ABRWH's) Worker Outreach Work Group (WOWG) is “to evaluate the effectiveness of NIOSH activities in obtaining and making use of information from current and former workers and their representatives.” Objective #3 of this plan further expands upon this goal:

*Evaluation Objective #3: Determine whether OCAS<sup>1</sup> is giving thorough consideration to information received from workers through the worker outreach efforts, incorporating consideration of that material into its work products, as appropriate, and adequately communicating the impact of substantive comments to workers. (ABRWH 2010a)*

The WOWG began its evaluation of the worker outreach program through a review of the Worker Outreach procedure and database records, as well as direct observation of outreach activities (SC&A 2010a). Findings included:

1. A lack of direction for tracking, trending, evaluating, or responding to worker input
2. Absence of criteria for identifying Action Items and evaluating the adequacy and timeliness of response/resolution
3. Incomplete documentation in the Outreach Tracking System (OTS) for meetings conducted during the effective period of OCAS-PR-012 (OCAS 2009b)
4. Lack of consideration and equivalent documentation requirements for venues other than worker outreach meetings
5. No process for meeting participants to review draft minutes for accuracy and completeness

A follow-up review of OTS documentation (SC&A 2010b) and an issues matrix were employed to track resolution of findings and observations from the OCAS-PR-012 review. To facilitate resolution of an open item from SC&A's review of an earlier Worker Outreach Program procedure (SC&A 2007), SC&A also compiled a list of site profiles that had been developed without worker outreach meetings (Robertson-DeMers 2011).

NIOSH's consideration of worker input, incorporation of information into technical work documents, and communication of the impact of substantive comments to workers proved relatively difficult to assess. The approach taken to date, in the Rocky Flats Plant (RFP) pilot review and the current LANL review, has been to focus on inputs received over the full course of outreach activities for a specific covered facility, from site profile rollout meetings through resolution of Special Exposure Cohort (SEC) petitions.

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<sup>1</sup> Now the Division of Compensation and Analysis Programs (DCAS)

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## 1.1 PILOT REVIEW – ROCKY FLATS PLANT

The draft implementation plan for the Rocky Flats Plant (RFP) pilot study (SC&A 2010c) described a process for identifying substantive comments, determining the outcome of comment considerations, and evaluating direct follow-up communications with commenters. From 549 comments identified by SC&A, a sampling plan was utilized to select a representative sample of 101 comments for review (SC&A 2011). SC&A was instructed not to make a technical judgment of the accuracy or validity of the NIOSH response or position. Given NIOSH's more direct access to key staff and communications, the review process included an opportunity for DCAS to respond to SC&A's initial observations before SC&A developed its final conclusions and summary report.

The *Pilot Review of Responsiveness to Rocky Flats Plant Worker Comments* (SC&A 2012) was completed and issued in August 2012. SC&A presented its observations at the August 2012 WOWG meeting (ABRWH 2012a), and NIOSH provided a response at the November 2012 WOWG meeting (ABRWH 2012b). About half of the 101 comments received a direct response within 6 months, with response rates somewhat dependent on the comment submission venue. Most of the technical issues cited by commenters (94%) were formally considered and evaluated at some point. The review process did not explore the extent to which modifications to technical documents were based on information received through outreach venues, but it did confirm that most of the technical issues of interest to the outreach participants were ultimately addressed in NIOSH review proceedings. SC&A assessed NIOSH's consideration as adequate for 85% of the comments reviewed, with 15% of comments assessed as "not considered" or as having "lacking, unclear, or incomplete" consideration.

SC&A noted that the formal Worker Outreach Program effectively documented comments, immediate responses, and consideration of technical information received through outreach meetings during the timeframe of the RFP site profile and SEC discussions. Comments received at Worker Outreach meetings in 2004 were documented in transcripts. Comments requiring further follow-up were logged into the TopHat database (Toxicological Profile and Health Assessment Toolkit) and later transferred to the WISPR database (Worker Input to Site Profile Revisions), where their resolution and impact on technical documents were clearly documented.

In more general terms, documentation of comments and responses tended to vary based on the venue in which comments were made. In the period covered by the pilot review, responses were well documented for comments received through Worker Outreach meetings and during Board or Work Group discussions specific to RFP. Documentation of direct responses was less consistent for petitioner presentations and public comment sessions at Advisory Board meetings; neither of these venues typically provides opportunities for immediate NIOSH response and discussion. Information submitted with an SEC petition did not receive direct responses within 6 months, but evidence of consideration was provided in the Evaluation Report (ER) and through the Work Group review process.

Some concerns were noted regarding documentation of site expert interviews; validation of interview notes was inconsistent and poorly documented, and some information provided by

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interviewees was not acknowledged or reflected in subsequent evaluations. Inconsistencies in information received from an individual site expert were not resolved.

SC&A recommended actions and inquiries for Work Group consideration, including:

1. Clarification of current expectations, practices, and procedures affecting outreach communications
2. Clarification of NIOSH self-evaluation and efforts to assure continual improvement in outreach communications
3. Consideration of institutional or management system for tracking and following up on worker comments in an integrated fashion, including responsibility for assuring responsiveness, timeliness, and accountability
4. Consideration of staff training and guidance in effective worker outreach communications
5. Solicitation of worker feedback on the effectiveness of outreach communications
6. Consideration of a follow-up review of more recent site-specific worker outreach experience to gauge the effectiveness of programmatic improvements

NIOSH has responded to five of these recommended actions and inquiries (the sixth recommendation was directed to the Work Group), as described below.

## **1.2 NIOSH RESPONSE TO PILOT REVIEW**

In its response to the Work Group in November 2012, NIOSH described its position on comment venues for which it had acknowledged opportunities for improvement. Several of these responses addressed direct feedback to commenters, which was a primary focus of the pilot review.

With regard to venues where direct responses were lacking, NIOSH clarified expectations and discussed improved practices. Information submitted with SEC petitions is addressed in the ER and through subsequent Board discussion; direct responses to individual commenters are not expected. For public comments at Board meetings, a process has been developed for tabulating comments, developing responses when appropriate, and referring comments to the appropriate Work Group. Public or petitioner comments at Work Group meetings are disposed by Work Group discussion; individual participants can follow these discussions to find out how the information they provide is treated. The longstanding practice of placing Work Group transcripts on the DCAS web site facilitates public access to Work Group deliberations. NIOSH now posts white papers and other discussion items to the web site as well, often in advance of Work Group meetings; this practice further enhances public access to the Board and Work Group proceedings. NIOSH concluded that specific process improvements are in place to address the majority of “opportunities for improvement” it had acknowledged in the pilot review.

In response to these recommendations, current expectation is that DCAS staff will respond to correspondence that requires a response, as soon as possible, using the same method of

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communication as the original correspondence (e-mail, conventional mail, etc.). DCAS tasks its outreach contractor, Advanced Technologies and Laboratories International, Inc. (ATL), with reviewing Advisory Board meeting transcripts to identify and list public comments. DCAS prepares responses, when appropriate, and forwards the list and responses to the Board. Comments related to ongoing Subcommittee or Work Group discussions are forwarded to the Chairs of the respective groups. DCAS management has communicated awareness that any DCAS staff members attending any activity where claimants, advocates, and other members of the public are present are potential conduits of “worker outreach” information. For comments and questions communicated publicly or privately, expectations for documentation and responsiveness include:

1. Provide an immediate response. No specific documentation or follow-up is required if the question or comment is addressed to the individual’s satisfaction.
2. Encourage the individual to send the question by mail or e-mail. This places the question in an existing tracking system and assures that it is not misstated by DCAS staff.
3. DCAS staff travel with note cards for documenting comments, questions, and contact information to facilitate responses. When a computer application is developed for tracking comments and questions, the note cards will be used as a source for data entry.
4. Minutes of meetings, when prepared, are entered into the SRDB and are procedurally required to be considered during any subsequent revisions to technical documents. DCAS attendees may capture comments on note cards or review the minutes for relevant comments. In either case, the comments will be entered into the computer application for tracking.

NIOSH has not defined a specific strategy for ongoing internal self-assessment of worker outreach, although the 10-Year Review and the development of an integrated tracking system are expected to facilitate self-assessment. Once an application is developed for managing comments and responses, the communications team lead will likely have a lead role in assuring that comments are handled appropriately. The Work Group asked NIOSH to consider making the new application accessible to the Board and Work Group.

Management expectations for outreach communications are communicated through staff and contractor training. Outreach expectations are covered periodically at health physics staff meetings and may be discussed in staff calls, conference calls, and other routine interactions.

ATL solicits feedback from participants in dose reconstruction and SEC workshops; class evaluations are reviewed for potential modifications to the workshop. DCAS does not currently use any other systematic process to specifically solicit and respond to worker feedback on the effectiveness of its outreach program. Workers are free to comment on outreach through any of the venues established for worker input.

### **1.3 ACCOMPLISHMENTS**

Several positive outcomes have emerged through the process of Work Group evaluations. Some of these outcomes involve development of new processes, while others capture and communicate

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practices that were already in place. A strategic approach has been developed to document and facilitate follow-up on information received through public comments at Advisory Board meetings. Legacy comments and Action Items from the WISPR database have been imported to OTS. At the Work Group meeting in November 2012 (ABRWH 2012b), NIOSH presented a rationale for determining the potential value of future outreach activities at facilities for which worker outreach had not been conducted during development of site profile technical basis documents (TBDs).

NIOSH presented a revised Worker Outreach procedure to the Work Group in November 2012 and issued it the following month (DCAS 2012); all matrix items specific to the DCAS-PR-012 procedure were resolved to the Work Group’s satisfaction. The new procedure clarifies documentation requirements for outreach activities and provides participants with the opportunity to review and comment on draft notes or minutes. It clearly communicates the potential for DCAS to receive substantive information at any type of outreach meeting, whether the primary intent of the meeting is information gathering or giving. Appendix E, which provides detailed guidance for identifying, recording, tracking and resolving Action Items, specifically addresses multiple concerns regarding procedural expectations for recording and responding to worker input. Documentation of Action Items in OTS includes initial entry of an issue, assignment of an item owner, projection of a completion date, status updates, and “Resolution Details,” including the impact (if any) on a technical document. Indicators of potential Action Items include (at a minimum) discussions in which:

1. An error or inadequacy in a site profile or technical document is pointed out
2. New information not previously considered may have an impact on a technical document
3. A follow-up is needed to address a question, a request, or a need to look for additional information

The majority of observations from reviews of Worker Outreach procedures have been resolved to the Work Group’s satisfaction with the issuance of DCAS-PR-012, Rev. 1 (DCAS 2012). Several venues through which NIOSH receives worker input are beyond the scope of DCAS-PR-012, but NIOSH has reported that a new database is being developed to consolidate comments from multiple outreach venues. As of November 2012, technical staff had begun to assess data needs; no timeline had been projected for database development and implementation (ABRWH 2012b).

#### 1.4 LANL REVIEW

During the November 2012 meeting, the WOWG selected the Los Alamos National Laboratory (LANL) site for its next review under Objective #3, and SC&A was tasked with preparing a draft evaluation plan for Work Group review and approval. Factors influencing site selection include recent completion of site profile or SEC review activities, availability of current technical documents to review for responsiveness, and an adequate volume of worker input.

The LANL review seeks to determine the extent to which DCAS has documented, considered, and incorporated into technical documents the substantive information received from workers in regard to LANL. The timeframe open to consideration in this review ranges from the first site

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profile rollout meetings (June 2005) through issuance of the revised ER for SEC Petition SEC-00109 (August 2012).

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## 2.0 REVIEW GUIDELINES

Based on experience gained during the RFP pilot study, the following considerations guided SC&A’s review of NIOSH responsiveness.

1. SC&A did not make a technical judgment of the accuracy or technical validity of a NIOSH response.
2. This review focused on assessing NIOSH’s consideration and disposition of the substantive information and concerns raised by commenters. SC&A did not evaluate NIOSH’s “quality of service” in terms of providing direct feedback to individual commenters.
3. Comments received during an ABRWH meeting or an ABRWH Work Group meeting, unless received informally, are transcribed and subject to formal tracking; therefore, such comments were not addressed in this review.
4. While “statements for the record” or provision of general information for the benefit of NIOSH do not imply the need for a response, SC&A included statements that provided substantive technical information for NIOSH consideration.

### 2.1 ELEMENTS OF REVIEW

At the November 2012 Work Group meeting and through subsequent correspondence, the following actions were presented and accepted by the Work Group as elements of the LANL review:

1. Identify substantive worker comments related to LANL from the inception of the worker outreach program (beginning with the first LANL Outreach Meeting in 2005) through the issuance of the revised Evaluation Report (ER) for SEC petition 00109 (August 13, 2012).
2. Identify NIOSH technical documents and work products supporting its dose reconstruction responsibilities under the EEOICPA (e.g., TBDs, SEC ERs, NIOSH guidance documents and white papers).
3. Where applicable, identify and document NIOSH’s incorporation of worker input into these technical documents.
4. Where applicable, evaluate documentation practices over time, such as site expert interview notes, outreach meeting documents, and Action Items, to illustrate programmatic means of tracking incoming comments.
5. Provide the WOWG with its findings regarding to what extent worker input, as conveyed in comments and other means identified in this review, were appropriately reflected in NIOSH program documents for LANL.

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## 2.2 REVIEW PROCESS

SC&A received input from NIOSH during an initial scoping exercise to identify potential sources of comments, and SC&A provided a catalog of potentially relevant comments to the Work Group with a draft Implementation Plan in February 2013 (SC&A 2013a). These steps were undertaken to determine if some form of sampling would be necessary to keep the review manageable. A total of 87 comments were identified during the initial scoping activities. Since this number was lower than the ultimate sample set reviewed in the pilot study, no statistical sampling regime was deemed necessary for the LANL review. Later consolidation and evaluation of comment sources resulted in a final set of 78 comments.

An internal “Review of Comment” form was used to structure the input and analysis for evaluation; the individual forms for each of the 78 comments evaluated by SC&A are provided in Appendix 2. New revisions of LANL TBDs for Occupational External Dose (ORAUT 2013a) and Occupational Internal Dose (ORAUT 2013b) were released during SC&A’s initial review of the comments (March 21, 2013, and April 18, 2013, respectively). These revisions provided an opportunity for SC&A to access updated and relatively detailed position statements reflecting NIOSH’s consideration and disposition of many issues.

SC&A provided a “working draft” of the individual comment review forms (SC&A 2013b) to the Work Group and NIOSH representatives on June 6, 2013. SC&A invited NIOSH to review the individual comment evaluations for representativeness and to address any missing information. NIOSH returned the working copy with completed “NIOSH Evaluation Comments” (NIOSH 2013), which SC&A received on January 7, 2014. SC&A subsequently reviewed the NIOSH Evaluation Comments, completed conclusions regarding the disposition and NIOSH responsiveness for each individual comment, and prepared this summary report.

## 2.3 RESULTS/OBSERVATIONS

The selection of a site with more recent Work Group review activity was expected to shed light on the effectiveness of programmatic improvements over time. However, possibly due to elimination of Advisory Board and Work Group meetings as sources of worker comments, the actual timeframe represented by the LANL comments and interviews was not as current as expected. While the timeframe open to consideration extended from June 2005 through August 2012, the actual period represented by the comments did not change significantly from the pilot review. Ninety-eight percent (98%) of comments for the RFP pilot review were received prior to 2008. Ninety-five percent (95%) of comments evaluated for the LANL review were received prior to 2009. Of the four comments received from 2009 through 2012, three were obtained from claimant communications and one was an “impromptu interview” that apparently occurred spontaneously during a data capture activity. Since both OCAS-PR-010, *Data Access and Interview Procedures* (OCAS 2009a), and OCAS-PR-012, *Worker Outreach Program* (OCAS 2009b), were originally issued in 2009, this follow-up study provides a very limited glimpse at the impact of programmatic changes over time.

As stated in the introduction, the LANL Worker Outreach review seeks to determine the extent to which DCAS has documented, considered, and incorporated into technical documents the

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substantive information received from workers in regard to LANL. The following sections present results and observations relevant to these three major facets of the review.

### 3.0 DOCUMENTATION OF INPUT RECEIVED THROUGH OUTREACH

Previous reviews of the Worker Outreach Program procedures and implementation have included observations regarding NIOSH’s documentation of worker comments and site expert interviews. In the procedural review of OCAS-PR-012, SC&A observed that few Action Items have been recorded in OTS. In the RFP pilot outreach review, interview notes were not available for several interviews that were referenced during Advisory Board and Work Group meetings, and site expert validation of interview notes was inconsistent and poorly documented.

Documentation of worker input was specifically included as a component of the LANL Worker Outreach review. Some deficiencies were noted during scoping and review activities.

Unfortunately, as noted above, the timeframe of comments identified for the LANL review is not significantly more current than those reviewed for the pilot study. Deficiencies and observations noted herein may not necessarily reflect the current status of the outreach program.

#### 3.1 OUTREACH MEETING FILES IN OTS

According to OTS records, seven Worker Outreach and SEC meetings were conducted within the evaluated period (June 2005–August 2012). Some of these meetings consisted of multiple sessions that NIOSH held to accommodate shift workers, so that the total number of worker outreach meeting sessions for this period is 15. The current status of LANL outreach meeting documentation is reflected in Table 1.

**Table 1. LANL Outreach Meetings and Files**

Meeting Information			Files Available in OTS							
OTS ID	Meeting Date	Number of Sessions	Files Added to OTS	Notice	Correspondence	Sign-In	Presentation	Draft Minutes	Final Minutes	Action Item
OTS-77	06/18/2005	1	10/19/2010	X	X	X	X	X	X	
OTS-78	06/20/2005	1	10/19/2010			X	X	X	X	
OTS-83	08/16/2005	4	10/19/2010	X	X	X	X	X	X	X
OTS-96+	05/09–10/2007	3	10/08/2010		X					
			12/05/2013			X				
OTS-16	09/16/2008	4	06/12/2009		X	X			X	
			10/20/2010	X						
OTS-17	09/17/2008	1	06/12/2009		X	X			X	
			10/20/2010	X						
OTS-18	09/17/2008	1	06/12/2009		X	X			X	

+ Meeting was not utilized as a source of comments for the LANL Worker Outreach review.

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When SC&A identified comment sources and collected comments for review, meeting minutes were available for 6 of the 7 meetings (12 of 15 meeting sessions). Minutes were not available for OTS-96, a series of three sessions held May 9–10, 2007. An explanation received from ATL indicates this was an isolated occurrence caused by a combination of factors related to a contract termination and technical difficulties. ATL was previously subcontracted by ORAU (the contract terminated within a week prior to OTS-96), and has subsequently contracted directly with NIOSH to provide outreach services. Professional recording equipment was not available, a project member had recorded the meeting on a personal recording device, and the recording had not been transcribed into a formal transcript or minutes. Minutes of the three meetings were added to OTS on December 5, 2013.

### 3.2 INTERVIEWS

SC&A noted during scoping activities that site expert interviews and documented communications for the LANL review were quite limited. Only eight “Documented Communications” were identified in the Site Research Database (SRDB) for the period of interest (2005–2012), and three of these files were discussions with current records personnel regarding coordination of a data capture request. As it seemed unlikely that NIOSH only conducted 5 substantive interviews with LANL workers over a 7-year period, SC&A concluded that the documentation available on the SRDB and SEC Viewer may be incomplete. Some efforts were expended before, during, and after the individual comment evaluations to assess the completeness of interview documentation.

The current Worker Outreach review plan invited NIOSH to participate in the initial scoping exercise (to identify relevant records) and to provide a response to SC&A’s individual comment reviews. Although SC&A noted a lack of interview documentation in both phases of the review, NIOSH did not provide additional interview notes.

NIOSH’s immediate responses to some commenters (refer to Comment 6 and Comment 67) indicated staff members’ interests in interviewing individuals on certain topics, but follow-up communications were not identified. The only clear statement indicating that an interview had been conducted was provided in response to Comment 9. NIOSH representatives at the outreach meeting described an interview they had conducted with a former Health Physics Tech, who provided guidance in finding and retrieving monitoring data of interest for dose reconstruction. SC&A did not identify documented communication consistent with this description. All of these discussions pre-dated OCAS-PR-010 (OCAS 2009a).

The source of Comment 35 is described as an “impromptu interview” that occurred within the effective period of OCAS-PR-010 (February 2012). Documentation of the site expert’s validation review was not identified. The NIOSH Evaluation Response indicates that the discussion was not considered a formal interview and was not documented as such. NIOSH also noted that the brief comments provided by the site expert are consistent with the Occupational Internal Dose TBD and are supported by other reference documents.

In an effort to obtain additional information indicative of the completeness of site expert interview documentation, SC&A searched available sources for statements describing site expert

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interviews and communications. In order to focus on more recent documentation, SC&A focused on the SEC-00109 petition review period, including LANL Work Group meetings and selected LANL-related Advisory Board meetings from April 2008 through August 2012. In comparison to RFP, the LANL-related meeting transcripts contain relatively few references to NIOSH interviews. As shown in Table 2, NIOSH’s descriptions of site expert communications were primarily related to data acquisition. Two statements from NIOSH’s presentation of the SEC-00109 ER (February 2009) appear to describe general interviews, but the comments do not offer sufficient detail to support an assessment of interview documentation. They do not indicate the number of interviews conducted or provide names or descriptions of interviewees.

**Table 2. NIOSH Statements Indicative of Site Expert Communications**

<b>Communications Related to Data Acquisition</b>		
Statement Source	Statement [or description]	SRDB References
ABRWH February 17, 2009 (ABRWH 2009)	[RE: Delays in accessing data for SEC evaluation.] . . . as [upper management] got people in who were managing the records, talking with them, and we were able to -- One, we were put onto the Federal Records Center in Denver. <i>So we started out there first. Then we had to have more discussions with them to clarify exactly what we wanted from the LANL site. This took several phone calls, and it was just each side trying to explain exactly what we wanted until the doors finally opened up. . .</i> Pages 232–233	55741 55742 55744  Data requests; plans for FRC data capture. Aug–Sep, 2008
LANL Work Group November 3, 2010 (ABRWH 2010b)	<i>We talked to the current people in the facilities, and we had the dosimetry . . .</i> Page 142  [RE: SC&A attempts to get holding pond tritium data from an individual at LANL.] <i>We talked to him several times as well. .</i> Page 263	(see above)  Communications not identified.
LANL Work Group May 2, 2011 (ABRWH 2011)	[NIOSH reported multiple discussions with an individual at LANL regarding tritium monitoring data for the LANSCE lagoon/holding pond. Progress was halted due to site budget constraints.] Pages 241–242	Communications not identified.
LANL Work Group May 14, 2012 (ABRWH 2012c)	[NIOSH obtained data indicating tritium concentration in the holding pond.] Pages 266–269	Communications not identified.
<b>Communications Related to General Site Knowledge</b>		
ABRWH February 17, 2009 (ABRWH 2009)	[RE: Sources of information for SEC-00109 Evaluation Report] <i>We have had interviews with current and former employees of the site.</i> Page 202  <i>I am not saying LANL was the ideal site for holiness and all that. Far from it. I talked to the managers.</i> Page 218	Communications not identified.  Communications not identified.

Consistent with indicators from ABRWH meeting transcripts, documented communications found in the SRDB for the SEC-00109 time period (presented in Table 3) emphasize the capture and interpretation of dosimetry records. SC&A did not identify any general site knowledge interviews in the SRDB or the SEC Viewer from 2008–2009 (when NIOSH indicated at an ABRWH meeting that interviews had been conducted). This seems to confirm SC&A’s initial observations regarding incomplete documentation of interviews.

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**Table 3. Documented Communications in SRDB within the Timeframe of SEC-00109 Consideration (April 2008–August 2012)**

SRDB ID	Date	Description
55742	August 7, 2008	Data request to LANL personnel RE: monitoring records for “exotic” radionuclides. (Miles 2008a)
55741	August 28, 2008	Follow-up on data request for exotics. Some discussion of monitoring practices and quantity of records available. (Miles 2008b)
55744	September 9, 2008	Follow-up discussion on monitoring data for exotics. Begin to plan data capture trip to Denver Records Center. (Miles 2008c)
65376	September 5, 2009	E-mail correspondence. ORAU noted a discrepancy in plutonium coworker data file. Site investigated and corrected error. (Arno 2009)
107058	January 10, 2012	Communication with an external dosimetry expert regarding neutron and photon dose measurements at LANL. (Fix 2012)
109092	February 28, 2012	Impromptu discussion of CMR [Chemistry and Metallurgy Research] building operations with former manager. (Bihl, 2012)

SC&A also consulted the SEC-00109 ERs as a source of information regarding site expert interviews. Section 4 of each ER provides information regarding data sources reviewed by NIOSH to evaluate the class. For the initial evaluation, Section 4.3, “Facility Employees and Experts,” lists only three discussions “with current LANL technical staff concerning additional data capture that was subsequently performed” (NIOSH 2009, page 14). The ER provides SRDB reference numbers for the three discussions, which are included in Tables 2 and 3, above [SRDB 55742, 55741, 55744 (Miles 2008a, 2008b, 2008c)]. Section 4.3 of the revised ER (NIOSH 2012) lists the same three communications.

Attachment 2 of the revised ER provides a synopsis of data capture efforts supporting NIOSH’s evaluation. The synopsis mentions “documented communications” obtained by the Oak Ridge Associated Universities Team (ORAUT), “interviews with workers” at Sandia National Laboratory (SNL) [potentially related to LANL monitoring of SNL personnel], and “SC&A site expert interview questions and responses” (NIOSH 2012, pages 83–98). As noted above for the public meeting transcripts, the data capture synopsis does not provide detailed information regarding the number or content of interviews conducted by NIOSH/ORAUT for the petition evaluation.

It is somewhat surprising to find data capture discussions emphasized in the SRDB while general site knowledge interviews are sparsely represented. This appears to reflect a preferential focus on data and records, consistent with NIOSH’s position at the time, that dose reconstruction was feasible. While general site-related interviews appear to have been conducted, they are not readily identifiable in the SRDB or SEC Viewer databases, and they do not appear to constitute a significant data source for the SEC-00109 petition evaluation. SC&A is unable to estimate the completeness of NIOSH’s interview documentation in any quantitative fashion.

### 3.3 ACTION ITEMS

Another facet of outreach documentation considered in the LANL review is the documentation of Action Items in the OTS. Some SC&A Conclusions for individual comments (Comments 1,

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6, 23, 24, and 77) noted that NIOSH’s apparent interest in further follow-up was not identified as an Action Item. In retrospect, SC&A recognizes that NIOSH had no programmatic expectation to document “Action Items” in 2005 and 2008, when the LANL Worker Outreach meetings were held. While certain discussions might appear to warrant Action Items under the current procedure, this guidance was not in effect during the timeframe of the LANL outreach meetings. Specific guidance to NIOSH staff for identifying and processing Action Items was formally incorporated in Rev. 1 of DCAS-PR-012 (DCAS 2012). NIOSH subsequently reviewed minutes of earlier outreach meetings to determine the need for additional Action Items, but this review was limited to meetings conducted under Rev. 0 of OCAS-PR-012 (beginning in early 2009). The LANL outreach meetings pre-date OCAS-PR-012.

At the time of the LANL Site Profile Rollout meetings (June 2005–August 2005), ORAUT-PLAN-0010 (ORAUT 2004) was the only formal guidance in effect for Worker Outreach. When the SEC Outreach meetings were held (September 2008), the effective procedure was ORAUT-PROC-0097 (ORAUT 2005). These early procedures called for worker comments to be recorded in a database and evaluated for applicability to technical documents. SC&A has access to scanned reports from the older database, TopHat, but the comments captured in this database pre-date the 2005 start date used in scoping this review. At one time, a report from the second database, WISPR, was available on the DCAS Staff Tools intranet page. This was a printed/scanned report of comments captured in WISPR that had resulted in changes to technical documents. The report is currently not available through the DCAS Staff Tools link. SC&A did not pursue further attempts to access the WISPR report or database to assess the completeness of comment documentation. The current status and accessibility of the database is unknown, and evaluation of WISPR is beyond the scope of the current review. During the resolution of OCAS-PR-012 matrix items, NIOSH indicated that all issues identified as legacy Action Items from WISPR have been imported to OTS.

The OTS contains one legacy Action Item from WISPR for LANL (Comment 2). In this specific case, the worker’s comment recorded in WISPR did not clearly capture the nature of the issue. The “resolution” of the Action Item is also unclear; it is recorded as “technical document revision,” although the referenced document had not been revised and the discussion at the outreach meeting did not indicate that a revision was warranted. SC&A considered NIOSH responsiveness for this comment “inconclusive,” solely due to poor documentation of the Action Item. SC&A has no substantive concerns regarding NIOSH’s response to the commenter or the agency’s position regarding small-scale incidents (potentially impacting individual dose reconstruction) and large-scale incidents (potentially impacting TBDs and dose reconstructions for a larger population).

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## 4.0 CONSIDERATION OF TECHNICAL INFORMATION

Once the commenter's input has been received and recorded, the outreach program seeks to evaluate significant implications of the issues, concerns, and information. A fundamental objective is to utilize substantive information, as appropriate, to enhance the technical work documents that guide implementation of the dose reconstruction program and the SEC. The process of considering technical information may include analysis, investigation, discussion, and incorporation into technical work documents. Evidence available to SC&A includes direct responses to the commenters (documented in transcripts and correspondence), follow-up interviews, retrieval of site records, transcripts of Advisory Board and Work Group meetings, discussion papers, and technical work documents. The outreach review process also solicits direct input from DCAS, primarily through the NIOSH Evaluation Comment field in the individual comment review form. This field provides DCAS an opportunity to supplement the sources accessible to SC&A in order to clarify the department's action, position, or disposition of an issue. SC&A's results and observations follow the logical progression of reviewing these sources of evidence: incorporation of information in technical documents, investigation of issues, supplemental information provided through NIOSH Evaluation Comments, and a final conclusion on NIOSH's responsiveness to each issue.

In order to facilitate some form of quantitative analysis for these qualitative and somewhat subjective assessments, SC&A has used a limited number of terms to describe conclusions regarding the disposition of each comment for each parameter evaluated.

- “Yes” indicates a substantive response (e.g., investigation, discussion, or incorporation) on the specific topic or issue raised by the commenter.
- “General” indicates a substantive response to the topic or issue on a broader scale or perspective than the commenter's specific concern.
- “Partial” indicates that some aspects of comment or concern were addressed, while one or more aspects were not addressed.
- “No” indicates that NIOSH did not incorporate or address the issue.
- “Uncertain” indicates that SC&A does not have sufficient information to determine the level of consideration or responsiveness.

The distinction between “yes” and “general” is somewhat blurry for all aspects of the review, because the comments themselves demonstrate considerable fluctuation, from very narrow (a specific operation, activity, or event) to very broad (environmental conditions, data adequacy, availability of records). In either case, the essential technical substance of the issue was assessed as being adequately addressed.

### 4.1 INCORPORATION OF INFORMATION INTO TECHNICAL DOCUMENTS

The incorporation of information into technical work documents is a key form of evidence substantiating NIOSH's consideration and responsiveness to the information received. Because technical documents are readily accessible, incorporation is far more readily assessed than other

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elements of consideration. However, results related to the incorporation of comments into technical work documents are not particularly meaningful in isolation. Depending on the nature of the comment and its implications for dose reconstruction, “partial” or “no” incorporation may be a perfectly appropriate disposition of the information received. Results and observations for this parameter are presented with full awareness that incorporation into technical documents is not necessarily warranted or expected for all comments.

SC&A found some evidence of incorporation into technical documents (Yes, General, or Partial) for 67 of the 78 comments (86%). Among the remaining 11 comments (14%) with no evidence of incorporation, other information assessed within the scope of this review resulted in the following assessments of NIOSH’s overall responsiveness to the information received.

**Table 4. Overall Assessment of NIOSH Responsiveness for Comments Not Incorporated into Technical Documents**

Overall NIOSH Responsiveness	Number of Comments	Percentage of Comments Found Unincorporated
Yes	4 of 11	36%
General	0 of 11	0%
Partial	0 of 11	0%
No	2 of 11	18%
Uncertain	5 of 11	45%

Comments that were not incorporated into technical documents, but were ultimately assessed as Responsive (Yes) include Comment 24, for which the NIOSH Evaluation Comment provides a detailed explanation of external dose to personnel operating package screening x-ray machines. Those assessed as Uncertain include Comment 76, which deals with external monitoring and adequacy for security personnel. NIOSH’s disposition of Comments 26 and 30 was not considered responsive to the substantive technical issue. Both comments address concerns regarding the adequacy of external dosimetry results due to the practice of wearing dosimeters under a lead apron. While NIOSH has addressed similar issues for other sites and agreed that the approach utilized elsewhere could be relevant for LANL, a lack of timely follow-up when these comments were received (September 2005 and December 2009) resulted in a missed opportunity to address the issue.

One notable observation related to the incorporation of information into technical documents is the limited incorporation of support service workers’ concerns regarding the adequacy of internal monitoring for this population. This observation was noted for 21 of the 78 comments (27%). NIOSH conducted multiple outreach sessions to solicit worker input, raised questions related to bioassay program participation and internal exposure potentials, and discussed the issue through the Work Group review process for SEC-00109, but neither the SEC-00109 ERs nor the revised Occupational Internal Dose TBD provide significant discussion of the impact of these specific concerns. The concern was listed on the Work Group’s Issues Matrix and was still unresolved when the determination was made to recommend an SEC class for all LANL workers through 1995.

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The recommended class certainly includes and incorporates the petitioner-proposed class, and SC&A concluded that NIOSH had demonstrated responsiveness for all of these comments (“general” responsiveness, in most cases). Still, the SEC-00109 ER (NIOSH 2009) came across as incomplete when specific concerns acknowledged by NIOSH in Section 3.1 (“Petitioner-Recommended Class Definition and Basis”) were not directly addressed in Section 7.4 (“Evaluation of Petition Basis for SEC-00109”). Perhaps the best explanation is found within Section 3.1: DCAS did not qualify the petition for evaluation on the basis of these concerns, but agreed to evaluate them in conjunction with higher-priority concerns. NIOSH’s emphasis in the ER and the revised site profile is consistent with the following statement:

*The petitioner also provided ten affidavits (listed in Section 4.7). A number of these affidavits asserted that Service Support Workers with inadequate or no PPE were routinely assigned to areas in which workers were using full PPE. They also asserted that these Service Support Workers had little or no participation in the LANL urine sampling or whole-body counting program. Because this petition qualified for further evaluation based on the issues discussed in the preceding paragraph, these affidavit statements will be considered during the evaluation. (NIOSH 2009, page 11 of 77)*

#### **4.2 INVESTIGATION OF TECHNICAL INFORMATION**

As noted above, NIOSH’s response to substantive information and concerns may justifiably involve investigation that does not result in revisions to technical documents. In the absence of a comprehensive tracking system, this scenario is somewhat difficult to assess; even DCAS staff may struggle to locate documentation showing that a specific issue or concern was investigated and evaluated. As with the incorporation of information into technical documents, a positive result (identifying evidence of investigation) is generally conclusive, but a negative result (failing to identify evidence) does not rule out the possibility that the issue was considered.

Some evidence of investigation (Yes, General, Partial) was noted for 69 comments (88%). Evidence includes retrieved records and data capture logs (Comments 1, 12, 13, 17), discussion papers and transcripts from Advisory Board and Work Group meetings (Comments 20, 21, 29, 46), and NIOSH Evaluation Comments (Comments 5, 11, 13, 24). Many comments had multiple sources of evidence.

Only 3 comments (4%) were assessed as not investigated. Two of the comments that were not investigated have viable explanations (Comments 16 and 59). Comment 26, describing dosimeters worn under lead aprons, was discussed above as an example of a missed opportunity.

The remaining 6 comments (8%) were “Uncertain,” lacking conclusive evidence of investigation or dismissal.

Comments assessed as having “Partial” investigation include some issues for which the evidence of investigation was lacking or incomplete. The total number of comments with negative, incomplete, or inconclusive evidence of investigation is 14 (18% of the comments evaluated).

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### 4.3 NIOSH EVALUATION COMMENTS

In this Worker Outreach review, SC&A’s scope is limited to seeking objective evidence that NIOSH substantively considered information and/or concerns shared by commenters in developing and implementing its dose reconstruction program and SEC evaluations. In keeping with the precedent established for the RFP pilot review, the LANL outreach review sought to leverage NIOSH’s access to key staff and communications by inviting DCAS to respond to SC&A’s initial observations before SC&A developed its final conclusions and summary report.

For the LANL review, NIOSH concurred with the SC&A Observation in 50 of the 78 cases evaluated (64%) and provided a substantive Evaluation Comment in the remaining 28 cases.

The NIOSH Evaluation Comments generally provide relevant explanations of NIOSH positions and assumptions. Among the 28 substantive NIOSH Evaluation Comments, the SC&A Observation was satisfactorily addressed in 64% of the cases (18 of 28). NIOSH’s responses in these cases included plausible scenarios for alleged discrepancies (Comments 11 and 15), new information describing NIOSH’s issue assessment and/or relevant dose reconstruction assumptions (Comments 5, 13, 17, 27, 60, and 66), and rationales for not investigating specific issues (Comment 8).

The NIOSH Evaluation Comment was considered “partially responsive” to the SC&A Observation in 6 cases (21%). Three of these cases (Comments 4, 6, and 9) involve concerns of data falsification and destruction. The NIOSH Evaluation Comments for these three issues indicate that NIOSH “has not found significant evidence” of data falsification or destruction of primary dosimetry records. These responses imply consideration of the issues, but they fail to demonstrate or explain NIOSH’s approach to tracking, investigation, and disposition of these significant concerns. The remaining three cases (Comments 25, 32, and 51) involve specific exposure and monitoring concerns for which no evidence of investigation was identified; these were considered “partially responsive” to SC&A Observations, because some aspects of the comment were addressed, while other aspects were not.

In 4 cases (14%), the NIOSH Evaluation Comment does not provide additional evidence of NIOSH’s responsiveness or indicate that NIOSH attempted to obtain it. These were considered non-responsive to the SC&A Observation. Two of these comments do not appear to have a direct bearing on dose reconstruction or SEC evaluations (Comments 2 and 3). The other two (Comments 36 and 76) involve specific internal and external monitoring concerns that are not addressed in technical documents or in the NIOSH Evaluation Comment.

One concern noted by SC&A is a tendency for NIOSH to use a LANL SEC class as a blanket response when evidence of consideration is not readily available. NIOSH and the Advisory Board have indeed recommended several SEC classes that now include all LANL workers through 1995. SC&A has referenced ERs and revised TBDs as evidence of consideration for multiple comments and issues addressed in these documents (even when the issue was addressed in very general terms or long after the comment was received). However, the focus of this review is placed on demonstrating responsive consideration of information received through outreach programs. SC&A does not agree that the recommendation of an SEC class

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automatically demonstrates consideration of all substantive issues and concerns that occurred during the covered period. If it did, the scope of this review would effectively be limited to a handful of issues from the post-1995 era.

One example of this concern is Comment 36, which was received at an outreach meeting in June 2005. The commenter indicated that workers inhaled or ingested significant quantities of black dust containing graphite and enriched uranium from the Rover project. The Rover project is mentioned in the site profile and described in more detail in SEC-00051 ER (NIOSH 2007), and the SEC class established from SEC-00051 does cover the project’s timeframe. However, because the descriptions of work conditions and exposure potentials in these documents are not consistent with the commenter’s descriptions, they were not considered evidence of NIOSH responsiveness to the information received. In cases like this, the ideal NIOSH response would provide additional information, perhaps referencing NIOSH investigations demonstrating that the commenter was mistaken about the composition of the material the workers had handled. Rather, the NIOSH Evaluation Comment states that NIOSH’s recognition of potentially incomplete personnel monitoring data and potential unmonitored intakes contribute to the basis of an SEC class designation for all LANL workers through 1995. This statement, while accurate, is not responsive to the issue or the SC&A Observation. Similar SEC blanket statements were included in NIOSH responses for Comments 4, 5, 9, 12, 19, 51, and 57.

It may be that this “SEC blanket response” is another side effect of the retrospective approach to Worker Outreach reviews, combined with NIOSH’s lack of a comment resolution tracking system. When any consideration of a specific issue would have occurred several years ago, and no central tracking system facilitates retrieval of existing evidence, the SEC blanket response may arguably be a far more cost-effective response than digging through old records and e-mails for evidence that adds little value to the dose reconstruction program.

#### **4.4 OVERALL NIOSH RESPONSIVENESS TO TECHNICAL INPUT**

For the LANL Worker Outreach review, some comments and issues clearly triggered investigations, discussions, and formal evaluations, which were captured in Advisory Board and Work Group meetings, SEC ERs, and revised site profile documents. Many other comments were not clearly defined, considered, or addressed at the level of detail presented by the commenter. While site profile TBDs and ERs justifiably address many issues from a relatively broad perspective, it is difficult to assess NIOSH’s responsiveness to specific comments while relying heavily on general site documents for supporting evidence. Direct responses to commenters are not assessed for the LANL review, and NIOSH’s most current or recent position on each topic is used to evaluate responsiveness. All of these factors tend to separate the assessment of NIOSH’s responsiveness from the specific inputs received, to the point that SC&A is evaluating whether or not NIOSH has addressed general topics in site profiles and ERs (at any time), rather than assessing the effectiveness of outreach programs in capturing, investigating, and considering information communicated by the participants. This tends to skew “responsiveness” results in NIOSH’s favor: if NIOSH retrieved site records covering a particular topic, or if a TBD discusses a particular source term or operation at a given facility, or even if an SEC class was added several years after inputs were received, all of these actions are

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considered as evidence of responsiveness, regardless of any causal or temporal relationship between the inputs and actions.

Within this working definition of consideration, SC&A found evidence of specific, general, or partial responsiveness to technical issues and information presented in 70 of the 78 comments (about 90%). This includes some issues that were closed without investigation, if NIOSH presented an adequate explanation.

Less than 3% of the comments were assessed as non-responsive. However, some comments were assessed as having “Partial” responsiveness, indicating that some aspects of the comment or issue were not addressed. Other comments were considered inconclusive, as SC&A did not have sufficient data or evidence to support a determination of NIOSH responsiveness. The total number of comments with negative, incomplete, or inconclusive evidence of investigation is 12 (15% of the comments evaluated).

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## 5.0 CONCLUSIONS AND RECOMMENDATIONS

As the above analysis illustrates, SC&A did not find any evidence of a systemic deficiency in the receipt, evaluation, and disposition of comments received during the LANL review period. While there were clearly some comments that were not systematically addressed in earlier timeframes, there were likewise a lack of procedures, tracking, and management commitment at the time to do so. Where particularly substantive technical comments were provided, it is clear that NIOSH addressed them formally, and a clear record within the Board’s Work Group demonstrates robust discussion and disposition. Comments that are more general in nature (e.g., lead aprons, which is a DOE-wide generic issue) or that have been already resolved by NIOSH’s internal review (e.g., technical positions on feasibility of dose reconstruction) were less likely to receive a formal disposition and response.

A routine logging and tracking system adds value by helping an organization assure that all substantive inputs receive adequate attention and due disposition, regardless of a prevailing DCAS position or assessment on the subject. NIOSH has historically lacked a comprehensive application for logging and tracking the disposition of technical information and concerns presented by commenters through all available venues of communication. The TopHat and WISPR databases served as tools for capturing and tracking the resolution of comments received at formal Worker Outreach meetings from approximately 2004 through 2008, but the transition from ORAUT-PROC-0097 (WISPR database) to OCAS-PR-012 (OTS database) resulted in less formal and traceable documentation of NIOSH’s responsiveness to inputs received through outreach activities. The full contents of these early databases are not available to SC&A. Only legacy Action Items from WISPR have been included in the current OTS database.

In the absence of a comprehensive tracking and issues resolution system, SC&A has found that NIOSH “responsiveness” can often be assessed only in general terms, and NIOSH’s follow-up investigations are difficult to identify and associate with inputs received. While there is value in observing that most of the substantive issues raised by commenters were ultimately considered through the combined efforts of NIOSH and the LANL Work Group, the approach does not effectively evaluate NIOSH’s responsiveness to the specific inputs received through outreach activities. For the LANL review, the potential benefit of a formal tracking system is apparent in those instances where workers expressed early concerns over dose reconstruction of their internal doses for time periods that ultimately were covered by later decisions by NIOSH to define SEC classes.

“Lessons learned” from the RFP review resulted in a more streamlined and efficient review process. “Lessons learned” from the LANL review may indicate the need for a fundamental shift in study design. The comprehensive review of outreach activities for a single site over the full course of Work Group deliberations provides a deep and thorough awareness of major and minor issues as they are received, evaluated, and incorporated into technical documents over a period of years. This long-range approach supports an appreciation of the process through which worker comments are received, investigated, considered, and dispositioned in a cumulative, aggregated manner over time. On the negative side, the comprehensive site review is cumbersome and resource-intensive. Even when a site is deliberately selected for the currency of its SEC resolutions and updated TBDs, the vast majority of inputs or comments evaluated pre-dates

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current practice by at least a full revision cycle. The major site reviews have raised awareness of specific concerns and issues, but this model is not “current” enough to assess the impact of programmatic changes. Moving forward, it appears that a more current, agile, flexible approach is needed to evaluate the impact of programmatic changes. It may be appropriate to develop a relatively short-range, smaller-scale investigation of specific findings and concerns, such as the completeness of interview documentation and the implementation of new guidance for identifying and tracking Action Items.

NIOSH has undertaken a new initiative designed to capture input from multiple outreach venues and effectively demonstrate the disposition of information received. Just as SC&A managed the potential for “scope-creep” by presenting implementation plans for Work Group review and approval, NIOSH may benefit from collaborative, constructive Work Group involvement in assessing data needs and functional requirements for the new application.

With the revised DCAS-PR-012 providing more detailed guidance for capturing Action Items, and a current effort underway to create a new database for tracking inputs from multiple outreach venues, NIOSH appears to be on a path to recover lost ground and potentially to exceed the level of documentation provided through past Outreach Program applications.

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## 6.0 REFERENCES

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## APPENDIX 1: DISPOSITION OF COMMENTS

#	Category	Comments	SC&A Observation Addressed?	Incorporated	Investigated	NIOSH Responsive?
1	Access to Records	No Action Item. Information addressed in subsequent data capture.	concur	general	yes	yes
2	Access to Records	Inconclusive. Action Item poorly documented in WISPR/OTS.	no	no	uncertain	uncertain
3	Access to Records	Inconclusive. NIOSH response unknown.	no	no	uncertain	uncertain
4	Data Adequacy and Completeness	Incomplete evidence of “cover-up” investigation.	partial	partial	partial	partial
5	Data Adequacy and Completeness		yes	general	general	general
6	Data Adequacy and Completeness	Incomplete evidence of investigation of records destruction. Limited interview records. No Action Item.	partial	no	uncertain	uncertain
7	Data Adequacy and Completeness		yes	yes	yes	yes
8	Data Adequacy and Completeness		yes	yes	yes	yes
9	Data Adequacy and Completeness	Incomplete evidence of "falsified data" investigation. Incomplete interview records.	partial	partial	partial	partial
10	Data Adequacy and Completeness		concur	no	yes	yes
11	Data Adequacy and Completeness	Plausible explanations for discrepancies.	yes	general	general	general
12	Data Adequacy and Completeness		yes	yes	yes	yes
13	Data Adequacy and Completeness	NIOSH Evaluation Comment discusses sample degradation from weekly sample pickup.	yes	yes	yes	yes
14	Data Adequacy and Completeness		concur	yes	yes	yes
15	Data Adequacy and Completeness		yes	general	general	general
16	Data Adequacy and Completeness	NIOSH did not pursue acquisition of medical records. Explained to commenter.	concur	no	no	yes
17	D&D		yes	yes	yes	yes
18	Environmental	Ongoing review.	concur	yes	yes	yes
19	Environmental	Typo in ER excluded TA-54 from SEC class Aug. 2007 to Aug. 2010.	yes	yes	yes	yes

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20	Environmental	Ongoing review.	concur	yes	yes	yes
21	Environmental	Ongoing review.	concur	yes	yes	yes
22	Environmental	Ongoing review.	concur	yes	yes	yes
23	External Dose Assumptions	No Action Item.	concur	general	general	yes
24	External Dose Assumptions	No Action Item. NIOSH Evaluation Comment addresses pkg screening exposures.	yes	no	yes	yes
25	External Dose Assumptions	Inconclusive. No follow-up. No Action Item.	partial	no	uncertain	uncertain
26	External Dose Assumptions	TLDs under lead apron.	yes	no	no	no
27	External Dose Assumptions		yes	general	yes	yes
28	External Dose Assumptions		concur	general	yes	yes
29	External Dose Assumptions		concur	yes	yes	yes
30	External Dose Assumptions	TLDs under lead apron.	yes	no	partial	no
31	Facilities & Operations		concur	yes	yes	yes
32	Facilities & Operations	General vs. specific issues. Ongoing investigation post-1995.	partial	general	partial	general
33	Facilities & Operations		concur	yes	yes	yes
34	Facilities & Operations		concur	yes	yes	yes
35	Facilities & Operations	Informal interview. Information consistent with documents.	yes	yes	yes	yes
36	Internal Dose Assumptions	Inconclusive.	no	partial	uncertain	uncertain
37	Internal Dose Assumptions		concur	yes	yes	yes
38	Internal Dose Assumptions	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
39	Internal Dose Assumptions	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general

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#	Category	Comments	SC&A Observation Addressed?	Incorporated	Investigated	NIOSH Responsive?
40	Internal Dose Assumptions	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
41	Internal Dose Assumptions	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
42	Internal Dose Assumptions	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
43	Internal Dose Assumptions	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
44	Special Exposures & Incidents		yes	partial	general	general
45	Special Exposures & Incidents	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
46	Special Exposures & Incidents	Ongoing review of Cerro Grande fire.	concur	partial	yes	yes
47	Special Exposures & Incidents		yes	yes	yes	yes
48	Special Exposures & Incidents	Ongoing review of Cerro Grande fire.	concur	partial	yes	yes
49	Special Exposures & Incidents	Ongoing review of Cerro Grande fire.	concur	partial	yes	yes
50	Special Exposures & Incidents	Ongoing review of Cerro Grande fire.	concur	yes	yes	yes
51	Special Exposures & Incidents	Mixed Activation Product (MAP) internal dose potential at TA [Technical Area]-18?	partial	partial	partial	partial
52	Special Exposures & Incidents	Ongoing review of Cerro Grande fire.	concur	partial	yes	yes
53	Special Exposures & Incidents	Ongoing review of Cerro Grande fire & support service workers' dose assessment.	concur	partial	general	general
54	Special Exposures & Incidents		concur	yes	yes	yes
55	Unknown Undocumented Exposure	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
56	Unknown Undocumented Exposure		concur	general	general	general
57	Unknown Undocumented Exposure	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general

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#	Category	Comments	SC&A Observation Addressed?	Incorporated	Investigated	NIOSH Responsive?
58	Unknown Undocumented Exposure	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
59	Unknown Undocumented Exposure	Monitoring at NTS – not relevant to LANL technical documents.	concur	no	no	yes
60	Unknown Undocumented Exposure		yes	general	general	yes
61	Unknown Undocumented Exposure		concur	general	general	yes
62	Unknown Undocumented Exposure		concur	general	general	yes
63	Unknown Undocumented Exposure	Ongoing review of Cerro Grande fire & support service workers' dose assessment.	concur	partial	yes	yes
64	Unknown Undocumented Exposure	Ongoing review of support service workers' exposure concerns.	concur	partial	yes	yes
65	Unknown Undocumented Exposure		concur	yes	yes	yes
66	Worker Protections & Monitoring	NIOSH Evaluation Response clarifies respiratory protection considerations in dose reconstruction (DR).	yes	yes	yes	yes
67	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns. Did not identify follow up. Limited documentation of interviews.	concur	partial	general	partial
68	Worker Protections & Monitoring		concur	general	yes	general
69	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns.	concur	general	yes	general
70	Worker Protections & Monitoring	Internal discrepancies regarding commenter's participation in bioassay. Follow-up is not evident.	concur	general	general	general
71	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general

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## APPENDIX 1: DISPOSITION OF COMMENTS

#	Category	Comments	SC&A Observation Addressed?	Incorporated	Investigated	NIOSH Responsive?
72	Worker Protections & Monitoring		concur	general	general	general
73	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
74	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
75	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
76	Worker Protections & Monitoring	Did not identify investigation of issues specific to security guards' external dose reconstruction.	no	no	uncertain	uncertain
77	Worker Protections & Monitoring	No Action Item. Did not identify specific follow-up. Ongoing review of support service workers' exposure concerns.	concur	partial	general	general
78	Worker Protections & Monitoring	Ongoing review of support service workers' exposure concerns.	concur	partial	general	general

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## **APPENDIX 2: NIOSH EVALUATION COMMENTS**

### **WORKER OUTREACH OBJECTIVE 3 REVIEW LOS ALAMOS NATIONAL LABORATORY**

#### **SC&A REVIEW OF COMMENTS**

Stages of Development:

Working Draft – Individual Comment Reviews: all fields through “SC&A Observation/Comment” were completed by SC&A in June 2013.

“NIOSH Evaluation Comments” were completed by NIOSH in December 2013.

“SC&A Conclusions” were completed by SC&A in April 2014.

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INDIVIDUAL COMMENT REVIEWS  
Worker Outreach LANL Review

<b>Category:</b> Access to Records																				
<b>Comment Number:</b> 1	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a), June 18, 2005	<b>Commenter:</b> Not identified																		
<p><b>Comment:</b></p> <p><i>When they closed DP West, they took a lot of stuff out in barrels and buried it out in Area G. They figured nobody would open the barrels up to see what was inside. They contracted Benchmark to write reports and keep the records. If you ask for the records, you can't get them. If you ask Benchmark, they say "You can't have them, they belong to the Lab." If you ask the Lab, they say "Benchmark has them." (pg. 15 of 30)</i></p> <p><i>Yes, if you want more information, go to Germantown DOE Records, and look at the CDs. I found information on the animals that were buried from around Area G – squirrels, deer, rabbits – they were hot. The documentation isn't at Los Alamos. DOE is keeping it at Germantown.</i></p> <p><i>The radiological reports vary from group to group, too. (pg. 16 of 30)</i></p> <p><i>They were keeping logbooks in 1976 when I started.</i></p> <p><i>Go to Area G and tell them you want the logbooks. . . .</i></p> <p><i>The logbooks are very important. The RCTs kept logbooks and made daily entries using the E530 and had to post the results every day. All the information is in the logbooks, and you should have access to those logbooks, especially if they are in the archives. (pp. 17–18 of 30)</i></p> <p><b>NIOSH Response/Consideration of Comment:</b></p> <p>Response from the outreach meeting (ORAUT 2005a, pp. 15–18 of 30):</p> <p><i>Jack Buddenbaum: I was told that they didn't keep records for what was taken to Area G for a long time, but they started keeping logs at some point. When did they start?</i></p> <p><i>Jack Buddenbaum: I've seen logbooks from the 1960s, but the problem I'm having with them is they are very general. We would like to have more specific information about what is buried there.</i></p> <p><i>Jack Buddenbaum: We have some of that already. CDC is making an effort to get the latest set of records that were pulled out of the Lab for another study.</i></p> <p>[There are numerous documents on the SRDB relating to Area G logbooks. Below is a list of some of the documents that directly relate to the comment. Documents from Benchmark Environmental Corporation are also represented on the SRDB.]</p> <table border="1"> <thead> <tr> <th>SRDB Reference ID</th> <th>Document Description</th> </tr> </thead> <tbody> <tr> <td>45304</td> <td>Area G TA-54 Activities January–July 1976. Los Alamos National Laboratory. August 26, 1976</td> </tr> <tr> <td>45483</td> <td>Area G Shaft and Disposals, Shafts 1–40, 1970–1973</td> </tr> <tr> <td>45736</td> <td>Transuranic Log of Disposal Pits Area G</td> </tr> <tr> <td>45748</td> <td>Area G Log Entries 1957–1972</td> </tr> <tr> <td>56460</td> <td>Area G Receiving Report Sludge 1993</td> </tr> <tr> <td>57723</td> <td>Mayfield, D. 1983. Surface Reconnaissance through 1980 for Radioactivity at Radioactive Waste Disposal Area G at the Los Alamos National Laboratory</td> </tr> <tr> <td>70904</td> <td>Radionuclide Contamination Analysis of Small Mammals at Area G TA-54, Los Alamos National Laboratory, 1995</td> </tr> <tr> <td>71122</td> <td>Elk and Deer Study, Material Disposal Area G, Technical Area 54, Source Document. September 1999</td> </tr> </tbody> </table>			SRDB Reference ID	Document Description	45304	Area G TA-54 Activities January–July 1976. Los Alamos National Laboratory. August 26, 1976	45483	Area G Shaft and Disposals, Shafts 1–40, 1970–1973	45736	Transuranic Log of Disposal Pits Area G	45748	Area G Log Entries 1957–1972	56460	Area G Receiving Report Sludge 1993	57723	Mayfield, D. 1983. Surface Reconnaissance through 1980 for Radioactivity at Radioactive Waste Disposal Area G at the Los Alamos National Laboratory	70904	Radionuclide Contamination Analysis of Small Mammals at Area G TA-54, Los Alamos National Laboratory, 1995	71122	Elk and Deer Study, Material Disposal Area G, Technical Area 54, Source Document. September 1999
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INDIVIDUAL COMMENT REVIEWS  
Worker Outreach LANL Review

ORAUT 2004. *Technical Basis Document for the Los Alamos National Laboratory – Site Description*, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004, pg. 52 of 65.

*In the late 1940s and early 1950s, it was found that the natural soils and clays at TA-21 [DP West] were effective in removing radioactive contaminants from the waste liquids. Absorption beds were then used in which the process effluent was emptied into a trench filled with absorption material consisting of cobble, gravel, and fine sand. These beds were at Material Disposal Areas (MatDAs) T, U, and V (see Table 2-5). . . . From 1968 to 1976, wastes were mixed with cement and pumped down asphalt-coated shafts augured between the two absorption beds at MatDA T. From 1975 to 1983, transuranic wastes were mixed with cement and pumped into corrugated metal pipes, which were stored in the retrievable storage pit dug between the two absorption beds at MatDA T. These wastes were retrieved from 1984 to 1986 and relocated to MatDA G at TA-54.*

**SC&A Observation/Comment:**

NIOSH responses during the outreach meeting reflect interest in waste inventory records described by the commenters, and several documents retrieved by NIOSH appear to be responsive to the issue. The site description, which pre-dated this meeting, reflects awareness of waste transfer from DP West to Area G.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Issue was investigated, as indicated by documents in site research database.  
General information is addressed in a technical document (pre-dating comment).

NIOSH was ultimately responsive to the substance of the comment.

No Action Item was recorded in WISPR at the time for this issue. This was an early worker outreach exercise, when NIOSH activities for LANL focused on capturing worker input for later assessment. Documents listed above, considered responsive to the issue, were retrieved predominately between Dec-2006 and Dec-2007. It appears that comment tracking under ORAUT-PLAN-0010 was adequate to facilitate follow-up at a later time.

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<b>Category:</b> Access to Records		
<b>Comment Number:</b> 2	<b>Source of Comment:</b> <i>Outreach Tracking System (OTS 2013)</i> <i>OTS-83: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005b) 8/16/2005</i>	<b>Commenter:</b> Not identified
<b>Comment:</b>		
<p><u>Outreach Tracking System:</u></p> <p>OTS Action Item ID: 100 (Legacy Item) Action Item Entered Date: 8/22/2012 Action Item Commitment Date: 8/16/2005 WISPR Comment ID: 2208</p> <p><i>Jack (Buddenbaum) had asked for that information, too. He was not aware of them.</i></p> <p><u>Context of Comment (from ORAUT 2005b, pp. 11–12 of 16):</u></p> <p>[Meeting transcript indicates that participants were talking with Philippa Griego (DOE) and Sam Glover (NIOSH) about two incidents from the early 2000s: a glovebox leak at TA-55 and a fire at the CMR building.]</p> <p><i>Philippa Griego: I don't believe we should have any problems getting the occurrence reports for you on both of those incidents. As far as the personal reports are concerned, you could probably get permission from the people that were involved to see whatever monitoring was done on them. . . .</i></p> <p><i>Response: <b>Jack (Buddenbaum) had asked for that information, too. He was not aware of them.</b></i> [Emphasis added]</p> <p><i>Philippa Griego: He did? I wonder if he knows about the occurrence reporting. I imagine he would.</i></p> <p><i>Sam Glover: He may not have access to it though. It is an internal database.</i></p> <p><i>Philippa Griego: I may be able to get access to that information for him. . . .</i></p> <p><i>Response: He said they are going through boxes of LANL records looking for reports. Health Physics has their own stuff to do, so basically they are leaving it up to the ORAU team to go through the records.</i></p> <p><i>Philippa Griego (to Sam Glover): You and I need to talk.</i></p> <p><i>Sam Glover: I just want to make sure that you understand that some things are more pertinent to personal dose reconstruction and others – the larger incidents – apply to the Site Profile. There is a difference. Yes, we can talk about access to records and make sure we have that.</i></p>		
<b>NIOSH Response/Consideration of Comment:</b>		
<p>[NIOSH and DOE responses to participants at the outreach meeting are included in the “Context of Comment” passage above.]</p> <p>OTS Action Item: 100</p>		

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Action Item Resolution Detail: *AFFECTED DOCUMENT: ORAUT-TKBS-0010-2: Rev. #00; WISPR entry states that the TBD is in revision. To date, the original document is still in place.*

Action Item Resolution Date: *8/16/2005 12:00:00 AM*

Action Item Closure Type: *Technical Document Revision*

**SC&A Observation/Comment:**

The documentation of this Action Item in WISPR/OTS is not clear. It does not identify the commenter, the nature of the information Jack Buddenbaum had requested, or the action to be taken. The meeting minutes appear to indicate that the intended action involved NIOSH/ORAUT access to LANL's occurrence reports. NIOSH's response to the commenter does not indicate a TBD revision was warranted.

The resolution is also unclear. The WISPR/OTS entry indicates the Action Item was resolved on 8/16/2005 (the same date as the outreach meeting) by technical document revision. However, the Site Description TBD (ORAUT-TKBS-0010-2) has not been revised since its initial release in 2004.

The Action Item resolution is puzzling for two reasons:

- If a Site Profile revision was not warranted, why does the Action Item entry list "Technical Document Revision" as the closure type?
- If a Site Profile revision was warranted, why was the Action Item closed before the revision was issued?

**NIOSH Evaluation Comment:**

From a dose reconstruction point of view, a revision to the TBD to include specific incidents would be useful; however, the lack of detailed incident information does not preclude assigning an accurate dose or a bounding dose to a specific energy employee, for the reasons described below. Regarding the dose reconstruction process specifically, a TBD revision is unnecessary; however, it would be a welcome addition to the information now used to estimate doses.

Detailed information regarding individual incidents is useful to the dose reconstructor in that it can, in certain cases, lead to more accurate assumptions about specific exposures. This has the effect of more accurate dose estimates, which is to say (based on project practices) lower dose estimates.

In most cases, description of individual incidents in the TBD can do little to assist in assigning doses, as the individuals involved cannot (and may not) be pre-identified in the TBD. Furthermore, there is usually insufficient information in the claim files to tie any specific individual with any specific incident (though there are exceptions, including notable exceptions).

In by far the majority of cases, bioassay information is used to base claimant-favorable assumptions about the modes and dates of exposure. Individuals involved in such incidents, or those with a potential radiological exposure, are typically the subjects of health physics follow-up actions, most often special bioassay when potential exposures include possible intakes of radioactive materials.

The advantage to including detailed incident information in the TBD is the possible correlation of these events with bioassay information, which may allow more accurate assumptions about dates and types of exposures. For this project, which bases most doses on claimant-favorable assumptions, that means a more accurate, and lower, estimated dose. For example, an individual exposed to airborne plutonium is almost always assumed to have been exposed to the absorption type that results in the higher dose. This is always assumed when there is a lack of specific information about the material involved such as would be documented in an incident investigation)

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Detailed knowledge that included the absorption type might result in a lower dose being assigned. Similarly, if the date of exposure is known based on incident information, dose reconstructors can more easily limit dose based on bioassay results, rather than applying the standard assumption of exposure mid-way through a monitoring period.

**SC&A Conclusion:**

Deficiencies noted in the SC&A Observation are limited to the documentation of the Action Item (in WISPR) and its resolution (in OTS); the NIOSH Evaluation Comment does not specifically address these observations.

Disposition:       Inconclusive.  
                          Action Item documentation is unclear, so completion of the action cannot be evaluated..  
                          Technical document was not revised.

NIOSH responsiveness to the substance of the comment is uncertain due to incomplete documentation. However, NIOSH's overarching explanation regarding the application of incident information to dose reconstruction is credible and has figured in reviews of a number of DOE sites in the past.

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<b>Category:</b> Access to Records		
<b>Comment Number:</b> 3	<b>Source of Comment:</b> Correspondence from Tom Udall to Larry Elliott, Director, OCAS (Udall 2006) March 17, 2006	<b>Commenter:</b> Tom Udall Member of Congress
<p><b>Comment:</b></p> <p><i>The purpose of this letter is to request assistance from the National Institute for Occupational Safety and Health, Center for Disease Control and Prevention in addressing a problem associated with medical records slated for destruction in Los Alamos, NM. I am requesting immediate assistance from your office on behalf of the many current and former employees of Los Alamos National Laboratory (LANL) located in my congressional district.</i></p> <p><i>By way of background, I had the opportunity to visit several records repositories at Los Alamos National Laboratory, its subcontractors and the Los Alamos Medical Center on March 6, 2006. The purpose of my visit was to learn more about the process in which personnel, exposure, and medical records are stored at Los Alamos, particularly the records pertaining to my constituents who have filed a claim under the Energy Employees Occupational Illness Program Act. During my visit, I learned that there are thousands of old medical records being stored in the basement of the Los Alamos Medical Center, and at a nearby warehouse owned by Los Alamos County. These medical records are currently in disarray, deteriorating and slated for destruction. . . .</i></p> <p><i>. . . Since acquiring the facility [Los Alamos Medical Center], I understand that LAMC requested the Department of Energy take custodianship of these records, but the DOE never followed up on their request.</i></p> <p><i>. . . LAMC asserts that private hospitals in New Mexico are required by law to only retain adult medical records for a period of 10 years after the last date of service. They argue that due to a lack of DOE intervention, they have gone beyond the call of duty and have held onto these records well beyond what has been required by law. Most importantly, LAMC has explained they can no longer afford to pay monthly rental fees for storage of these records, nor do they have the necessary resources to assess, catalogue and preserve them in such a manner that the records may be useful. . . .</i></p> <p><i>Because LAMC and its physicians have historically served the entire community of Los Alamos, the medical records in question include patient files for LANL employees, their families and other local residents. I have been told that some of these records date back several decades to the hospital's early years of operation. . . .</i></p> <p><i>I respectfully request that your office make arrangements to fully evaluate and assess these records to determine if they have epidemiological value and/or may be useful in EEOICPA claims. I also request that these records be considered worthy of protection under the 1990 Moratorium issued by then-Secretary of Energy James Watkins (and renewed in 2000) due to the unique historical relationship between LAMC, LANL, the Atomic Energy Commission and DOE.</i></p>		

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**NIOSH Response/Consideration of Comment:**

[NIOSH response was not located. Resolution of the concern was reported by DOE in 2009.]

ABRWH 2009. *National Institute for Occupational Safety and Health Advisory Board on Radiation and Worker Health, 61<sup>st</sup> Meeting*, Doubletree Hotel Albuquerque, Albuquerque, New Mexico, February 17, 2009, pp. 159–160 of 391.

[Regina Cano (DOE):] *The other project we have been working on for a couple of years – and I'm happy to say that we awarded the cooperative agreement to the hospital in January, and that is to take possession of the Los Alamos Medical Center records, the medical records that previously belonged to DOE, and those are records up to 1964. As a matter of fact, the contractor is on site this week conducting ES&H surveys. So we hope we will be able to start working through those records within the next few weeks.*

**SC&A Observation/Comment:**

DOE indicated at the Work Group meeting that final arrangements were being made to take possession of the medical records from Los Alamos Medical Center. While this reflects DOE action rather than NIOSH responsiveness, it seems relevant to note that the request was eventually resolved. This appears to be an appropriate resolution, since DOE has primary responsibility for workers' records.

SC&A has not located documentation of NIOSH's response to the Congressman's request. This observation may reflect limitations of SC&A's access to NIOSH correspondence rather than NIOSH's lack of responsiveness.

**NIOSH Evaluation Comment:**

The source of this comment was a letter from a Congressman. It appears that the issue was resolved by DOE (a few years later). NIOSH may not have sent a formal response back to the Congressman.

**SC&A Conclusion:**

The NIOSH Evaluation Comment does not indicate if NIOSH attempted to identify correspondence demonstrating responsiveness to the Congressman's request for assistance.

Disposition: Inconclusive. Resolution may have been referred to DOE or addressed in some other fashion. Issue does not appear to impact technical documents.

NIOSH responsiveness to the substance of the comment is uncertain.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 4	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<p><b>Comment:</b></p> <p><i>If someone else comes in and takes over the Laboratory, you'll get your records. They've been covering things up for a long time. That's why they're trying to get someone else to come in with the University of California to help keep this covered up. Because they have lied and falsified documents right and left up there. Their documentation that you need to do your dose reconstruction is totally flawed. If you use it, you're not going to get good results. I brought a document from the Tiger Team that says that their whole system for doing radiation monitoring was flawed – the monitors were turned off, people weren't qualified to be doing the monitoring, the equipment was never calibrated. How are you going to do a reconstruction up there?</i></p> <p><i>. . . The numbers that Los Alamos will give you for your calculations are wrong. If you have bad data going in, you have bad data coming out.</i></p> <p style="text-align: right;">(pp. 3–4 of 30)</p> <p><i>[Name withheld] was a [redacted] and he had a number of bad things happen to him over a period of years . . .</i></p> <p><i>The first thing was a criticality accident that happened in [redacted], in which the victim was [redacted] and [redacted]. This man volunteered to [redacted]. And it all happened at night, so people wouldn't know about it. He said if it had happened today, the whole Lab would have been shut down and all of northern New Mexico would have had a heart attack. But at that time, it was like a military operation. The higher-ups came in and talked to the people who had the plumbing skills to be able to handle it and said "You have to volunteer, this is much too dangerous to give the assignment to just anybody who wants to do this." And he and his partner were crazy enough to go and take care of it, so he had a huge exposure there.</i></p> <p><i>And as his working life went on, there were many more incidents that came out during the course of the interview.</i></p> <p><i>After a [redacted]. . . he decided to go get his medical records. After so many exposures, he had nothing on paper. When he went to ask for his record, they came out with a single sheet of paper, and on that sheet of paper were figures from nose swipes and a few other things that were completely distorted, many times smaller than what he remembered.</i></p> <p><i>I failed to mention that when they came out of the Lab after solving this criticality problem where they were all heavily exposed, someone said, "Let's take the badges and throw them in the trash (like a macho thing). We've gotten through this night and saved the lab, we don't pass along this information. Let's just take them off and throw them away." And they all followed suit, so there were no readings from the incident.</i></p> <p style="text-align: right;">(pp. 21–22 of 30)</p> <p><i>These reconstructions... the Lab's documentation is false. The reason is because they caused the problem and they're trying to cover it up. That's the only conclusion NIOSH could come off with, and these people should be awarded these claims. If they falsified the records, they are responsible for it. They've failed. You don't have a choice. If the numbers were true, we'd go along with it, but we know the numbers are not true. We're showing you that right here.</i></p> <p style="text-align: right;">(pg. 23 of 30)</p>		

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[Information relevant to these concerns was discussed at the Outreach Meeting (ORAUT 2005a):]

*Mr. Glover said that, although the meeting was not intended to discuss it, a Special Exposure Cohort (SEC) petition can be filed when there is not enough data available to support dose reconstructions. He indicated that if anyone had any questions about filing an SEC petition, he would be happy to talk with them after the presentation. He explained that NIOSH was currently attempting to get information from LANL to proceed with dose reconstructions.*

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*Sam Glover: If a person is monitored for plutonium, and there are plutonium bioassay results, we can calculate a dose. Whatever air monitoring data was, we're going to do our best. External dosimetry has been mentioned – that people threw their badges away. If somebody falsified data, if they were biased in some fashion, or if records were deleted, that's certainly going to bias our result – absolutely. When the reconstruction process begins, we have a claimant phone interview. Some of the hardest interviews are the ones where the workers have passed away and the relatives try to give what their work experience is. In that case, things like you've talked about, where you've captured someone's history or memory will certainly help . . . .*

*Ken Silver: The Tiger Team Report makes it quite systematic – for example, the internal dosimetry bioassay program – the time to analyze some of the samples was too long, there was no internal audit, the standards used in the lab tests can't be traced to National Institute of Standards of Technology (NIST), failure to complete the chain of custody records, all kinds of things are documented in Chapter 4 of the Tiger Team Report . . . .*

*Sam Glover: I think we've already agreed that this is something we definitely need to address.*

*Sam Glover: We specifically look at what the monitoring practices are, and some of these sites have changed dramatically since the TBDs have been written. As we have said, these are "living documents," and when practices are found to be inadequate, we take that into account.*

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*Sam Glover: . . . If we can get additional data, we want the rest of the data. If the data is wrong, we can say that we can't do dose reconstruction. And we have done that.*

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NIOSH 2007a. *SEC Petition Evaluation Report, Petition SEC-00051*, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007.

*. . . individual monitoring data have been given the highest emphasis. NIOSH has worked with LANL and obtained extensive monitoring record data sets for the period March 15, 1943 through December 31, 1975. These data sets include individual worker external dosimetry reports and internal bioassay results for the major radionuclides (plutonium, uranium, polonium, and tritium). . . . When reconstructing doses for even infrequently-monitored workers, the dose reconstruction will often rely on missed dose. The calculation of missed dose attempts to answer the question: Given the individual monitoring data, what is the maximum plausible dose that could have been received by the worker without being detected by the monitoring program? . . . For unmonitored workers, who were in exposure conditions in which they should have been monitored, NIOSH applies a co-worker model that assumes that these workers were exposed to the upper end of the distribution of results collected from the monitored population.*

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*... excerpts from LANL historical documentation corroborate the general concerns raised in petition SEC-00051 for a substantial portion of the timeframe under evaluation. These general concerns include the absence of bioassay data, undocumented overexposures, and inadequate monitoring procedures.*

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[Refer to Comment 12 for NIOSH Response/Consideration regarding findings of the Tiger Team assessment.]

**SC&A Observation/Comment:**

During the outreach meeting, NIOSH representatives considered and responded to the workers' concerns. They described how some issues would be addressed in dose reconstruction, and they also informed workers of the SEC petition process and offered to answer questions on this topic. General concerns regarding missing records, undocumented overexposures, and inadequate monitoring procedures have been considered, acknowledged, and corroborated by NIOSH. These concerns have contributed to SEC status recommendations.

As noted for Comment 12, NIOSH provided a response regarding the Tiger Team report in the SEC-109 ER and included a detailed assessment of the programmatic concerns in Revision 1 of the Internal Dose TBD.

The criticality incident mentioned by one of the commenters is consistent with an incident ([redacted]) that is included in the Site Description TBD. NIOSH's response indicates that an individual's personal work history, including claims about incidents and discarded dosimetry, would be considered and evaluated in the individual dose reconstruction.

Although NIOSH acknowledged that false information would affect dose reconstruction, and assessed the data pedigree as a component of SEC evaluations, SC&A has not located substantive NIOSH consideration of allegations that LANL may have deliberately falsified or covered up evidence of radiological exposures.

**NIOSH Evaluation Comment:**

The issues described in this comment all took place prior to 1996. Although NIOSH has not found significant evidence that LANL deliberately covered up or falsified data concerning radiological exposures, an SEC class has been established for all workers at LANL prior to 1996. NIOSH has recognized that personnel exposure data may be incomplete prior to 1996. Any available pre-1996 data may be used for partial dose reconstructions for claimants who are ineligible for compensation under the SEC. Dose reconstructors evaluate all case-specific information with respect to the documented dosimetry results. If recorded results are not consistent with potential exposures, they have the option to assign external dose based on average measured doses, and to assign internal dose based on co-worker intakes of primary radionuclides.

**SC&A Conclusion:**

The NIOSH Evaluation Comment indicates "NIOSH has not found significant evidence" regarding falsified radiological exposure data. This statement implies consideration of the concern but does not provide additional information regarding NIOSH investigation.

Disposition: Most issues were investigated and addressed in technical documents.  
Limited documentation regarding NIOSH investigation of "cover-up" concern.

NIOSH appears to be responsive to the substance of the comments. Evidence of responsiveness available to SC&A is incomplete.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 5	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b>		
<p><i>I was around radiation sources. I was an x ray technician and my film badge always showed up zero, but in my ionization chamber it always showed up something else. But any place I worked, all the building dosimeters were always very hot. You're doing the models for the radiation dose and they're giving you the data, but the data's not true. Their dosimeter readings were false. Either from the experience of the person reading the film, or the equipment was not calibrated, or they were just plain lazy and didn't want to write a report.</i></p> <p style="text-align: right;">(pg. 6 of 30)</p> <p><i>Comment: I was a radiographer, an inspector, and worked at TA-8. I worked monitoring machines where there were sources of cobalt (150 curies) and iridium (100 curies). The dosimeter readings were always zero. They just can't be. You used a remote control to send the source out and bring it back. This was in the field. I worked in the tunnels in Nevada, too, with iridium and cobalt sources. My inhalation chamber would be up, but my film badge was always zero.</i></p> <p><i>Question: What about the ones on the wall? There used to be packets on the wall, in an ionization chamber, that had a film badge, a Kelly badge, and all kinds of things in it. It was supposed to be in plain sight. When they took readings from those, they showed something, but you being there working in that same area, in that same place, always zero.</i></p> <p style="text-align: right;">(pp. 14–15 of 30)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>The issue of data adequacy for external monitoring was discussed at the outreach meeting (ORAUT 2005a):</p> <p><i>Bill Murray: . . . The section on the external dosimetry program includes information on sources of exposure, what dosimeters were used, what dosimetry practices they used, badge exchange, and if they made any adjustments to the dose. Most important, what the minimum detectable levels were, and if the levels detected were reasonable. . . . If zeros appear where there should be readings, a missed dose value, usually about half the minimum detectable level, can be put into the equation. If you consider that badges were generally exchanged weekly, this can sometimes be significant.</i></p> <p style="text-align: right;">(pg. 10 of 30)</p> <p><i>Sam Glover: We have to go in, look at the external dosimetry data, and see if there's a problem. We have a scientific test – what's the hypothesis? We're going to verify if it makes sense. Do the people with this type of occupation have an exposure – a radiographer, for example – and then we ask "Does this person have an exposure that makes sense?" That would require allegations that there are problems, here are specific incidents.</i></p> <p><i>Sam Glover: We specifically look at what the monitoring practices are . . . . As we have said, these are "living documents," and when practices are found to be inadequate, we take that into account.</i></p> <p style="text-align: right;">(pp. 24–25 of 30)</p> <p>ORAUT 2013a. <i>Los Alamos National Laboratory – Occupational External Dose</i>, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013.</p> <p><i>For photon and neutron dose, Sections 6.3 and 6.4, respectively, discuss the sources of bias, workplace radiation field characteristics, responses of the different beta/gamma and neutron dosimeters in the</i></p>		

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*workplace fields, and the adjustments to the recorded dose measured by these dosimeters during specific years.*

*Section 6.5 presents sources of potential dose that could be missed because of the limitations of dosimetry systems and the methods of reporting low doses. This missed dose is discussed as a function of facility location, dosimeter type, year, and energy range.*

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*Between 1981 and September 1990, shallow, deep, or neutron exposures less than 10 mrem were reduced to 0 mrem [LANL 1996 (9/14/90 document)]. LANL decided to change associated procedures such that shallow doses, deep doses, and neutron doses less than 5 mrem were rounded to 0 mrem, and doses between 5 and 10 mrem were rounded to 10 mrem effective with September 1990 TLD evaluations. These changes were not fully implemented until 1991 [LANL 1996 (2/5/91 and 4/19/91 memoranda)]. . . .*

*6.2.1.6 Quality of External Dosimetry Data*

*At LANL, dosimeters were selected, issued to workers, and processed; the resulting measurements were recorded and used to estimate doses. There appears to be no use of recorded notional doses, although there are issues of missed dose for low-dosed dosimeters (see Section 6.5) and recorded doses for individual dosimeters at levels less than the statistical minimum detection level (MDL).*

*. . . Administrative practices are described in the Photodosimetry Evaluation Book (LASL 1959, 1969, 1977, 1979; LANL 1986, 1989, 1996, 2001, 2003) and LANL technical reports, and detailed information for each worker is in the NIOSH claim documentation. The claim documentation provides specific information to be evaluated on the recorded dose of record. There do not appear to have been significant administrative practices that jeopardized the integrity of the dose of record.*

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*6.5.1 Photon Missed Dose*

*Missed photon dose for LANL workers would have occurred if doses received were below the limits of detection for the dosimeters provided and if they were based only on a recorded or assumed zero dosimeter result. . . . Missed dose for dosimeter results less than the MDL is particularly important for earlier years when MDLs were higher and dosimeter exchange was more frequent.*

*NIOSH (2007a) describes options to calculate missed dose. The typical method is to assign dose equal to the MDL divided by 2 for each dosimetry result that is either zero or some positive value less than the MDL/2.*

*Analysis of missed photon dose by period according to dosimeter type and exchange frequency is needed to evaluate claim information, particularly if only annual dose data are available. The normally cited MDLs for beta and photon dosimeters are based on laboratory irradiations. Actual MDLs are higher because of additional uncertainty in actual field use and the use of dose recording thresholds.*

(pg. 51 of 79)

**SC&A Observation/Comment:**

NIOSH has considered a variety of factors that can interfere with accurate monitoring of external exposures, such as source terms, dosimeter responsiveness, exposure geometry, and reporting practices. NIOSH has developed methods to account for these factors in dose reconstruction.

NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction, particularly for periods after 1975. Available data, even for early periods, is used for partial dose

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reconstructions for claimants who are ineligible for compensation under the SEC. Missed dose is assigned for recorded or assumed zero dosimeter results, based on the individual's typical exposure or coworker data.

SC&A did not identify specific consideration of the workers' concerns regarding dosimeter readings that did not seem reasonable based on the source term, work activities, ionization chambers, and building dosimeter readings.

**NIOSH Evaluation Comment:**

The issues of concern are primarily associated with potential missed dose from film badges. Film badges at LANL were replaced by TLDs in 1980. An SEC class has been designated for all workers at LANL during the entire time period of film badge usage. Film badge dosimetry data may be used for partial dose reconstructions for claimants who are ineligible for compensation under the SEC.

Dose reconstructors evaluate all case-specific information with respect to the documented dosimetry results. If recorded results are not consistent with potential exposures, they have the option to assign external dose based on average measured doses, and to assign internal dose based on co-worker intakes of primary radionuclides. However, environmental dosimeter readings are not typically included in case information.

Environmental dosimeter readings almost always show much higher recorded doses than personnel dosimeters for workers in a given area due to the fact that the dosimeters are usually in place for a month or more; some sites use semi-annual and annual exchange frequencies for building or environmental dosimeters. Personnel dosimeters would be located in a specific area for a fraction of the working day, but a small fraction of the day overall.

The following is an example of how dosimeter residence time would affect the measured dose for a worker on a monthly dosimeter exchange cycle: A dose rate of 0.06 mrem/hr would result in an external dose to a worker of approximately 10 mrem in a month, assuming the worker's presence in that area for 168 hours of the month; an entire occupational month. This could be recorded as zero, as it is lower than the administrative minimum level of detection used by many sites. At this same dose rate, the result for an annually-exchanged environmental dosimeter at that location would be 520 mrem.

**SC&A Conclusion:**

Disposition:      General issues were investigated and addressed in technical documents

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 6	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<p><b>Comment:</b></p> <p><i>At one time LANL had a contractor known as ZIA. When ZIA stepped out of the contract, the Health Division at the Lab hired summer students to purge the medical records. Ask the Lab what they did with those purged records. They purged all the information for the ZIA employees in case there were any legal issues when ZIA stepped out.</i></p> <p><i>[Bill Murray: Are you saying that their dose records were purged, too?]</i></p> <p><i>I don't know what all they purged, but I know they purged records. I'm sure they purged the dose records also. They probably purged the dosimetry records too. . . .</i></p> <p><i>. . . I don't know what all they purged. I found out about it when one of the nurses in the Health Department told me she couldn't believe they were doing it.</i></p> <p><i>[Bill Murray: Is she still alive? Do you think she would talk to us?]</i></p> <p><i>Yes, she's still alive. She's bitter about all of this, people run scared up here.</i></p> <p><i>There was a lady who worked in Dosimetry at the Lab in the early years. She was the one who kept the records. You should contact her.</i></p> <p style="text-align: right;">(pp. 9–10 of 30)</p>		
<p><b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b></p> <p>[The issue was discussed at the Outreach Meeting (ORAUT 2005a, pg. 10 of 30). Most NIOSH responses are incorporated with the comments (above).]</p> <p><i>Bill Murray: NIOSH did a study of the ZIA cohort. ZIA was here at LANL from 1945–85, and they hired a lot of people of Hispanic origin for maintenance. NIOSH got dose data on those people for the study.</i></p> <p>Silver, K., 2005. <i>Review and Critique of the Draft NIOSH Site Profile Document for Los Alamos National Laboratory</i>, September 19, 2005., pg. 35:</p> <p><i>A specific event was described by a former worker in which “the Lab hired summer students to purge the medical records” of Zia employees. It is unclear whether dose records were purged, but the former worker thinks probably so. According to this former worker, the purpose was to shield the Lab from potential liability related to a change in the maintenance contractor from Zia to another company.</i></p>		

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**SC&A Observation/Comment:**

NIOSH expressed concern and interest in the issue at the outreach meeting, requesting additional information and contacts. However, SC&A has not located documentation of NIOSH follow-up on this concern. As noted for Comment 9, the SRDB and SEC Viewer may not contain complete documentation of NIOSH’s site expert interviews and communications.

A cursory search of the SRDB was performed to identify interviews and/or document retrieval related to the issue of Zia records destruction. SC&A did not identify any documents in which the keyword “Zia” co-occurred with “purge” or “destruction.”

Although Dr. Silver recalled the worker’s comment in his critique of the LANL site profile, SC&A did not identify discussion of this issue in NIOSH’s response to the critique (NIOSH 2006).

**NIOSH Evaluation Comment:**

Records can exist in a number of locations, and controls on record material are specific and costly to implement, so that documentation not meeting the definition of ‘record material’ is often disposed of to save cost. This can be made up of secondary records, or non-record copies of record material. In general, dose reconstruction experience with hundreds of Los Alamos claims does not show that ZIA workers’ records are, typically, different or less complete than records for other contractors’ employees.

NIOSH has not found any evidence suggesting that dosimetry-related documents were purged for Zia employees. Dosimetry records for Zia employees are readily available.

**SC&A Conclusion:**

The NIOSH Evaluation Comment provides a plausible scenario in which the “purging” of records described by the commenter may not impact the completeness of records available for dose reconstruction. The NIOSH Evaluation Comment further explains that evidence does not suggest a loss of dosimetry-related records, which are readily available for Zia employees. These statements reflect apparent consideration of the workers’ concern but do not provide additional information regarding NIOSH’s investigation.

Disposition: NIOSH’s explanation is reasonable and has precedence in evaluations at other sites. However, there is no documented tracking and disposition of this issue, despite the significance of any allegation of records destruction. Likewise, there is no mention of this issue in any of the later technical documents.

Inconclusive. NIOSH’s explanation is reasonable and credible, but there is no record of whether and how this issue was received, tracked, and dispositioned, so NIOSH responsiveness at the time cannot be gauged.

Documentation of NIOSH interviews and site expert communications is limited and may be incomplete.

NIOSH representatives at the Outreach Meeting expressed an interest in further investigation of this issue, but no follow-up Action Item was recorded in WISPR.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 7	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified

**Comment:**  
*The urine samples may have been there for a month or two before they were picked up. Sometimes, we had to ask them to do nose swipes. There was no regular pattern to the programs.*  
(pg. 13 of 30)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**  
[Refer to Comment 12 for NIOSH response/consideration regarding adequacy of internal monitoring program.]  
  
ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013, pg. 33 of 117.  
  
*Intakes are not calculated from nasal swipe results, but the results of nasal swipes are used as indicators of possible intakes. Nasal swipes continue to be used in the present bioassay program as an indicator of possible intakes.*  
  
ORAUT 2009. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 01, Oak Ridge Associated Universities Team, October 15, 2009, Appendix E, pg. 141 of 150.  
  
[From Table E-9. Programmatic items potentially affecting the calculation or assignment of dose from plutonium and/or uranium.]

Item	Finding/issue description	Dose affected	DR action	Comments
9-1	The 1991 DOE Tiger Team Assessment expressed concern that tritium bioassay samples scheduled by the field could remain in the field for several weeks rather than being turned in immediately (DOE 1991).	Tritium	No Specific Action	Calculated doses would be based upon the analysis and the submission dates, and positive doses would be back-corrected, but missed doses may have resulted when samples dropped below the MDA over time. However, this project routinely assigns missed dose, so no additional action is necessary.
9-2	Some studies indicate that varying amounts of tritium could be held up in the polyethylene container when timely processing of samples (within hours) does not occur.	Tritium	No Specific Action	This could result in some diffusion of tritium through the container, reducing the concentration in the sample to some extent; however, the potential loss cannot be estimated by the dose reconstructor. In any case, it is unknown to what extent this observation would have affected the universe of LANL tritium dose measurements.

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**SC&A Observation/Comment:**

Potential concerns related to untimely processing of urine bioassays were addressed in Revision 1 of the Internal Dose TBD. NIOSH considered the potential for missed tritium dose (due to decay below detection limits) and the potential loss of tritium from a sample due to diffusion through the container. NIOSH indicates the first concern is addressed by the routine assignment of missed dose, while the impact of the second concern cannot be estimated by the dose reconstructor. Appendix E was not retained in Revision 2 (ORAUT 2013b).

Inconsistent performance of internal monitoring practices was among the programmatic concerns identified in the Tiger Team report. As noted for Comment 12, these concerns were considered in the SEC-109 ER and addressed in Rev. 1 of the Internal Dose TBD. Nasal swipes are not utilized to assign dose, although they may be considered in estimating an intake date.

**NIOSH Evaluation Comment:**

Appendix E was removed from the internal dose TBD because the SEC class period was extended through 1995; therefore, no longer will any attempt be made to reconstruct dose from non-primary radionuclides for which there are no bioassay results in the claim files. The routine assignment of missed dose is intended to, over an entire monitoring period, overestimate potential losses described in the comment.

**SC&A Conclusion:**

Disposition: Issues were investigated and addressed in technical documents

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 8	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified

**Comment:**

*I worked as a Radiological Control Technician (RCT) in 1977 at TA-55, the plutonium facility. We wore TLDs and finger badges, but I felt there were discrepancies in exposure rates. When you work in TA-55 in the gloveboxes with 238Pu, 239Pu, 241Am, 137Cs and 60Co, and the reports come back with readings of 0.001 millirem – how could the results be so low? When you’re doing glovebox changes, you know that it has to be higher than that.*

*When I worked at CMR (Chemistry and Metallurgy Research), the chemical and mineralogy center, they took 35 truckloads of materials that were buried in the basement of CMR and moved it so the Tiger Team wouldn’t see it. There was a lot of exposure, chemical, toxic substances and radiation. But when the RCTs got their reports, the exposure rates were very low. An example is the stacks at CMR – I was personally instructed not to turn in the filter for count if it was over a certain level, to just dispose of it in the trash can.*

*I worked with the different instruments that were used, the Alpha 11139, the E530 for beta and gamma, the Bonner sphere for capturing neutrons, calibrating these instruments in the basement. I asked for – and was not given – a lead apron. When we removed the radiation sources from the dead pigs, the exposure was high.*

*[Jack Buddenbaum: Were you wearing dosimeters during those operations?]*

*Response: Yes, we wore thermoluminescent dosimeters (TLDs), but the results were always low.*

*Comment: They always had two sets of badges in the plutonium facility. One set was kept overnight in a cabinet. If you want to know the real numbers, where are the numbers for the badges that stayed overnight in the cabinet?*

(pg. 14)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[Refer to Comment 5 for NIOSH’s general response/consideration regarding adequacy of external monitoring data.]

NIOSH 2007a. *SEC Petition Evaluation Report, Petition SEC-00051*, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007, pp. 91–92 of 117.

*In the plutonium processing areas of TA-1, -3, -21, and -55, the primary sources for external radiation exposure were low-energy photons from plutonium and Am-241, a progeny of the Pu-241 present in weapons-grade plutonium (WGpu). Also present were neutrons from spontaneous fission of even isotopes of plutonium, alpha-neutron reactions, and low abundance neutron-induced fissions.*

*In the uranium chemistry, metallurgy, machining, and testing applications processing areas, the primary external radiation exposure concern was high-energy beta emitters from uranium progeny and impurities.*

ORAUT 2004. *Technical Basis Document for the Los Alamos National Laboratory – Site Description*, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004, pg. 26 of 65.

*As of 1969 the CMR Building, except for Wing 9, was used for laboratory work on small quantities of uranium and plutonium. Wing 9 contained hot cells for irradiated uranium and sometimes plutonium. Effluents could have contained mixed fission products, including iodine. Filters were counted for both alpha and beta radiation.*

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**SC&A Observation/Comment:**

As noted for Comment 5, NIOSH has considered many factors contributing to uncertainty for external dose reconstruction, and the dose reconstruction process routinely accounts for uncertainties affecting the external monitoring data. NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction with the use of claimant-favorable assumptions, particularly for periods after 1975. SC&A did not identify specific consideration of the workers' concerns regarding dosimeter readings they felt were inconsistent with the source term and work activities.

Characterization of source terms for TA-55 and CMR are generally consistent with the workers' descriptions. The Site Description indicates stack filters were counted for alpha and beta radiation. SC&A did not identify specific consideration of the worker's statement that stack filters were discarded without being counted.

**NIOSH Evaluation Comment:**

External dose rates from gloveboxes with plutonium source terms are typically low due to the attenuation of the alpha particles offered by the gloveboxes and the intervening air; the associated emissions from X-rays are of low energy and low penetrating power as well, so all these factors result in very low deep doses. Glovebox operations with cesium-137 and cobalt-60 would result in higher external doses; however, the presence of large amounts of these radionuclides in plutonium gloveboxes is unlikely to be common, other than their presence in radioactive sealed sources used for instrument operational testing. Doses from radioactive sealed sources are typically small; the sources are easily controlled, dose rates are low, and they usually irradiate a very small area.

Dose reconstructors evaluate all case-specific information with respect to the documented dosimetry results. If recorded results are not consistent with potential exposures, they have the option to assign external dose based on average measured doses, and to assign internal dose based on co-worker intakes of primary radionuclides.

Stack filters are not themselves good indicators of potential exposures; internal doses are based on bioassay results, co-worker data, or other sources. Environmental internal doses are typically based on environmental air concentrations measured outside facilities because such measurements are likely to be more representative of potential intakes.

**SC&A Conclusion:**

Disposition:      Source terms and uncertainties are addressed in technical documents.  
                          Potential inconsistencies between monitoring results and work tasks are assessed in individual dose reconstructions.  
                          The question of stack filters being discarded without counting was not investigated due to its lack of impact on internal dose reconstruction.

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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**Category:** Data Adequacy and Completeness

<b>Comment Number:</b> 9	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
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**Comment:**

*The Department of Energy did come up with a report saying that the data that Los Alamos was sending was not the correct data that the physicians' panel needed to do the dose reconstruction for claimants.*

*[Bill Murray: The physicians' panels are different from what we're talking about here. That's under the Subtitle E – that's not radiation.]*

*Response: But my point is that H2, the occupational facility for Los Alamos, was not sending the correct data to NIOSH for the physicians' panel. Therefore, the claimants were getting short-changed because the data that LANL was sending was not the data the physicians' panel needed to reconstruct the dose rate for the claimant.*

*(pg. 6 of 30)*

*Is there anyone brave enough to say to the Lab "The data you're giving us is flawed. What are we going to do about it?" Has anyone approached that? No. You're telling us that you never have. You're saying that you've taken reconstruction material and done it and then putting in a fudge factor because some information is missing. If it's missing, it's missing . . .*

*Is there somebody above you who can make a decision who can say "The stuff we're getting from the Laboratory, or any place that we can do reconstruction, is not true and the books are cooked, and now where do we go folks?"*

*(pg. 27 of 30)*

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[NIOSH response from the outreach meeting (ORAUT 2005a):]

*Ken Silver: What he's referring to is the 2004 report to Congress Access to Information for Performance of Reconstructing Dose Reconstruction . . . He hit the nail on the head. That report shows that the Lab is not coming through with the information that was required by NIOSH. Whether anything's changed since then, you'll have to tell us.*

*Jack Buddenbaum: We have one thing that may be what you're talking about. What they [LANL] originally sent for the claims was LANL's estimate of internal dose . . . NIOSH originally said in their letter, "We want the raw data. We want to know when someone was chest counted, or when people left urine samples. We want to know what those results were, not interpretations of what those figures represent." NIOSH wants to take that data and try to use the best science we have today to estimate what the doses are. . . Your point – how good is the bioassay data, how good is the radioanalytical data that they generated when they measured the concentrations in urine or how good is the whole body counting data – that's something we're wrestling with. We're trying to use our best experience and our knowledge to see if it's reasonable. . .*

*Jack Buddenbaum: . . . There is some good news. For the last nine months or so, we have a couple people at the Lab creating a database from the data. It was in disarray, a lot of it was very difficult to work with. . . We're starting to see results. We've got pretty good data on plutonium and americium. We're looking pretty good on tritium. Uranium is about half-way there. Fission product data is sparser than we'd like to see. . . We're not there yet, but we're getting some of that data now. . . The only thing is, we do have claimants that don't have bioassay data, so we have to take other approaches and maybe Bill and Sam can talk about that more.*

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*... We've interviewed a former HP tech (name withheld) who worked at the Lab way back, what they called a monitor in those days. He's given us great guidance to the reports we should look at, and we're finding and retrieving some of those documents. There is a great deal of indoor air measurement data, actual counts on the instrument. We're looking at the data. Most of us have many years of experience and we know when things don't seem reasonable.*

(pp. 6–7 of 30)

*Sam Glover: We did tell them they gave us the wrong data. The bioassay data they gave us to begin with was not adequate.*

(pg. 27 of 30)

**SC&A Observation/Comment:**

NIOSH's response describes staff efforts to acquire, organize, and utilize raw data for site profile development and dose reconstruction. NIOSH representatives interacted with participants in a very open manner, describing their efforts and accomplishments as well as current limitations of available information.

The NIOSH response describes an interview with a former HP Tech who provided guidance in finding and retrieving monitoring data of interest for dose reconstruction. SC&A did not identify documented communication consistent with this description. This may indicate incomplete documentation of NIOSH interview notes and other site expert communications on the SRDB and SEC Viewer. In scoping sources of comments for the current review, SC&A found only eight Documented Communications for the period of interest (2005–2012), and three of these files were discussions with current records personnel regarding a data capture request.

SC&A has not identified substantive consideration of workers' concerns regarding falsification of data.

**NIOSH Evaluation Comment:**

NIOSH recognizes that the internal dosimetry data provided by LANL may be incomplete. Partially due to this situation, an SEC class has been designated for all workers at LANL through 1995. NIOSH is continuing to work with LANL to ensure that complete internal dosimetry records are provided for claimants, particularly for the post-1995 period. These efforts are ongoing.

NIOSH has not found any significant evidence suggesting that records data have been falsified, only that they may be incomplete.

**SC&A Conclusion:**

The NIOSH Evaluation Comment indicates "NIOSH has not found significant evidence" regarding falsified radiological exposure data. This statement implies consideration of the concern but does not provide additional information regarding NIOSH's efforts to investigate it.

Disposition:      Data adequacy for internal dose reconstruction was investigated and addressed in technical documents.  
                           Incomplete evidence of investigation regarding data falsification concern. Not addressed in technical documents.

NIOSH appears to have been vigilant in investigating any evidence of falsification of data. However, actual documentation of such investigations have, heretofore, been incomplete.

Likewise, documentation of NIOSH interviews and site expert communications appears to be incomplete.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 10	<b>Source of Comment:</b> OTS-83: <i>Rollout Meeting for Los Alamos National Laboratory Site Profile</i> (ORAUT 2005b ) August 16, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>... it seems that the Lab has "lost" many of the records regarding my radiation exposure at other sites over the years. That must make it considerably more difficult to perform a dose reconstruction.</i> <span style="float: right;">(pg. 6 of 16)</span>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b> Response from outreach meeting (ORAUT 2005b, pg. 6 of 16):  <i>Bill Murray: Yes, it does.</i>  <i>Sam Glover: In this case, LANL ran the film monitoring program and lost the data for the Nuclear Weapons Testing Air Monitoring Program.</i>		
<b>SC&amp;A Observation/Comment:</b>  The NIOSH representatives appeared to be familiar with the specific situation described by the commenter. They acknowledged that LANL had lost data from the program and agreed that the absence of monitoring data complicates dose reconstruction. SC&A was not able to identify additional information based on the limited details available in this brief exchange.  As noted for Comment 5, NIOSH has concluded that external dosimetry data may be incomplete prior to 1975, but available results will be used in partial dose reconstructions.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition: Issue was investigated and was not incorporated into technical documents.  NIOSH was responsive to the substance of the comment.		

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 11	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 20, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p>[Spouse] worked for the Zia Company, a subcontractor for Los Alamos National Laboratory, from approximately [redacted]. During the course of his employment, [spouse] was over-radiated on several occasions.</p> <p>[Between late 1963 and late 1965] . . . I vividly remember that . . . my husband was prohibited from entering a “hot” site because he was already over-exposed. During this same time period, [spouse’s] dosimetry readings were zero. [Dosimetry reports were provided in support documentation.]</p> <p>At this time, I have requested all of [spouse’s] medical records from the Los Alamos Medical Center. Unfortunately, the Los Alamos Medical Center has responded that no records could be found or located.</p> <p style="text-align: right;">(pg. 40 of 50)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>[Refer to Comment 5 for NIOSH response/consideration regarding data adequacy for external monitoring.]</p> <p>NIOSH 2007a. <i>SEC Petition Evaluation Report, Petition SEC-00051</i>, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007.</p> <p style="padding-left: 40px;"><i>Extensive work to determine the pedigree of 1943–1970 LANL monitoring data has not been performed because those years are being recommended for SEC inclusion. This recommendation is based on an identified lack of monitoring data necessary to perform dose reconstructions for the proposed class for that time period.</i></p> <p style="text-align: right;">(pg. 66 of 117)</p> <p>NIOSH 2010. <i>SEC Petition Evaluation Report, Petition SEC-00170</i>, Rev. 0, National Institute for Occupational Safety and Health, April 26, 2010, pg. 16.</p> <p style="padding-left: 40px;"><i>Although NIOSH found that it is not possible to completely reconstruct radiation doses for the period from March 15, 1943 through December 31, 1975, NIOSH intends to use any external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at LANL during the period from March 15, 1943 through December 31, 1975, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.</i></p>		
<b>SC&amp;A Observation/Comment:</b>		
<p>NIOSH has recommended the time period referenced by the commenter for inclusion in the SEC, and available personal monitoring data are used to partially reconstruct doses for claimants ineligible for the SEC. SC&amp;A did not identify specific consideration of the commenter’s concern regarding the discrepancy between a worker’s monitoring records and a work-restricted status.</p>		

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**NIOSH Evaluation Comment:**

The DOE and its predecessor agencies required (and require) contractors to control personnel radiation doses to federal limits, and expect the contractors to reduce the doses as much below those limits as is practicable. However, overexposures do infrequently occur, and though they are relatively rare, they were more common in the early years of the Cold War. Overexposures were typically carefully documented and often health physics follow-up actions were taken to try to mitigate the exposure or to estimate the dose resulting from the incident. For this reason, dose reconstructors will often see records of investigations in claim files for individuals who are involved in overexposure incidents.

Work restrictions may result from a number of causes. These include limiting further exposure to external dose-rate fields or potential intakes of radioactive material to ensure that dose limits are not exceeded. An example of a work restriction as an administrative control to maintain dose below an administrative limit or control level is based on work in a tritium area: When urine results for tritium exceed a maximum permissible concentration (usually based on the committed effective dose), entry is restricted until concentrations drop below the control level and access is restored. Internal dose from tritium will not register on a whole-body dosimeter.

Other reasons individuals might be denied entry to radiological areas include the lack of proper dosimetry for entry to a given area, the need for bioassay prior to entry, and the lack of necessary training for entry. Individuals who have been administered medical isotopes are also typically restricted from entry due to the fact that the radiation from these medically-administered radionuclides can interfere with personnel monitoring instrumentation. There are also a number of other reasons for restriction of entry to certain areas, including industrial hygiene and industrial health and safety controls.

It is also important to remember that external dosimeter results will not reflect internal doses from intakes of radioactive material. It is possible for an individual to have been ‘overexposed’ to potential intakes of radioactive material, based on bioassay results, and have an external dosimeter result of zero. The dose reconstructor reviews all internal dose records and assigns dose based on positive results. Missed dose is assigned based on the assumption that, for negative bioassay results, the material is present at the minimum detectable amount but not detected.

It is unlikely that NIOSH would be able to locate the specific work restriction being referenced from the 1960s in order to evaluate the alleged discrepancy. NIOSH has not found any significant evidence suggesting that records data have been falsified.

**SC&A Conclusion:**

The NIOSH Evaluation Comment considers several scenarios in which restriction from radiological areas (even for reasons related to over-exposure) would not be incompatible with negative dosimeter results. The NIOSH Evaluation Comment further explains the assignment of internal dose from positive results and missed dose from negative results. Investigation of the specific alleged discrepancy may not be feasible and is not a reasonable expectation for the scope of this review.

Disposition:      General factors affecting external data adequacy have been investigated and incorporated into technical documents.

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 12	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>. . . record keeping at Los Alamos National Laboratory is so problematic that there is a discrepancy in the weapons plutonium inventory. . . . A DOE report titled <i>Plutonium: The First Fifty Years</i> exposed a discrepancy [of 765 kilograms between DOE and LANL records of the amount of plutonium discharged to waste]. DOE claimed the inconsistency was due to differences in accounting for waste and normal operating losses. However, the IEER [2005] report analyses all losses recorded by DOE and a discrepancy of about 300 kilograms still remained.</i></p> <p><i>Moreover, the DOE Inspector General inspected LANL for its material control and accountability. The Inspector General found that accountable nuclear material had not undergone a 100 percent inventory for possibly 13 years. The inspector General went on to say [LANL’s Material Control &amp; Accountability Program “could be improved with regard to the provision of timely and accurate information concerning the inventory, characteristics, and location of accountable nuclear materials.”]</i></p> <p><i>Information concerning the type, quantity, and location of radionuclides is required to prepare a dose reconstruction.</i></p> <p style="text-align: right;">(pp. 49–51 of 112)</p> <p><i>A study conducted at LANL found that while LANL subcontractor ZIA had employed 14,428 people between 1946 and 1978, records for only 5,424 of those employees were sufficient for occupational health studies. Further records shortfalls were cited in a report by Steve Wing and David Richardson:</i></p> <p style="padding-left: 40px;"><i>Most occupational health studies at LANL have been limited to white Anglo employees of the University of California. Radiation monitoring, personal and medical records for the Zia workforce, which includes many Hispanics and Native Americans, have been less complete than records for the University of California workforce. In one study personnel records were available for 97 percent of University of California workers but only 20 percent of Zia workers, and urinalysis records were available for 39 percent of University of California workers but only four percent of Zia workers. Hispanics, non-whites, and women have been excluded from a number of occupational health studies of University of California employees at LANL. [Wing, S., Richardson, D. page 45]</i></p> <p><i>LANL prepared a report titled “LANL ES&amp;H Self Assessment”. The report detailed problems in the LANL documentation program. [Specific issues noted by the petitioner from this report include a lack of central instruction and formally implemented controls regarding requirements for written procedures, document format and numbering, revision control processes, and periodic management review of procedures.]</i></p> <p><i>The Tiger Team Assessment of 1991, which is attached to SEC petition 00051, also had findings concerning records. [Specific issues noted by the petitioner include reporting of occurrences and off-normal incidents, documentation of fail-safe interlocks and warning lights for x-ray and radiography machines, inadequate records for field maintenance of detection instruments, incomplete information for internal dosimetrists and incomplete chain-of-custody records for bioassay samples, inadequate contamination controls in plutonium and DU areas. Not all machine operations were logged at the TA-8 linear accelerator; placement of barriers and postings were not recorded. Logbook entries made in pencil, lack of knowledge regarding records retention requirements, and documentation of RCT training were also noted by the petitioner.]</i></p> <p style="text-align: right;">(pp. 52–55 of 112)</p>		

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

NIOSH 2012a. SEC Petition Evaluation Report, Petition SEC-00109, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012.

*Multiple data capture efforts have taken place to support this evaluation. These efforts have included trips to LANL as well as the National Archives in Denver. . . .*

[Examples of Radiological Procedures retrieved:]

- *Radiological Safety Procedures in P-Division, dated January 1977, contain a set of procedures prepared by the Radiation Safety Committee which describe various health physics practices designed to minimize exposure to radioactive materials (P-Division, 1977).*
- *A memorandum, Standard Operating Procedures for the Handling of Actinide Elements, dated October 15, 1973 and reviewed and updated on April 20, 1976 [passage quotes procedural requirements for gloveboxes, leak testing, and protective clothing for all manipulations of americium or curium. Full face respirators were required for transfers out of gloveboxes.]*
- *An office memorandum entitled Radiation Protection Procedures, dated September 17, 1976, lists 40 Standard Operating Procedures that pertain to radiation protection that were reviewed and found to be adequate and up-to-date (SOPs, 1976).*

(pp. 42–43 of 98)

*SEC-00109: The Tiger Team Assessment Report (submitted by the petitioner) made a number of observations about the LANL site that are pertinent to the potential for unmonitored intakes (DOE, 1991). [The ER summarizes types of findings, including frequency and documentation of radiation surveys: incomplete control of contamination; inappropriate, inconsistent, or missing signage; inconsistent calibration and response-checking of instruments; placement of air monitors not based on airflow studies; inconsistent setting of alarm thresholds for air monitors.]*

*None of the numerous Tiger Team findings and observations pertains to the adequacy of the internal or external personnel monitoring programs; therefore, they do not compromise NIOSH's ability to conduct dose reconstruction with sufficient accuracy. Dose reconstructions for LANL employees are based upon internal and external monitoring data. These data are also employed in co-worker studies to estimate unmonitored worker intakes.*

(pg. 58 of 98)

ORAUT 2009. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 01, Oak Ridge Associated Universities Team, October 15, 2009, Appendix E, pg. 126 of 150.

*Each item in the tables below is a summary of a programmatic problem or observation made by the 'Tiger Team' assessment described in DOE (1991). The dose reconstructor should evaluate each claim to determine whether the programmatic findings listed may imply an unmonitored intake in accordance with Section 5.5 of this technical basis document. . . .*

ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.

*The following sections describe several types of employees for which potential unmonitored internal doses must be considered when reconstructing internal doses. In each case, a review must be performed for potential unmonitored internal doses using case information. Programmatic problems identified in the Tiger Team assessment (DOE 1991) indicate that the potential exists for unmonitored intakes. Unmonitored intakes may be estimated using ORAUT-OTIB-0062, Internal Dosimetry Coworker Data for*

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*Los Alamos National Laboratory (ORAUT 2009b). However, doses from potential intakes of other radionuclides may only be based on dose monitoring information in claim files. Because of the potential for internal dose that is not reflected in internal dose monitoring information, classes of LANL employees have been added to the SEC that include all workers in the period before January 1, 1996.*

(pg. 17 of 117)

*The Zia Company was the service worker contractor. Zia employees participated in a separate monitoring program from that for Laboratory employees. . . .*

*. . . although listed as a monthly requirement for hazardous areas as early as 1946, submission of urine samples was dependent on determination of a “high nose count” or an “extremely hazardous job” or at the request of the DP East Section Leader (Meyer 1954).*

*. . . In 1975, it was determined that the H-1 and H-5 efforts to schedule plutonium urine samples for Zia employees were inadequate. Only Zia employees who were permanently assigned to DP West and the CMR Building were being sampled; other Zia employees in plutonium areas were not. . . [Changes between 1976 and 1978 improved bioassay participation and clarity of guidance regarding which workers required bioassay.]*

(pp. 19–20 of 117)

**SC&A Observation/Comment:**

NIOSH’s Data Capture Synopsis in the revised ER for SEC-109 indicates that NIOSH identified, reviewed, and retrieved LANL records regarding material accountability and plutonium inventories. These issues are considered in NIOSH’s assessment of environmental occupational dose.

The absence of formal, site-wide records management policies does not necessarily indicate lack of appropriate controls for radiation safety and monitoring procedures. NIOSH specifically noted Radiation Safety Committee approval and periodic management review for some of the procedures noted above (from the 1970s).

NIOSH documented consideration of the Tiger Team report in both revisions of the SEC-109 ER. Revision 1 of the Internal Dose TBD included a detailed assessment of programmatic concerns from the Tiger Team report and the impact of each issue on dose reconstruction, which was not retained in Revision 2.

The Internal Dose TBD indicates NIOSH’s consideration of concerns regarding Zia monitoring practices prior to 1975. SC&A did not identify specific NIOSH considerations regarding the completeness of Zia records for 1976–2005.

**NIOSH Evaluation Comment:**

NIOSH recognizes that the internal dosimetry data provided by LANL may be incomplete. Partially due to this situation, an SEC class has been designated for all workers at LANL through 1995. Zia performed contract work at LANL from 1946 to 1986.

**SC&A Conclusion:**

The NIOSH Evaluation Comment clarifies that NIOSH acknowledges potentially incomplete internal monitoring data for LANL, which encompasses Zia employees even if it does not specifically assess the completeness of Zia data, per se. This comment is responsive to the SC&A Observation.

Disposition: Issues were investigated and addressed in technical documents

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 13	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p>[From narrative regarding Sigma Americium Contamination Incident:]</p> <p><i>. . . Only guards that were working at Sigma on July 26, 2005 were monitored for contamination. Other guards were not monitored. . . [Handwritten logs were not checked for persons to be monitored.] Some guards requested in-vivo and in-vitro monitoring as they remember handling the workers badge the day the contamination occurred. Guards are not enrolled in the routine bioassay program. Additionally, as a result of this incident, LANL revealed that recently hired guards had not received base-line bioassay monitoring required of new hires.</i></p> <p><i>Even if support service workers were enrolled in the routine bioassay program, their in vitro bioassay results probably would not be accurate. The reason is bioassay kits are collected on a weekly basis. For example, at TA-55 the kits are returned to a wooden cabinet with glass doors. These kits are collected for analysis every Tuesday...</i></p> <p>[Petitioner cites NCRP Report 87 regarding deterioration of biological samples from bacterial action that may interfere with subsequent analysis.]</p> <p><i>Further, the LANL bioassay program is insufficient. Support Service workers were not routinely monitored under the bioassay program. Further the records are either inadequate or incomplete.</i></p> <p>[Petitioner cites SEC-051 ER, describing deficits and challenges related to data adequacy and completeness for LANL internal monitoring records prior to 1990.]</p> <p>[Also quoted from SEC-051 ER:] <i>Interviews with current and past LANL personnel involved with bioassay indicate that fission products were not considered a significant source term for intake among LANL workers. However, site reports contain references to high airborne fission product concentrations. [SEC Petition Evaluation Report Petition SEC-00051 page 78]</i></p> <p><i>Next, LANL used a variety of radionuclides over its history. Monitoring for “exotic” radionuclides was rare. The LANL SEC 1943–1975 evaluation report pointed out:</i></p> <p><i>LANL has always been a center for research. As such, small-scale use of various radionuclides not addressed above has occurred throughout the history of LANL (“small-scale” as in number of persons or activity of the source). Little or no documentation has been found on bioassay for these nuclides, which included: Ac-227, P-32, C-14, Cm-244, Th-232, Th-230, and Pa-231. Even so, most of these radionuclides received considerable discussion in monthly reports. From these discussions, it can be surmised that, during some periods, <b>these radionuclide</b> [sic] <b>represented significant source terms.</b> [Emphasis added] Such discussions addressed the need for bioassay, listing of these radionuclides as significant environmental effluents, and identification of the lack of monitoring as an assessment finding.</i></p> <p><i>Inventory records to establish the significance of the source term of these “exotic” radionuclides is limited. Most available information is limited to waste activity reports. [SEC Petition Evaluation Report Petition SEC-00051 page 79]</i></p> <p style="text-align: right;">(pp. 65–68 of 112)</p>		

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

NIOSH 2009. SEC Petition Evaluation Report, Petition SEC-00109, Rev. 0, National Institute for Occupational Safety and Health, January 22, 2009, pg. 40–41 of 77.

*... For the purpose of this discussion, the term “exotics” is used to include everything other than U-234/235/238, Pu-238/239, tritium, Am-241, and Cs-137 (i.e., radionuclides for which there are limited or no internal dosimetry data). This would include Sr-90, Th-232, Cm-244, Ac-227, Pa-231, Np-237, and others. Although not primary contributors to the collective dose at LANL, it is possible that for some individuals, one or more of these exotic radionuclides were the primary source of internal dose. LANL clearly possessed capabilities to conduct bioassay measurements for these exotic radionuclides (LANL, 2008); however, specific data for such measurements are very sparse and generally unavailable.*

NIOSH 2012a. SEC Petition Evaluation Report, Petition SEC-00109, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012.

*... Generally, the surrogate nuclide approach might not be appropriate for bounding exotics for the following possible reasons:*

- *Exposure for many exotics might be on an intermittent, experimental basis leading to episodic exposures that are not adaptable to chronic-exposure models.*
- *The controls in place for smaller bench-top-type operations might not have been as well-engineered as the controls in place for larger routine operations.*
- *The operations involving these exotics might have been of a sufficiently different nature as to preclude a direct comparison to those of U and Pu.*

(pp. 47–48)

*7.2.4 Internal Dose Reconstruction Feasibility Conclusion*

*In its initial evaluation of SEC-00109, NIOSH concluded that internal dose reconstruction for members of the proposed class was feasible, based on: (1) using in vitro and in vivo bioassay data for monitored workers; and (2) using co-worker data to bound intakes to unmonitored workers . . . Since that initial evaluation, following multiple meetings of the Advisory Board Work Group on LANL and subsequent research, NIOSH has now concluded that it lacks sufficient information, which includes biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source term information, to allow it to estimate with sufficient accuracy the potential internal exposures to fission and activation products, and various other radionuclides of concern, to which the proposed class may have been subjected.*

*Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from January 1, 1976 through December 31, 1995, NIOSH intends to use any internal monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at LANL during the period from January 1, 1976 through December 31, 1995, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.*

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**SC&A Observation/Comment:**

NIOSH has documented consideration of the petitioner’s concerns regarding a lack of routine internal monitoring for internal exposures, inadequate or incomplete internal monitoring data, and potentially high airborne

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concentrations of fission products, scarce monitoring data and insufficient source term information for “exotic” radionuclides.

Each of these issues was acknowledged by NIOSH in both revisions of the ER. NIOSH conducted data capture and considered options for estimating or bounding worker’s exposures to exotic radionuclides. Inadequacy of internal monitoring data for exotic radionuclides was a primary factor in NIOSH’s recommendation of LANL worker classes to the SEC. NIOSH continues to investigate these issues as part of its ongoing review of the post-1995 period. A recent data request (NIOSH 2012b) includes questions regarding monitoring for exotic alpha emitters, fission and activation products, thorium, and special tritium compounds, as well as internal monitoring practices and assessment of internal dose for support service workers.

SC&A did not locate a response on the matter of weekly sample pickup potentially impacting the accuracy of bioassay results (specifically related to biological degradation of samples). As noted for Comment 7, NIOSH did consider potential missed dose caused by holding tritium samples for several weeks before counting.

**NIOSH Evaluation Comment:**

The effect of biological degradation of samples on the accuracy of the measurement is one factor considered when bioassay protocols are developed. Often, the entire sample volume is used, but for those techniques in which an aliquot is used, the material is processed to ensure radionuclides are redistributed throughout the sample volume, typically by stirring or processing the sample mechanically in some way, such as in a blender.

For routine sampling techniques, the collection protocols (often 24-hour or “simulated 24-hour” samples) are specified in instructions to the sampled individual as these can have a significant impact on the level of sensitivity. After collection is complete, short delays in analysis (on the order of a week or so) have less effect, and routine protocols often feature delays of a week or more prior to analysis.

**SC&A Conclusion:**

Disposition: Issues were investigated and most were addressed in technical documents

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 14	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>  <i>Another issue is the neutron dosimetry at LANL. The LANL 7776 type TLD was in use at LANL until 1998 when the Model 8823 was adopted. To determine neutron dosimetry, the LANL 7776 required the use of site specific neutron correction factors (NCFs). Hoffman and Mallett said this about neutron correction factors, “NCFs can vary by more than an order of magnitude at LANL facilities” [Hoffman, J.M. and Mallett, M.W. page S98]. Considering that Support Service workers could work at several facilities during a day, dose reconstruction using the data from the LANL 7776 type TLD cannot be done.</i>  <p style="text-align: right;">(pp. 68–69 of 112)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  NIOSH 2012a. <i>SEC Petition Evaluation Report, Petition SEC-00109</i> , Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 58 of 98.  <i><u>7.4.4 LANL 7776 TLDS and Neutron Correction Factors</u></i>  <u>SEC-00109</u> : “NCFs can vary by more than an order of magnitude at LANL facilities.” Considering that Support Service workers could work at several facilities during a day, dose reconstruction using the data from the LANL 7776 type TLD cannot be done.  <i>Area-specific neutron correction factors (NCFs) are used at LANL to improve the accuracy of the neutron dose based on workplace instrument measurements (ORAUT-TKBS-0010-6). If workers frequented multiple facilities, or if the facilities frequented are unknown, NIOSH can bound neutron doses by applying the highest NCF for any of the buildings the worker may have entered.</i>		
<b>SC&amp;A Observation/Comment:</b>  The petitioner’s concern regarding neutron correction factors for the 7776 TLDs is directly addressed in the ER. NIOSH acknowledges that workers may have frequented multiple facilities and that worker movements on site are not precisely documented. The maximum NCF from facilities the worker may have entered is used to bound the neutron doses for an individual claimant.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition: Issue was investigated and addressed in a technical document.  NIOSH was responsive to the substance of the comment.		

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 15	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008a) September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>Guards had the same TLDs (thermoluminescent dosimeters) as other workers, but the dosimetry reports always read "0." [Name redacted] said that he once had a reading of 130 millirem, but his annual report stated that he had received "0" millirem.</i> <span style="float: right;">(pg. 3 of 11)</span>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b> [Refer to Comment 5 for NIOSH Response/Consideration regarding adequacy of external monitoring data.]		
<b>SC&amp;A Observation/Comment:</b> As noted in the analysis of Comment 5, NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction with the use of claimant-favorable assumptions, particularly for periods after 1975. Missed dose is assigned for recorded or assumed zero dosimeter results, based on the individual's typical exposure or coworker data. SC&A did not identify substantive consideration of workers' concerns regarding dosimeter results that were not consistent with other assessments of exposure.		
<b>NIOSH Evaluation Comment:</b> Dose reconstructors evaluate all case-specific information with respect to the documented dosimetry results. If recorded results are not consistent with potential exposures, they have the option to assign external dose based on average measured doses, and to assign internal dose based on co-worker intakes of primary radionuclides.  The specific issue appears to be a discrepancy between a pencil dosimeter reading (or other direct reading dosimeter) and a TLD badge that was worn along with it. Such discrepancies are not uncommon and when they do occur, the TLD is generally considered to give the most reliable result, although not in real time. The TLD result is the basis for the dose of record and would be used by NIOSH for dose reconstruction.		
<b>SC&amp;A Conclusion:</b>  Disposition:      General adequacy of external monitoring data has been investigated and addressed in technical documents.  NIOSH was responsive to the substance of the comment and the SC&A Observation.		

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<b>Category:</b> Data Adequacy and Completeness		
<b>Comment Number:</b> 16	<b>Source of Comment:</b> OTS-18: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008b) September 17, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>[Name redacted]. . . commented that he understood that many of the medical records that have not been available are in boxes in a basement somewhere. He stated that, while he understands and supports the NIOSH efforts to locate the records, he would like to hear how Dr. Macievic proposes to get those documents.</i> <span style="float: right;">(pg. 3 of 11)</span>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b> A direct response was provided at the Outreach Meeting (ORAUT 2008b, pg. 3 of 11):  <i>Dr. Macievic responded that he is not searching for the medical records because those are provided during the initial part of the claims process. NIOSH is looking for the survey reports that contain the source data from the measurements taken by radiological control technicians (RCTs) in the field.</i>  ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i> , ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013, pg. 53 of 117.  <i>In some cases, occupational medical records not included in the DOE files are in the DOL file. These can include records that contain important detail on potential exposures including extremity dose information, nasal count data, airborne contamination reports, and incident reports. Dose reconstructors estimating doses for LANL workers should always, therefore, review the DOL files.</i>		
<b>SC&amp;A Observation/Comment:</b>  The commenter’s description of many records “in boxes in a basement” is consistent with the issue discussed in Comment 3, which stated that a substantial volume of medical records was being held in storage by Los Alamos Medical Center. Additional details and resolution of this issue is discussed in the analysis of Comment 3.  NIOSH responded during the outreach meeting to clarify the agency’s primary interest in radiological records for dose reconstruction. The Internal Dose TBD advises dose reconstructors to review claimant medical files for data that may be relevant for dose reconstruction.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition: NIOSH did not pursue acquisition of medical records. An explanation was provided to the commenter.  NIOSH was responsive to the substance of the comment.		

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INDIVIDUAL COMMENT REVIEWS  
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<b>Category:</b> Decontamination/Decommissioning		
<b>Comment Number:</b> 17	<b>Source of Comment:</b> OTS-16, 9:00 a.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008c) September 16, 2008	<b>Commenter:</b> Not identified
<p><b>Comment:</b></p> <p><i>[Name redacted] stated that when DP Site was decommissioned, contaminated soil was removed to a depth of 12 feet outside the building’s concrete walls. [Name redacted] stated that 12 truckloads of soil per day were transported for burial in Nevada over a month’s time. [Name redacted] added that the walls and shielding were also transported to Nevada, along with additional contaminated soil past the 12-foot mark.</i></p> <p><i>Ms. Valerio asked whether any of the attendees had been on patrol during the mid-1970s when TA-1 was decommissioned – a 200-page report on the decontamination efforts apparently states that the area will never be 100% decontaminated. Many contaminated items from LANL’s early days were taken to waste sites for burial. [Name redacted] stated that he did not begin working at LANL until the late 1970s but, historically, security personnel have escorted transported material.</i></p> <p style="text-align: right;">(pg. 8 of 11)</p>		
<p><b>NIOSH Response/Consideration of Comment:</b></p> <p>ORAUT 2004. <i>Technical Basis Document for the Los Alamos National Laboratory – Site Description</i>, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004.</p> <p>[Sections 2.3.1.1 and 2.3.1.2 (pp. 19–21) describe plutonium processing at TA-1 and TA-21 (DP Site). Descriptions of some individual buildings include dates of decommissioning and/or removal.]</p> <p><i>In 1970, the concentrations of plutonium and strontium were measured in the vicinity of TA-21. The concentrations measured north of East Road was .11 pCi/g in surface soil and .9 pCi/g south of it. The study concluded that the plutonium must be from deposition of the releases from DP-Site’s airborne effluents (Stoker, 1976). Another report indicates the estimated area of soil contaminated by TA-21 is approximately 300,000 meters squared, with 239-plutonium concentrations ranging from .005–.006 pCi/g (Voelz 1980).</i></p> <p style="text-align: right;">(pg. 22–23 of 65)</p> <p>NIOSH 2007a. <i>SEC Petition Evaluation Report, Petition SEC-00051</i>, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007.</p> <p><i>TA-1 (General): Original Main Technical Area (inactive): Active 1943–65; turned over to Los Alamos County or private interest in 1966; all contamination removed by 1975.</i></p> <p style="text-align: right;">(pg. 26 of 117)</p> <p><i>TA-21, DP Site a.k.a. DP Mesa (General): . . . In 1977, a transfer of work to the new plutonium facility (TA-55) began and much of the complex was vacated. TA-21 was partially decommissioned and decontaminated in 1977–1980. As of 1993, most of the contaminated buildings, exterior duct work, and underground structures still remained at the site.</i></p> <p style="text-align: right;">(pg. 34 of 117)</p> <p>NIOSH 2012a. <i>SEC Petition Evaluation Report, Petition SEC-00109</i>, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 43 of 98.</p> <p><i>LANL report entitled, The Decommissioning of TA-21-153, Ac-227 Contaminated Old Filter Building, dated November 1981, includes a discussion about health physics controls used for this operation. . . .</i></p>		

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[Examples of SRDB documents indicating consideration of DP Site decommissioning and soil issues:]

SRDB Reference ID	Document Title/Description
929	Decommissioning of TA-21-153, a 227 Ac Contaminated Old Filter Building
13574	Plutonium and Strontium in Soil Near Technical Area 21, 1970–1971
45689	Accumulation and Transport of Soil Plutonium in Liquid Waste Discharge Areas at Los Alamos
54133	H-1 Standard Operating Procedure for Demolition and Disposal of Building DP-12
55489	Project Plan for Cleanup of Technical Area 21
69404	TA-21 Building 3/4 Decommissioning
73414	TA-21 Site Characterization
75296	Recommendations for Clean Up of TA-21 DPW
109451	Standard Operating Procedure for the Demolition of TA-21-153 Filter Building – Associated Ductwork, Contaminated Soil and Asphalt

The SRDB contains the report (approximately 200 pages) of TA-1 decontamination mentioned by a commenter:

SRDB 27944. Ahlquist, A.J., Stoker, A.K., Trocki, L.R., 1977. Radiological Survey and Decontamination of the Former Main Technical Area (TA-1) at Los Alamos, New Mexico.

**SC&A Observation/Comment:**

The Site Profile and SEC petition evaluation reports contain fairly limited information about decommissioning activities. A cursory review of document titles in the SRDB appears to reflect investigation of DP Site decommissioning, soil contamination, and remediation. The report on TA-1 decontamination, mentioned by a commenter, was also identified on the SRDB.

SC&A did not identify documentation of NIOSH’s response/consideration of the comment regarding security escort of D&D waste shipments. However, it has been a long-established NIOSH policy to exclude such escorts as being in a “covered facility” as defined under EEOICPA.

**NIOSH Evaluation Comment:**

Dose rates from material disposed as part of decontamination and decommissioning activities are typically low. The Department of Transportation also limits dose rates on radioactive material shipments to ensure that the public and transportation workers are protected.

Dose reconstructors assign doses based upon assumed employment, potential work areas, and dosimeter results without specifically evaluating whether work took place in a “covered facility.”

**SC&A Conclusion:**

Disposition: Decommissioning and soil contamination issues were investigated and addressed in technical documents (some pre-dating the comment).

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> Environmental		
<b>Comment Number:</b> 18	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<p><b>Comment:</b></p> <p><i>The State of New Mexico Environmental has come down hard on LANL for over 2,800 hot sites that have been identified for clean-up. There are still a lot of hot sites to be identified.</i></p> <p><i>DP West is going to be one of your hot spots.</i></p> <p style="text-align: right;">(pg. 11 of 30)</p>		
<p><b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b></p> <p>A direct response was provided at the Outreach Meeting (ORAUT 2005a, pg. 11 of 30):</p> <p style="padding-left: 40px;"><i>Bill Murray: That's a problem, as it is at all the sites. The problem is that you have to try to find out when there were high levels of internal and external radiation, because you don't really know where a person worked.</i></p> <p>ORAUT 2010. <i>Los Alamos National Laboratory – Occupational Environmental Dose</i>, ORAUT-TKBS-0010-4, Rev. 01, Oak Ridge Associated Universities Team, March 26, 2010, pg. 10 of 96.</p> <p style="padding-left: 40px;"><i>Occupational environmental exposure refers to exposures workers received while on the site but outside facilities from elevated ambient radiation, from facility effluent releases to the environment, and from resuspension of radionuclides in soils. Effluent releases can result in internal and external exposures by inhalation of airborne radionuclides and by submersion in an effluent. This TBD provides estimated annual intakes for inhalation exposure and estimated doses as a result of submersion and ambient exposure at LANL.</i></p> <p style="padding-left: 40px;"><i>. . . This TBD addresses occupational environmental exposure by considering available source term information that has been compiled for some of the TAs, as well as results of published environmental measurements for a larger number of TAs.</i></p> <p>ORAUT 2004. <i>Technical Basis Document for the Los Alamos National Laboratory – Site Description</i>, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004, pg. 14 of 65.</p> <p style="padding-left: 40px;"><i>TA: TA-21</i> <i>Name and Description: DP Site: a.k.a. DP Mesa: former plutonium operations (DP West); uranium/polonium operations (DP East); Material Disposal Areas A,B,T,U,V; Tritium Systems Test Assembly, Tritium Science and Fabrication Facility (1945 to 1978) . . .</i> <i>Radiation sources: 239Pu; 238Pu; 240Pu; 241Pu; 241Am; 235U; 238U; 210Po; 227Ac; 3H</i></p> <p>[Refer to Comment 21 for additional consideration of workers' potential exposure to legacy waste and environmental contamination.]</p>		

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**SC&A Observation/Comment:**

Both NIOSH's response at the outreach meeting and the Environmental Dose TBD indicate the agency's awareness of workers' exposure to environmental contamination. DP West is described in some detail in the Site Description TBD. Descriptions of the operations, facilities, and releases take up 5 pages of the document.

As noted for Comment 21, in its ongoing review of the post-1995 period, NIOSH continues to investigate potential exposure of unmonitored workers to exotic radionuclides from environmental source terms that may not be fully characterized.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      Issues were investigated and addressed in technical documents (some pre-dating the comment).  
                                 Ongoing investigation.

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Environmental		
<b>Comment Number:</b> 19	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>[Sam Glover: Was there a plutonium bioassay program – urinalysis?]</i>  <i>Yes, but it wasn't done regularly. I was working at TA-54 and burying every kind of radiation there was. Pigs, monkeys, everything they were doing testing on, I had to bury them. Half the time, there were no air monitors while I was working. People stole the batteries. There was no good monitoring program.</i> (pg. 13 of 30)  <i>I have a document that said they buried tritium at TA-54. They put it in vermiculite to help grab the gas. A report was written when they wanted to expand Area G that said "Tritium is buried in barrels, which are leaking, and the shafts will continue to leak for many years," and there's no way to stop it. When you look at the monitors, they don't show it. Area G had "sniffers" that weren't on.</i> (pg. 16 of 30)		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
ORAUT 2004. <i>Technical Basis Document for the Los Alamos National Laboratory – Site Description</i> , ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004, pg. 16 of 65.  <i>TA: TA-54</i> <i>Name and Description: Waste Disposal Site: solid wastes; Materials Disposal Areas G, H, J, L</i> <i>Radiation sources: All</i>		
ORAUT 2010. <i>Los Alamos National Laboratory – Occupational Environmental Dose</i> , ORAUT-TKBS-0010-4, Rev. 01, Oak Ridge Associated Universities Team, March 26, 2010.  <i>Although for later years data are available to characterize environmental internal doses in great detail, such data are not available, typically, for years before 1971. On-site ambient doses may be included in partial dose estimates for years in which they may be based on a consistent environmental dose measurement program, specifically, 1965 and later.</i> (pg. 11 of 96)  <i>4.2.1.3 Estimation of Air Concentrations</i> <i>Air-monitoring data, when available, formed the basis for estimates of air concentrations at each TA [5]. For some areas, especially TA-21 and TA-54, more than one monitoring station was active during many years (LANL 2003). In these cases, the analysis averaged concentrations over all stations in the TA. For years and locations when monitoring data were not available, the analysis based an estimate on the relationship between source emission rate and air concentration for years when data were available.</i> (pg. 16 of 96)		
NIOSH 2007a. <i>SEC Petition Evaluation Report, Petition SEC-00051</i> , Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007, pg. 41 of 117.  <i>Location: TA-53 (sic) [See NOTE below in SC&amp;A Observation.] Currently active solid waste disposal area; Materials Disposal Areas G, H (inactive), J, and L. MDA G is the LLW disposal area for the Laboratory and has been in use since 1957. It has also been used to store low-level TRU mixed waste, as well as liquid hazardous and mixed wastes. Tritium migrated from the shafts at MDA H in the 1960s and early 1970s. Air samples collected from shafts at MDA H had elevated tritium activity of "1.6 to 4.4 million times the DOE derived concentration guide of 1.0 x 10<sup>3</sup>." Subsequent investigations show that</i>		

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*tritium has been released from MDA H shafts to the surrounding turf where it may be released by evaporation or transpiration from plants. . . .*

*Radionuclides: All, including TRU, H-3, DU, Pu-238, Pu-239, Pu-240*

NIOSH 2012a. SEC Petition Evaluation Report, Petition SEC-00109, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 58 of 117.

*SEC-00109: The Tiger Team Assessment Report (submitted by the petitioner) made a number of observations about the LANL site that are pertinent to the potential for unmonitored intakes (DOE, 1991). In summary, the report observed that: . . . (12) out-of-calibration instruments, such as glovebox hand and foot monitors and tritium monitors, were not placed out of service. . . .*

*None of the numerous Tiger Team findings and observations pertains to the adequacy of the internal or external personnel monitoring programs; therefore, they do not compromise NIOSH's ability to conduct dose reconstruction with sufficient accuracy. Dose reconstructions for LANL employees are based upon internal and external monitoring data. These data are also employed in co-worker studies to estimate unmonitored worker intakes.*

**SC&A Observation/Comment:**

NIOSH technical documents acknowledge the presence of tritium in TA-54, the migration of significant amounts of tritium from shafts in MDA H, and limited environmental monitoring data from periods before 1971. SC&A did not identify a specific discussion regarding “sniffers” turned off in Area G. Similar issues noted in the Tiger Team assessment report were determined not to preclude dose reconstruction of sufficient accuracy.

NIOSH has collected and analyzed available air monitoring data to develop estimates of environmental dose to support partial dose reconstructions. Dose reconstructions are primarily based on internal and external monitoring data, including individual results for monitored workers and coworker models for unmonitored workers.

**NOTE:** The solid waste disposal area was incorrectly identified as TA-53 in Table 5-1 of the SEC-051 ER. Elsewhere in the ER and other documents, the solid waste disposal area is identified as TA-54.

TA-54 was not listed in two subsequent addenda to the ER (NIOSH 2007b and NIOSH 2007c), which specified “operational Technical Areas with a history of radioactive material use” to define a class of LANL workers for inclusion in the SEC. The technical area criterion was eliminated in August 2010, when the SEC-170 class became effective.

**NIOSH Evaluation Comment:**

NIOSH recognizes that the internal dosimetry data provided by LANL may be incomplete. Partially due to this situation, an SEC class has been designated for all workers at LANL through 1995. NIOSH is continuing to work with LANL to ensure that complete internal dosimetry records are provided for claimants, particularly for the post-1995 period. These efforts are ongoing.

**SC&A Conclusion:**

Disposition: Issues were investigated and addressed in technical documents (some pre-dating the comment). Ongoing investigation.

NIOSH was responsive to the substance of the comment.

A clerical error in Table 5-1 of the SEC-051 ER apparently resulted in TA-54 being excluded from the SEC Class designation from August 2007 to August 2010

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<b>Category:</b> Environmental		
<b>Comment Number:</b> 20	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p>Summary of general topics regarding environmental exposures, monitoring, and modeling at LANL:</p> <ul style="list-style-type: none"> <li>• Complex terrain – pp. 13–14 of 112</li> <li>• Climate and winds influence dispersion of radionuclides – pp. 14–19 of 112</li> <li>• LANL releases from exhaust stacks, explosives testing, burial, and discharges – pp. 19–20 of 112</li> <li>• Open air explosives testing – pp. 20–24 of 112 <ul style="list-style-type: none"> <li>○ Material carried in the updraft following the fireball moves straight up as though travelling in a chimney. This should be modeled as a point source, but the Site Profile assumes explosives testing created an area source.</li> </ul> </li> <li>• Building design (stack height, shape, orientation to the wind, proximity to other buildings) and complex topology influence how releases are dispersed – pp. 24–29 of 112</li> <li>• Challenges involved in monitoring emissions – pp. 30–34 of 112</li> </ul> <p>Specific statements regarding monitoring and modeling of environmental exposure at LANL:</p> <p><i>Radioactive emissions from LANL are modeled using the Clean Air Act Assessment Package – 1988 (CAP-88). . . CAP-88 has limitations which affect the accuracy of the model at Los Alamos. . .</i></p> <p><i>. . . CAP-88 does not address terrain height, building wake or tip downwash, multiple sources (i.e., all sources are co-located) or the skyshine pathway. These limitations are discussed in the 1999 LANL Site Wide Environmental Impact Statement [SWEIS] on page B-5, Appendix B, Volume III.</i> (pp. 34–36 of 112)</p> <p><i>The AIRNET air samplers are located around the LANL perimeter. The AIRNET samplers are used to detect plutonium, uranium, tritium, and americium. The AIRNET samplers do not detect the other radionuclides released from LANL sources. The placement of the air monitors is to determine the dose to the public off-site. . . The AIRNET samplers are placed over various distances up to several miles from exhaust stacks. Few are located in areas that would determine the exposure to employees. . .</i></p> <p>[The TA-72 firing range, used by the guard forces for weapons qualifications, is located in Sandia Canyon about 1000 feet south-southwest from the LANSCE exhaust stack. It is used primarily in the afternoon and evening (1,200–2,400 hours), when winds blow down the canyon and LANSCE peak emissions occur.] <i>There is no monitoring in the canyon for radioactive releases from the LANSCE although the LANSCE is the largest source of the off-site dose, about 90% of the dose. . . The National Research Council stated, “External exposures can be significant for noble gases such as 41Ar or 133Xe or long-lived radionuclides that are deposited on the ground.” Finally, the LANL ES&amp;H Self Assessment found fault with the holding of gases to allow for decay prior to release. [LA-12200-MS]</i></p> <p><i>Finding/AX.2-3: The practice of holding, or delaying, the release of radioactive emissions to maximize radioactive decay has not been fully implemented.</i></p> <p><i>Discussion: Although LAMPF is not a nuclear facility, it releases the highest level of activity on site. Currently, filtration and short transit air times are used, but it has been determined that a longer delay would significantly reduce emissions.</i> (pp. 36–39 of 112)</p>		

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*The LANL ES&H self assessment discovered problems with the stack monitoring at LANL. [LA-12200-MS]*

*Finding/AX.2-1: Stack monitoring is inconsistently applied across Laboratory facilities.*

*Discussion: Different technologies and configurations are used for stack monitoring; many are not real-time monitors, while others are state-of-the-art systems. These systems are not being evaluated for adequacy for both normal and off-normal conditions. Continuous Air Monitor (CAM) alarms, which monitor the exhaust of some buildings, are not always monitored at a location remote from the operating area. Alarms are not routed to a remote location where operators can monitor them.*

[Similar concerns regarding stack monitoring resulted in non-compliance with the Clean Air Act.] Specifically, [the EPA] found that not all sources of radionuclide emissions had been identified, stack monitoring equipment had not been installed on all stacks and vents emitting significant amounts of radionuclides into the air, for those stacks and vents monitored, the monitoring systems did not meet regulatory requirements and upgrading, and LANL had not conducted and was not in compliance with the quality assurance programs required by the regulations.

(pp. 41–42 of 112)

*The final report of the First Independent Audit of Los Alamos National Laboratory for Compliance with the Clean Air Act, 40CFR, Subpart H was completed in 1999. . . Historical stack sampling did not meet 40CFR61 requirements.*

*The results continued that LANL did not take representative samples of effluent. [Factors noted by the petitioner include inadequate sampler rates (4 vs. 34 cubic feet per minute), failure to test samplers for compliance with EPA regulations, and placement of samplers relative to emission locations.] LANL only calculated dose assessments at one location. By not calculating dose assessments at other locations LANL may not have calculated the highest dose for the maximally exposed individual. LANL did not meet regulatory requirements to provide complete and accurate information when reporting. The 1996 annual RAD NESHAPS report to the EPA contained 20 errors. There were discrepancies in CAP-88 dose assessments. The reported doses to the public required correction. Required data concerning distances from points of releases or sources . . . were omitted or not provided causing a regulatory deficiency.*

(pp. 43–44 of 112)

*The air was not monitored around the buildings at LANL. . . . The proximity of buildings has a dramatic effect on the dispersion of aerosols and gases. . . . LANL knew it had not accounted for these factors. The air emissions report noted, “The role of stack parameters, plume rise, and the likely role of building downwash and wake dispersion has not been addressed in the emissions monitoring documentation we have seen.” The report further nailed the point down by saying:*

*The area of stack height has its specific concern. It is known that stack emissions from stacks that are short compared with the building height are partially trapped in the building’s wake and appear immediately at ground level. **One could question whether LANL employees near such buildings are at risk.** [LANL Air Emissions Monitoring Program, pg. 14, Emphasis added.]*

(pg. 46 of 112)

*The documentation that was used to prepare the Centers for Disease Control Los Alamos Historical Document Retrieval and Assessment (LAHDRA) report as well as the LANL Environmental Surveillance reports only address airborne concentrations that would affect people offsite. **These reports were main resources for the dosing tables in the Technical Basis Document. This is a key factor that was not addressed in the Technical Basis Document ORAUT-TKBS-0010-4.** However, the document does point out that the locations of air monitors, in relation to workers, is not well known.*

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[Petitioner cites SEC-051 ER:]

*Airborne concentrations are available for some years of operation, but are deficient for all ROCs [radionuclides of concern].*

*With area and environmental monitoring data missing for some time periods and deficient for all ROCs, a complete assessment of potential dose cannot be performed without the use of unsubstantiated assumptions. [SEC Petition Evaluation Report Petition SEC-00051 Page 81] (pg. 47 of 112)*

*Additionally, problems exist with the air monitors and the data from them. In 2000, testing of the air monitors at Los Alamos revealed inconsistent wind sampling at high wind speeds. . . . Under high winds in the wind tunnel, the AIRNET sampler exhibited about 96% efficiency for 5 micrometer particles and about 60% efficiency for the respirable fraction represented by 10 micrometer particles. . . . The AIRNET sampler overestimated the concentration of micrometer particles for all wind speeds tested. Further, the percentage of penetration into the sampler varied according to direction of the flow in relation to the direction the sampler was facing. The sampler was most efficient if the flow was into the front of the air sampler. As illustrated earlier, the winds in Los Alamos do not always blow from the same direction. (pg. 48 of 112)*

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

ORAUT 2010. *Los Alamos National Laboratory – Occupational Environmental Dose*, ORAUT-TKBS-0010-4, Rev. 01, Oak Ridge Associated Universities Team, March 26, 2010.

*LANL has reported effluents for many of the TAs from 1971 to 1995 [1]. In recent years, the reporting of air emissions has been by stack or vent. It is not possible to ascertain at this point how comprehensive the current reporting of effluents is. . . . Furthermore, LANL has not assessed the exact locations of releases in relation to potential receptors in a TA.*

[The TBD describes locations and historical monitoring results from AIRNET stations]. . . *results are not reported for many TAs, and data are missing for some radionuclides and some years. Locations of the air-monitoring stations in relation to a specific worker location in a TA are not well known.*

*Due to the lack of comprehensiveness of both effluent and air-monitoring data, the approach to estimation of worker intakes of radionuclides from air due to emissions from the TAs relied on a combination of the effluent and air-monitoring data in this TBD. Because air-monitoring data from a TA include concentrations from effluents from that TA as well as resuspension of previously deposited radionuclides and effluents from nearby TAs, this analysis preferred these data for estimation of air concentrations and ultimately worker intakes. The analysis used emissions data to fill some of the known gaps in monitoring data (see Section 4.2.1.3).*

(pg. 12 of 96)

*The National Council on Radiation Protection and Measurements (NCRP) screening model chosen for these calculations (NCRP 1996) . . . accounts for potential increases in exposure due to building wake effects for close-in receptors (i.e., those less than 100 m from the source location) . . .*

*. . . The calculation assumed an average wind speed  $u$  of 2.8 m/s and an average effluent release height  $h$  of 8 m. The average wind speed at Los Alamos has been reported to be about 2.8 to 3 m/s (LANL 1994, 1999). The specification of an effluent release height of 8 m results in a dispersion factor that is more favorable to claimants because this assumes that releases are near ground level, rather than from elevated stacks, which increases estimated ground level concentrations. (pg. 15 of 96)*

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*4.3.2.2 Los Alamos Neutron Science Center (TA-53)*

*The large, high-current accelerator at TA-53 began operation in 1976. Since then, this facility released megacurie quantities of activation products annually through the exhaust stack. In addition to 41Ar, the accelerator stack released significant activities of 11C, 13N, and 15O. . .*

*. . . To estimate air concentrations from the LANSCE stack, the analysis considered three work locations: TA-53, TA-21, and TA-72. . .*

*. . . Bowen (1987) modeled dispersion from the LANSCE stack using Gaussian equations. However, the calculations were for a receptor at the site boundary (East Gate) rather than for onsite work locations. . . The dispersion factor from this modeling effort was adjusted for this work to apply to TA-21 and TA-72 to develop average annual concentrations. The adjustment was based on distances from TA-53, and differential wind frequencies were ignored. Wind frequencies toward both TA-21 and TA-72, as measured at the East Gate, are 3% . . . The wind frequency toward the public receptor is 13%. Therefore, the assumption that wind frequency is 13% (i.e., not adjusting the dispersion factor based on wind frequencies) is an approach more favorable to the claimant. . .*

*. . . This analysis calculated estimates of external dose (skin and whole body) from LANSCE emissions for TA-53, TA-21, and TA-72. The estimated doses in Tables 4-29 and 4-30 are based on average annual air concentrations in TA-53, TA-21, and TA-72 from Table C-29. The concentrations at TA-53 assumed a ground-level release. Therefore, the air concentration estimates for TA-53 account for the fact that a percentage of the emissions from that location was diffuse, rather than from the 30-m stack.*

(pp. 23–24 of 96)

ORAUT 2012. *Discussion Points for the ABRWH'S Work Group on LANL*, Rev. 0, Oak Ridge Associated Universities Team, April 6, 2012, pp. 16–17.

*NIOSH RESPONSE TO PETITIONER ISSUE 1.2:*

*NIOSH acknowledges the firing site as a location where contamination may be present, including exotics contamination, and presumptive exposures to the so-called 'exotic' radionuclide may be addressed using the bounding internal dose estimate described in the Evaluation Report. This method assigns intakes based on co-worker intakes, leaving the radionuclide of concern and the era of possible exposure to be determined based on case-specific data.*

*NIOSH RESPONSE TO PETITIONER ISSUE 1.5:*

*For the purpose of bounding dose, if intakes are based on bioassay, even surrogate bioassay, the adequacy of stack monitoring or the issue of resuspension would be irrelevant.*

NIOSH 2012a. *SEC Petition Evaluation Report, Petition SEC-00109*, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012.

*7.2.2 Evaluation of Bounding Ambient Environmental Internal Doses*

*. . . Table 4-31 in ORAUT-TKBS-0010-4 provides site-wide maximum ambient intakes for the entire class period under evaluation. Although available post-1975 data enable dose reconstruction, in this evaluation, workers are assumed to be maximally exposed to conditions that potentially existed in operational areas. Ambient environmental dose is bounded by the assignment of this operations-related dose.*

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*7.3.2 Evaluation of Bounding Ambient Environmental External Doses*

*LANL had a comprehensive program for monitoring ambient radiation exposure within its boundaries and in the surrounding area. This program and the data it generated are described in detail in ORAUT-TKBS-0010-4, which provides a thorough evaluation of ambient environmental dose as applicable to performing individual dose reconstructions. Table 4-25 in ORAUT-TKBS-0010-4 provides site-wide maximum ambient dose data for the entire class period under evaluation. This information should be sufficient to allow bounding of ambient environmental external dose for all members of the class.*

(pg. 56 of 98)

**SC&A Observation/Comment:**

SC&A identified NIOSH’s consideration of LANSCE/LAMPF emission of mixed activation products, dispersion models, height of release point, wind speed and direction, AIRNET locations, completeness of air monitoring and effluent data, and the locations of workers in relation to the release point and the environmental monitoring locations.

NIOSH has evaluated the dose to workers in TA-72 (and other areas) from LANSCE stack emissions. The representativeness of effluent monitoring and air monitoring for activation products, fission products, and other “exotic” radionuclides was a significant factor in NIOSH’s decision to recommend an SEC class for all LANL workers from 1976–1995. NIOSH uses site-wide maximum values to bound environmental dose for claimants who are not eligible for compensation from the SEC classes.

NIOSH continues to investigate these issues as part of its ongoing review of the post-1995 period. A recent data request (NIOSH 2012b) includes queries regarding LANL assurance of compliance with 10 CFR 835 for exotic radionuclides. Additional queries address unresolved petitioner concerns, including LANL assessment of potential internal dose to unmonitored workers from resuspended exotic radionuclides at the firing site.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      Issues were investigated and addressed in technical documents.  
                                 Ongoing investigation.

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Environmental		
<b>Comment Number:</b> 21	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>Further, LANL radioactive wastes disposed onsite are sources of contamination. Onsite disposal of radioactive wastes has occurred since the beginning of the Manhattan Project in 1943. Liquid effluents were discharged into canyons and solid wastes are buried on the mesas. Large amounts of radioactive material have been disposed in the ground. LANL does not have reliable source inventories for solid wastes disposed onsite. LANL has Material Disposal Areas (MDA), Solid Waste Management Units (SWMU), Areas of Concern (AOC) and Potential Release Sites (PRS). MDAs contain radioactive and hazardous wastes. LANL has 25 MDAs. . . Two of the MDAs, U and V, have unknown radionuclide inventories. The MDAs contain radionuclides stored in unlined pits, trenches and shafts carved out of the volcanic tuff. Precipitation and subsequent runoff from the MDAs can cause leaching and migration of the radionuclides. Additional contaminants that have settled in canyons can be carried downstream in storm runoff. The Committee for the Technical Assessment of Environmental Program at the Los Alamos National Laboratory found:</i></p> <p style="padding-left: 40px;"><i>There are still large uncertainties in LANL’s estimates of the inventories of principal contaminant sources and their locations. Similarly, analyses are lacking to approximate the current locations of contaminants (which may have migrated from there [sic] sources) in the various hydrogeological units that constitute the LANL site and surrounding areas. [National Research Council Groundwater Protection at LANL Page 33]</i></p> <p style="text-align: right;">(pp. 69–70 of 112)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>ABRWH 2011. <i>Work Group on Los Alamos National Laboratory</i>, Cincinnati Airport Marriott Hotel, Hebron, Kentucky, May 2, 2011, pp. 285–293.</p> <p><i>DR. MACIEVIC: I know we talked about waste disposal and things like that as a potential source term, but that would have to be addressed in the environmental response. . . .</i></p> <p><i>[CHAIRMAN GRIFFON: . . . these other environmental exposures where people are working around the site. . . -- are the source terms characterized well enough, and can you figure out resuspension potential and exposure that way. . . . [issue] 1.5 covers the environmental exposures and the adequacy to make sure we can -- the environmental model covers all these potentials.]</i></p> <p>ORAUT 2012. <i>Discussion Points for the ABRWH’S Work Group on LANL</i>, Rev. 0, Oak Ridge Associated Universities Team, April 6, 2012, pg. 17 of 23.</p> <p><b>NIOSH RESPONSE TO PETITIONER ISSUE 1.5:</b> <i>For the purpose of bounding dose, if intakes are based on bioassay, even surrogate bioassay, the adequacy of stack monitoring or the issue of resuspension would be irrelevant.</i></p> <p>[Refer to Comment 20 for NIOSH’s conclusions regarding feasibility of dose reconstruction and bounding of occupational environmental dose.)]</p>		

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**SC&A Observation/Comment:**

The petitioner’s concern regarding inadequate characterization of wastes and other contaminants in the LANL environment was discussed in some detail at the Work Group meeting in May 2011. NIOSH identifies such source terms as posing a potential for exposure. As noted for Comment 20, NIOSH uses site-wide maximum values to bound environmental occupational dose for claimants who are not eligible for compensation from the SEC classes.

NIOSH continues to investigate some of these issues in its ongoing review of the post-1995 period. A recent data request includes queries addressing unresolved petitioner concerns, including potential exposure of unmonitored workers to environmental source terms that may not be fully characterized. (NIOSH 2012b, pg. 11 of 12)

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      Issues were investigated and addressed in technical documents.  
                                 Ongoing investigation.

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Environmental		
<b>Comment Number:</b> 22	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008a)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple]

**Comment:**

*[Name redacted] stated that the guards were told as far back as 1995 not to drive their vehicles off the roadways because of the possible contamination to the vehicles from the depleted uranium in the soil. Dr. Macievic asked [Name redacted] if the areas had signs posted along the roadways advising of the contamination hazards. [Name redacted] replied that signs were not posted until much later. (pg. 2 of 11)*

*[Name redacted] stated that the guards patrolled the Hot Dump at TA-54 to make sure that the gates were locked. [Name redacted] stated that he had not been out there in two years, but recalled patrolling Area L and driving through Area G. The Lab only recently had started monitoring the guards on the way out of the area but did not check the patrol vehicles. He stated that he did have any information about patrols in that area before he came to work at LANL. He commented that construction trades workers and firefighters may have some concerns about TA-54, especially the firefighters who are first responders in that area.*

*[Name redacted] stated that an environmental lawsuit has been filed against LANL for violations of the Clean Water Act in the “PRs” and “AOCs” (Areas of Concern), citing concerns regarding the waste streams leaching into the Rio Grande River. [Name redacted] asked if LANL had done monitoring at the streams in TA-49 and TA-2, where the guards also had SWAT training. [Name redacted] was not certain if there has been recent environmental monitoring in those areas.*

*[Name redacted] suggested that [name redacted] at the New Mexico Environmental Department in White Rock may have environmental survey data. [Name redacted] stated that the Resource Conservation and Recovery Act (RCRA) permits, Clean Water Act, and the National Academy of Sciences ground water reports raised concerns about the mass balance of the materials moving through the areas. He added that many of the reports from the early 1990s are unclassified; the RCRA permits from the early 1990s included some of those documents. [Name redacted] noted that his presentations to the Advisory Board in Denver and Tampa discussed some of the materials in the Technical Areas and the cleanup processes for those materials, which might be useful to derive source terms. He described the watershed cycle that sometimes causes heavy runoff from the waste streams from LANL into many of the arroyos and canyons, creating “hot spots” as the pools from the runoff evaporate (for example, uranium concerns from the waste streams at TA-39 into Ancho Canyon, and runoff from TA-50 and TA-55 into Mortandad Canyon). LANL monitors the soil and water in the areas of concern, particularly since the lawsuit.*

*[Name redacted] recalled a contamination incident in the early 1990s at TA-35 in which a guard was contaminated when he was escorting workers who were digging up an old storage tank containing fuel cells on the south side of Building 2. [Name redacted] suggested that the material may have been spent fuel cells from TSL. (pp. 8–9 of 11)*

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from the outreach meeting (ORAUT 2008a, pg. 7 of 11)

*Dr. Macievic stated that he is aware of issues with legacy materials that are in many areas around the LANL site.*

*Dr. Macievic stated NIOSH may have a hard time finding survey or sampling data to model the dose received from radiological materials in the ground.*

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ORAUT 2010. *Los Alamos National Laboratory – Occupational Environmental Dose*, ORAUT-TKBS-0010-4, Rev. 01, Oak Ridge Associated Universities Team, March 26, 2010, pp. 18–19.

*4.2.2 Resuspension*

*Resuspension of radionuclides from contaminated soil has been a potential source of internal dose to workers at LANL since the beginning of operations. A work area in which radionuclide emissions took place is a potential area of exposure to resuspended radionuclides that were deposited on the soil. . . . In Section 4.2.1, measured concentrations of radionuclides are the basis for the estimates of intake in the listed TAs; these estimates include resuspended radionuclides at those TAs.*

*In its early years of operation, LANL discharged liquid effluents from TA-1, TA-21, and TA-50 (formerly TA-35 and TA-45) to Acid, Pueblo, Los Alamos, and Mortandad Canyons. These canyon areas became contaminated with radionuclides. Due to the extent of soil contamination, these areas pose the greatest potential for significant historical intake from resuspension . . . . The canyon areas are presently not part of work areas in any TA . . . . Nevertheless, if workers spent significant time in these canyons in areas where air-monitoring was not conducted, dose reconstructions should consider intakes and exposures from resuspension.*

*LANL has investigated resuspension in Acid, Pueblo, and Bayo Canyons (Ferenbaugh et al. 1982; LASL 1979). Table 4-25 lists estimated air concentrations of selected radionuclides in the canyons for conditions during the 1970s. For Mortandad and Los Alamos Canyons, information on soil contamination levels is available for estimation of resuspension (Purtymun, Stoker, and Peters 1980); this study indicated that plutonium isotopes, 137Cs, and 90Sr were found in soil during the 1970s at levels in excess of those that would be expected due to fallout. Estimates of air concentrations require the application of a resuspension factor to the measured levels. . . . Table 4-25 lists estimated air concentrations for these areas.*

[Refer to Comment 20 for NIOSH’s conclusions regarding feasibility of dose reconstruction and bounding of occupational environmental dose.]

**SC&A Observation/Comment:**

As noted for Comment 20, the potential exposure of support service workers to environmental sources has been addressed in TBDs, SEC petition evaluation reports, and discussions at public meetings. NIOSH has acknowledged such source terms as posing a potential for exposure. NIOSH uses site-wide maximum values to bound occupational environmental dose for claimants who are not eligible for compensation from the SEC classes.

NIOSH continues to investigate potential unmonitored exposures to resuspended exotic radionuclides in its evaluation of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      Issues were investigated and addressed in technical documents.  
                                 Ongoing investigation.

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 23	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b>		
<p><i>I used to wear my film badge on my coveralls in TA-54. In the winter, I wore my jacket over my coveralls . . . . When they used to get our badges, they picked them up, laid them on the desk, and sometimes they were there for two or three weeks.</i> (pg. 13 of 30)</p> <p><i>I wore a film badge when I performed maintenance on the accelerator in the basement at Los Alamos Neutron Science Center (LANSCE). Sometimes I had to sit directly on the steering magnets to change out isolation valves. The film badge was on my lapel, but I was sitting directly on the radiation source. That doesn't return a very accurate reading. I did this many times, and the reading would be between 35 and 40 millirems.</i></p> <p><i>[Jack Buddenbaum: It wouldn't be the best measurement. Did you do the maintenance during shutdown? Did you go into the target area? Was there a health physics technician?]</i></p> <p><i>Yes, we did. It was so hot we had to go in and out. There were six targets. Target 6 was reading about 6 rems at times. When you sit on the radiation source, a film badge on your collar isn't going to pick it up correctly.</i></p> <p><i>[Jack Buddenbaum: What part of the accelerator did you actually sit on? Was that in the target area?]</i></p> <p><i>That would be the 805, and they have the steering magnets throughout the experimental areas.</i> (pg. 18 of 30)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>NIOSH representatives responded during the Outreach Meeting (ORAUT 2005a, pg. 18 of 30):</p> <p><i>Sam Glover: It's certainly not going to pick up the beta radiation. The beta radiation will be attenuated.</i></p> <p><i>Jack Buddenbaum: Yes, we missed that, but it would certainly pick up some of the gamma radiation.</i></p> <p><i>Mark Lewis: This is what I mean when I talk about getting the rest of the story. This is a very complicated site. The people feel a lot of frustration here.</i></p> <p><i>Jack Buddenbaum: I'm hoping that it will be helpful, that it will be of value down the road. I'll make an effort to pursue this.</i></p> <p>Exposure geometry was also discussed prior to the workers' comments (ORAUT 2005a, pg. 10 of 30):</p> <p><i>We know about the workplace radiation fields and workers' locations around the sources. If a worker is wearing a badge on his collar and he's doing work at a glovebox, it won't get a very accurate reading. There are cases where there is a lot of glovebox work and people are standing with their backs to the glovebox. Dose reconstructors can make corrections for situations like this while they're calculation [sic] the dose.</i></p> <p>ORAUT 2013a. <i>Los Alamos National Laboratory – Occupational External Dose</i>, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013.</p> <p><b>6.6 ORGAN DOSE</b></p> <p><i>Calculation of the POC [probability of causation] requires an estimate of the organ dose because the claim is normally specific to disease in an organ. This is estimated from uncertainty distributions of various parameters related to dosimeter response, radiation type, energy, and worker orientation in the field.</i></p>		

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*Appendix A of NIOSH (2007a) discusses conversion of measured doses to organ DE, and Appendix B contains appropriate DCFs [Dose Conversion Factors] for each organ, radiation type, and energy range based on the type of monitoring performed. The selection of worker orientation is important to the calculation of organ dose. Examples of common exposure orientations are listed in NIOSH (2007a, Table 4.2 . . . (pg. 52 of 79)*

OCAS 2007. *External Dose Reconstruction Implementation Guideline*, OCAS-IG-001, Rev. 3, Office of Compensation Analysis and Support, November 21, 2007.

*4.5.2 Geometry Uncertainty*

*There is often considerable uncertainty as to the position from which the claimant received radiation exposure. As noted in section 4.3, there may be some information about job function and position of exposure when handling radioactive materials. Since the “true” exposure geometry is almost never known, an uncertainty distribution about the dose conversion factor is appropriate. Since likely exposure geometry can be calculated for most jobs, a uniform distribution appears to be inappropriate. However, a triangular distribution with the effective DCF being the most likely geometry, the lower bound being the geometry that would result in the lowest organ dose (or dose conversion factor) and the upper bound being the geometry resulting in the highest organ dose (highest dose conversion factor) maybe appropriate.*

(pp. 40–41 of 77)

**SC&A Observation/Comment:**

NIOSH’s responses to the commenter at the outreach meeting, the External Dose TBD, and the implementation guide indicate the agency’s consideration of workers’ orientation and its impact on dose reconstruction. Uncertainties are considered in the assignment of organ dose to the organ of interest for a specific claim. The dose reconstruction process incorporates dose correction factors or adjustments for uncertainties related to dosimeter response, radiation type and energy, and the orientation of the worker and badge to the radiation source(s).

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: General issues affecting external dosimetry were investigated and addressed in technical documents.

NIOSH was responsive to the substance of the comment.

NIOSH representatives at the Outreach Meeting expressed an interest in further investigation of this issue. No follow-up Action Item was recorded in WISPR.

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<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 24	<b>Source of Comment:</b> OTS-83: <i>Rollout Meeting for Los Alamos National Laboratory Site Profile</i> (ORAUT 2005b) August 16, 2005	<b>Commenter:</b> Not identified

**Comment:**

[A guard asked if worker exposures from x-ray monitors (used to check for prohibited articles) would be below minimum detectable level “if the lead curtains were open and the electrons leaked out of the machine.”]

*We sometimes screen as many as 100 packages per hour. That means that the guard handling the switch is getting one hundred shots of radiation per hour.*

*The reason I asked is that a couple of years ago, a worker reached for a package through the lead curtain and the alarms activated because of the X-rays that came out and our dosimetry report for the year did not record that.*

*[Jack Buddenbaum: Those monitors are probably set at a fairly low threshold. It also depends on where the individual was relative to those monitors.]*

*I was right in front of those curtains when he opened them. The hand-held monitor was sitting on top of the X-ray machine with a plastic cowl over it and the portal monitor was off to the left side facing it – about 10 feet away from the machine.* (pg. 6 of 16)

*[Jack Buddenbaum: Where is the X-ray machine for package inspection located?]*

*Response: (Undecipherable)... and the materials access area. They removed the machines at TA-18 and the Chemical and Metallurgical Research (CMR) building 4 or 5 years ago because they changed the security requirements there. They’re still active at TA-55. I’m not sure where else they have them – if they have X-ray machines at TA-8 or TA-41.*

*Response (from another attendee): Yes. We had them up at X site also.* (pp. 8–9 of 16)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

A direct response was provided at the Outreach Meeting (ORAUT 2005b, pp. 6–9 of 16):

[Response to initial questions about typical exposure:]

*Jack Buddenbaum: Modern X-ray machines are well shielded and the beam is very columnated, pointing directly at the source that is being examined. There is some scatter radiation coming off the target being shot, which may lead to some exposure... some dose. Certainly the amount of dose coming out of the machine would be much lower, but the badge the guard is wearing would pick that up typically. If the guard was not badged, then we would look at the type of machine, the operating voltage, the current of the machine, and the exposure time – how long that shutter is open. We could probably reconstruct fairly accurately the amount of scatter radiation at the point where he was standing.*

[Response to incident information:]

*Bill Murray: Was there ever a time when packages were being hand-fed into those machines and they were not shielded with lead curtains?*

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*[Commenter Response: Not in the seven years that I've worked here. I don't know what they had before that.]*

*Bill Murray: That is something that we could check into. Is it listed in the document that they use X-ray package screening?*

*Jack Buddenbaum: There are references to X-ray inspection, but more on the side of the business where they use more powerful X-ray units to look for manufacturing issues related to weapons development.*

*There are so many of those. We did not consider exposure from package screening. We can certainly look into it and add it to our profile. It makes sense.*

*Sam Glover: The question is, if the workers were badged would their dosimeters have picked up the dose from the incident? Is there some reason why we would give them less dose? Would additional dose reconstruction be required?*

*Jack Buddenbaum: Right... that is the question.*

**SC&A Observation/Comment:**

NIOSH representatives engaged in discussion with the outreach meeting participants to request additional information about the package screening operation. Their comments reflect consideration of the potential implications of the exposure incident for dose reconstruction. SC&A did not identify evidence of further consideration regarding low-energy x-rays for package screening. The site description TBD discusses x-rays primarily in the sense of equipment used for weapons development and testing; this section of the site profile has not been revised subsequent to the outreach meeting.

The workers were apparently badged during package screening activities and during the incident described by the commenter. As noted in the analysis of Comment 5, NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction with the use of claimant-favorable assumptions, particularly for periods after 1975.

**NIOSH Evaluation Comment:**

Based on the excerpt included below from the Health Physics Society's "Ask the Experts" page (link and excerpt below), the dose rate is evaluated for a total dose assuming 800 packages are scanned in the course of an 8-hour shift:

$$2.1 E - 11 \text{ C/kg} \times \frac{1R}{2.58 E - 4 \text{ C/kg}} \times 800 = 6.5 E - 5 R, \text{ or } 0.065 \text{ mR}$$

At this dose rate, assuming an individual was assigned for an entire working month (22 days), he or she would receive 1.4 mR, about 1.2 mrem, below the minimum level of detection for a whole-body dosimeter. For this reason, missed dose is likely to cover any doses from package screening equipment.

From the Health Physics Society "Ask the Experts" page at <http://hps.org/publicinformation/ate/faqs/effectsandsecurityscreening.html>

I work for a major airline and will be required to spend eight hours a day near the new baggage X-ray machines (the big ones that I think are CT machines) that TSA (Transportation Security Administration) uses. We have been given a handout saying that TSA has determined that the machines are not dangerous and that we do not need film badges. How can anyone say working near radiation is not dangerous if it is not monitored in any way?

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Some of the newer X-ray machines used to scan checked luggage use computerized tomography (CT) technology, just like those used in medicine. The main difference between the two types of use (security at airports and medical diagnosis) is that the machines used in airports have more shielding to stop the scattered radiation, —nearly the entire luggage belt is shielded where, in medicine, the patient table is not shielded, and they subject the baggage to lower doses because the image does not need to be as clear as it does for a patient.

Someone standing next to the unit in airports would receive little, if any, radiation exposure. Radiation emitted around a piece of equipment when it is operating is determined at the manufacturer and sometimes checked by the purchaser. A manufacturer must assure the equipment is operating within Federal regulations that govern X-ray equipment, which in this case is  $1.3 \times 10^{-7}$  C kg<sup>-1</sup> at 5 cm from the unit (Coulomb per kilogram [C kg<sup>-1</sup>] is a unit of radiation exposure) though performance studies of the equipment indicate that the average exposure rate was about  $2.1 \times 10^{-11}$  C kg<sup>-1</sup> per scan ([NCRP Report 95](#)). Purchasers can use the manufacturer's assurance and/or can perform their own surveys on the equipment. The dose to the luggage is very low and there is no detectable radiation outside the machines according to one manufacturer.

**SC&A Conclusion:**

The NIOSH Evaluation Comment explains that any personnel exposure is likely to be covered by assignment of missed dose. The NIOSH Evaluation Comment provides information responsive to the comment, but it does not indicate if NIOSH investigated the issue prior to the current review.

Disposition: Issue has been investigated and was not incorporated in technical documents.

NIOSH was responsive to the substance of the comment when it was made and to the SC&A Observation.

NIOSH representatives at the Outreach Meeting expressed an interest in further investigation of this issue. No follow-up Action Item was recorded in WISPR.

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<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 25	<b>Source of Comment:</b> OTS-83: <i>Rollout Meeting for Los Alamos National Laboratory Site Profile</i> (ORAUT 2005b) August 16, 2005	<b>Commenter:</b> Not identified
<p><b>Comment:</b></p> <p><i>I know that the Savannah River Site had the issue with falsifying dosimetry reports. I am concerned that might be happening here. There have been other incidents – like testing down at TA-18 – where they give you an additional dosimeter and when they get a report for that temporary dosimeter it shows that they received a dosage. When the annual report comes out, it shows zero.</i></p> <p><i>[Jack Buddenbaum: That is disturbing.] [Bill Murray: Are they wearing some sort of a pocket dosimeter?]</i></p> <p><i>Response: No, they are given an additional thermoluminescent dosimeter (TLD).</i></p> <p><i>[Jack Buddenbaum: Is this a situational TLD, where they turn it right back in?]</i></p> <p><i>Response: Yes. There are several tests that happen every year . . . .</i></p> <p><i>[Bill Murray: Were there situations where situational TLDs were issued in high radiation areas where the dose was expected to be high?]</i></p> <p><i>Response: We did that at TA-18, where they were giving criticality bursts. They would do the burst and we would redeploy the criticality shield.</i></p> <p><i>Response: With the large X-ray machines – like at TA-8 and TA-16 – there have been some problems there as far as positioning people and their proximity to the building. The requirements have changed over the years regarding distance – it used to be a lot closer.</i></p> <p><i>[Jack Buddenbaum: So the security guards are back a little further now?]</i> <i>Response: Yes.</i></p> <p><i>Response (from another attendee): Now they are. In the past, they did not even tell you until after the burst was done. The only indication that we had that a burst had been done would be that the hand-held dosimeter would go off. The hand-held monitor would go berserk, and I would wonder what was going on. That was when they would tell you that they had a burst. One night, I closed the road down for a burst at TA-46 and was on top of TA-18 a couple of miles away. I had a handheld monitor because I was curious about the dose, and it went crazy when they had the burst. I also had a neutron bubble dosimeter, and that came back with a small dose reading. But the regular TLD didn't show any dose.</i></p> <p><i>[Following NIOSH discussion of dosimeter types:]</i></p> <p><i>Response: I have also seen them use the pencil dosimeters. I wonder how much exposure I am getting when I see them looking at the results. Things have changed over the years. They did not tell us anything before the 1980s. Now if we ask, they tell us.</i></p> <p style="text-align: right;">(pp. 8–10 of 16)</p>		
<p><b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b></p> <p>Some issues were discussed at the Outreach Meeting (ORAUT 2005b, pp. 8–10 of 16):</p> <p style="padding-left: 40px;"><i>Jack Buddenbaum: This is something we should follow up with. If those records cannot be resurrected, another option is to have health physicists reenact the incident to see if there is significant dose. They take</i></p>		

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*actual measurements and relate it to a dose for an individual at that location.*

*Bill Murray: It would be interesting in those areas where there could be some substantial dose whether or not that showed up in the records. [Response: That is my concern.] . . .*

*Sam Glover: It sounds like his main concern is the critical assemblies . . . TA-18 is where they have the BEHR assemblies – and there are a number of them -- one for uranium, one for plutonium, as well as others – and they each have their own neutron spectrum.*

*Jack Buddenbaum: Historically, workers in that area have been badged. Maybe the security guards were handled a little differently. The scientists and other area personnel were typically badged. There are external measurements that were taken during the burst shots.*

*Sam Glover: They actually shut the road down at times.*

*Jack Buddenbaum: That is discussed a little bit in the site profile. We are aware that it has been a source of exposure. But when it comes to unmonitored personnel, when they were temporarily badged for an event...*

*Sam Glover: If they didn't have neutron dosimetry there would be a reason for special monitoring.*

[Following the example scenario, NIOSH personnel discussed the worker's recollection of a small neutron dose result when the TLD result was zero.]

*Bill Murray: These are some important things to consider and try to get more detail.*

*Sam Glover: The modern LANL badge assembly has a neutron dosimeter built in. Does it have a higher missed dose compared to a cloud chamber? The cloud chamber may show a small dose, where there would be a missed dose when associated with a TLD.*

*Jack Buddenbaum: That is a good question. The cloud chamber is a good screening dosimeter. The albedo dosimeter, which is used at LANSCE, is more accurate. Results from these are generally the ones used in permanent records.*

ORAUT 2004. *Technical Basis Document for the Los Alamos National Laboratory – Site Description*, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004.

*Operations of the various assemblies at the Pajarito Site resulted in elevated radiation levels along Pajarito Road while the devices were in use. Extensive gamma and neutron measurements were made during operations of the various machines at Pajarito Site in 1975. Extrapolations from these measurements indicated that the annual dose rate from gamma plus neutron radiation at the most exposed location on Pajarito Road was 1,120 mrem yr-1 in 1975 using an assumption of continuous occupancy along the TA-18 boundary. . . .*

*. . . . Neutron dose rates at Kappa Site (TA-36) resulting from operations at TA-18 were identified as a concern in 1957. The highest neutron flux was measured in December of that year when the Hydro assembly was operating. An 18.5-min tolerance was measured at the Kappa Site guard station, with a caveat that the film badges being used had a blind spot for the neutron energies that made up a good share of the flux at that location.* (pg. 46 of 65)

ORAUT 2013a. *Los Alamos National Laboratory – Occupational External Dose*, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013.

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*Before 1949, the Laboratory implemented neutron dosimetry for selected workers beginning with the use of PICs that incorporated Bakelite chambers and graphite coatings. In 1949, nuclear track plates (NTPs) were first used, and badges incorporating Eastman Kodak nuclear track emulsion, type A (NTA) film were first used in 1951. While TLD badges were used for neutron dosimetry beginning in 1980, NTA film continued to be used in a “piggyback” fashion with TLD badges for some workers. Track-etch dosimeters (TEDs) have been used for evaluation of fast neutron doses since 1995.*

(pg. 13 of 79)

**6.2.3.6.3.1 Neutron Energy Spectrum**

*Neutron spectral measurements were made in three areas at TA-18 in 1998 and 1999 to determine what NCFs should be used in conjunction with exposures from critical assembly testing [LANL 2001 (3/17/98 and 6/24/99 memoranda)]. As a result of this work, an NCF of 0.07 was recommended for areas surrounding TA-18. A plot of neutron spectra from several sources, including environmental monitoring TLD Station 6 in the parking lot for TA-18, is shown in Figure 6-9 [LANL 2001 (6/24/99 memorandum)].*

*. . . . Workers are normally at remote locations while the criticality experiments are in progress.*

**6.2.3.6.3.2 Gamma-to-Neutron Dose Ratio**

*The 1967 study of criticality dosimetry methods yielded estimates of gamma-to-neutron ratios for five critical assemblies at LANL based on measurements with TLDs and film badges placed in air, on the front of “plastic man” manikins filled with sodium solution, and on the back of plastic men (Hankins 1968). Table 6-18 lists the gamma-to-neutron and corresponding neutron-to-gamma ratios for the Hydro critical assembly based on measurements with TLDs on the front of plastic men at distances from 5.9 to 100 m. Hankins (1968) presents data for six distances from 5.9 to 19.8 m. A line was fit to these data for extrapolation of the ratios to greater distances.*

(pp. 44–45 of 79)

**SC&A Observation/Comment:**

NIOSH representatives engaged in discussion with the outreach meeting participants to request additional information about the work activities, location, and monitoring practices. The workers expressed concern over supplemental badges with positive results that were not reflected in annual exposure summaries. Some details of the concern are unclear, particularly regarding the type of dosimetry described by the workers (extra TLD or neutron dosimeter) and one worker’s statement that a neutron dosimeter indicated some exposure when a TLD did not. NIOSH personnel discussed potential implications of the information for dose reconstruction and expressed interest in further follow-up. SC&A did not identify specific follow-up or conclusions on the issues discussed, including the workers’ concern that supplemental badges with positive results were not reflected in annual exposure summaries.

The site description, which pre-dates this comment, indicates awareness/consideration of the source terms, including the potential for worker exposures at some distance from the critical assemblies. The External Dose TBD contains detailed information regarding the evolution of external dosimetry at LANL and the limitations of various dosimeters to field conditions described by the commenters.

**NIOSH Evaluation Comment:**

Temporary TLDs are sometimes issued so that they can be quickly read to control individual worker doses as a project progresses; by reading the temporary TLDs, the contractor can ensure that control limits are not exceeded and, in recent years, that worker doses are maintained ALARA. However, it is much simpler to perform the same task with direct-reading dosimeters such as electronic dosimeters and personal ionization chambers, or pencil dosimeters. These are usually called *supplemental dosimeters*. The direct-reading function makes it much easier to control worker dose as the work progresses; however, most supplemental dosimeters are known to over-respond

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(read high), so the dose of record is assigned based on the TLD. The older dosimeters are also very sensitive to mechanical shock when dropped or knocked, and typically show very high readings as a result, when the actual dose, as measured by the TLD, is much lower.

Dose reconstructors utilize all recorded dosimeter results returned by the DOE. Though some dosimeter cycles for Los Alamos include multiple dosimeter results, the dose reconstructor cannot tell from the record whether one was a supplemental dosimeter result or not. Similarly, the dose reconstructor would not be able to identify a situation where a supplemental TLD was issued, but the result was not recorded.

**SC&A Conclusion:**

The NIOSH Evaluation Comment provides information responsive to the comment; it does not provide additional information regarding NIOSH investigation of the issue, nor does it indicate that exposures received in these situations would likely be accounted for in missed dose. The NIOSH Evaluation Comment indicates that a dose reconstructor would not be able to identify and account for an unrecorded supplemental TLD.

LANL SEC Evaluation Reports indicate dose reconstruction for gamma and neutron exposures is feasible from 1946 forward.

Disposition: NIOSH investigation of the specific situations raised in the comments is unclear and is not reflected in technical documents.

NIOSH responsiveness is inconclusive. While there is obviously recognition by the Outreach team of the implications of these comments and the need for further follow-up, that NIOSH follow-up is not evident in subsequent issue tracking or documentation.

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<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 26	<b>Source of Comment:</b> <i>Review and Critique of the Draft NIOSH Site Profile Document for Los Alamos National Laboratory.</i> ([redacted]) September 19, 2005	<b>Commenter:</b> [redacted]'s description of personal communication from P. Schofield, 2005
<b>Comment:</b> <i>Even more fundamental than censored dosimeter readings is the practice of workers wearing their film badges underneath their lead aprons. A former plutonium glove box worker described this as "common practice" while doing "hot work, especially gamma" at CMR Building, DP West and TA-55. Americium, Pu-242 and the changing of hot equipment were jobs in which this practice was common, through the mid-1990's. In one specific incident, the worker's pen dosimeter read "greater than 10R." In several other incidents it exceeded 1R. Yet in all of these cases the worker's film badge was underneath the lead apron where the recorded dose would turn out to be much lower.</i> <p style="text-align: right;">(pg. 35 of 94)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  ORAUT 2013a. <i>Los Alamos National Laboratory – Occupational External Dose</i> , ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013.  <i>By 1960, film badges were calibrated to gamma radiation with a 60Co source (Littlejohn 1961). . . .</i>  <i>. . . Periodic calibrations were made to nickel-coated and uncoated plutonium. . . . Films were calibrated in direct contact with the source and with various filtering materials between the source and the film to simulate dry-box conditions.</i> <p style="text-align: right;">(pg. 31 of 79)</p> OCAS 2007, <i>External Dose Reconstruction Implementation Guideline</i> , OCAS-IG-001, Rev. 3, Office of Compensation Analysis and Support, November 21, 2007, pg. 40 of 77.  <i>Table 4.2 Common exposure geometries for various jobs and facilities.</i> <i>Facility: Chemical Separations</i> <i>Job: Glovebox Chemist</i> <i>Geometry / Percentage: AP [Anterior-Posterior] 90%; ROT [Rotational] 10%</i>  [Refer to Comment 30 for additional consideration of external dose reconstruction for glovebox workers.]		
<b>SC&amp;A Observation/Comment:</b>  The LANL External Dose TBD indicates that film badge calibration practices in the 1960s accounted for dry box conditions. It is not clear if these calibrations addressed lead aprons worn by workers over the film badge, or to what extent lead aprons have been worn by LANL workers. The External Dose Implementation Guideline, as well as the Technical Information Bulletin referenced for Comment 30, consider the exposure geometries for glovebox workers, but do not address lead aprons.  As noted for Comment 30, NIOSH has evaluated lead apron usage specific to site operations and has provided guidance to dose reconstructors in the site-specific External Dose TBDs for some sites. NIOSH has not specified an approach for addressing this issue at LANL.		

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**NIOSH Evaluation Comment:**

Placement of the TLD under the lead apron was an attempt to measure the dose received at the whole body. Pencil dosimeters are notoriously inaccurate, typically read high, and are known to easily go off-scale high as a result of impacts when dropped or knocked.

The Los Alamos TBD does not incorporate a correction algorithm for the use of lead aprons; however, the approach used at other sites, such as the Rocky Flats Plant, could readily be adopted.

**SC&A Conclusion:**

Additional information regarding NIOSH consideration of the issue is communicated in the comment evaluation form for Comment 30.

Disposition: NIOSH has identified some information relevant to the issue and has addressed the same issue for other sites. The approach used at other sites would be appropriate for LANL (as stated in the NIOSH Evaluation Comment). The opportunity to address the issue of dosimeters under lead aprons at LANL, in response to this comment, was missed.  
The issue is not addressed in LANL technical documents, although general guidance is available for dose reconstructors if this issue arises for LANL claimants..

NIOSH was not responsive, at the time, to the substance of the comment. The NIOSH Evaluation Comment is responsive to the SC&A Observation.

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<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 27	<b>Source of Comment:</b> OTS-16, 9:00 a.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008c)</i> September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b>  <i>Radiography areas in S Site . . . had area dosimeters to measure background radiation. Personnel were also issued dosimeter badges, but never had more than “0” readings on their personal dosimetry reports nor were they ever informed of the readings from the area dosimeters.</i>  <i>Guards were always in close proximity to the Kivas when high energy radiation was emitted from Godiva. Several guards were reprimanded when they placed their own dosimeters on the fence.</i> <p style="text-align: right;">(pg. 2 of 11)</p> <i>Mr. Lewis asked if the guards wore dosimetry badges in all of the areas they had discussed. [Name redacted] responded that he had always worn a dosimetry badge but the reports always came back with “0” dose. He was not aware of any guard ever receiving more than “0” dose, except when the two guards placed their badges on trees to see how high the background reading would be. [Name redacted] stated that readings for those badges were extremely “hot” because they were so close to the burst. The DOE conducted a Class A investigation of the incident.</i> <p style="text-align: right;">(pg. 8 of 11)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  ORAUT 2004. <i>Technical Basis Document for the Los Alamos National Laboratory – Site Description</i> , ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004.  [Regarding Godiva assemblies (TA-18):]  <i>In August of 1951, an unclad sphere of enriched uranium metal called Lady Godiva began operation. This assembly was for delayed-critical work through 1952. . . . Use of the Lady Godiva assembly prompted the construction of a second experiments facility, called Kiva 2, which was completed in February of 1953. . . .</i>  <i>. . . In mid-1953, Lady Godiva began being used for super-prompt critical bursts to supply pulses for a variety of experiments . . . . Lady Godiva was replaced with the Godiva II assembly, which was specifically designed for prompt-critical bursts . . . .</i>  <i>Other critical assemblies at TA-18, Pajarito Laboratory, included: . . . Godiva IV: A portable fast burst assembly (successor to Godiva II).</i> <p style="text-align: right;">(pp. 44–45 of 65)</p> [Refer to Comment 25 for NIOSH’s Response/Consideration regarding external exposure concerns with critical assemblies.]  [Refer to Comment 5 for NIOSH’s general response/consideration regarding adequacy of external monitoring data.]		
<b>SC&amp;A Observation/Comment:</b>  As noted above and for Comment 25, the LANL site profile provides information regarding the facilities and operations mentioned by the workers, LANL external monitoring, and assumptions/corrections for dose reconstructions.		

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As noted for Comment 5, NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction with the use of claimant-favorable assumptions, particularly for periods after 1975. Missed dose is assigned for recorded or assumed zero dosimeter results, based on the individual's typical exposure or coworker data. Occupational environmental dose is also assigned. SC&A did not identify specific discussion of the workers' concerns regarding dosimeter readings they felt were inconsistent with the source term and work activities.

The workers' description of reprimands and investigations for personnel who left their badges near criticality experiments indicates that guards' badges were read and that abnormal results were investigated.

**NIOSH Evaluation Comment:**

Rules and procedures for operating radiography sources are intended to ensure that individuals remain outside the active beam while the source is extended, and check to ensure the source has been retracted prior to re-entry to the area. Low doses are certainly the goal of these operations. Results from environmental dosimeters would typically not be representative of personnel doses due to the long residence times of the dosimeters compared with an average occupational occupancy time for a given area (see the response to Comment 5).

The site attempted to control access to areas exposed during the operations of the critical assemblies. Zero dosimeter results are certainly consistent with management's goals in controlling the operation. Also, the experience of one individual or group of individuals who got zero dosimeter results does not mean that the dose results were zero for all affected individuals. It is possible that some guards had non-zero doses, but the fact was never discussed with other workers.

**SC&A Conclusion:**

Disposition:      General issues were investigated and addressed in technical documents

NIOSH was responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 28	<b>Source of Comment:</b> OTS-17: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008d) September 17, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>[Name redacted] added that they regularly wear a TLD and exchange badges once a month.</i></p> <p><i>[Name redacted] stated that he was given two badges when he began working at LANL in the 1970s – a small, square one and a longer rectangular one that had 4 spots. After a time, the Lab decided not to use the larger badge. . . . [Name redacted] stated that they keep single incident dosimeters on the truck, but they rely on the RCTs to tell them if it is necessary to wear a special device based on the situation.</i></p> <p style="text-align: right;">(pg. 7 of 14)</p> <p><i>A discussion ensued regarding the lack of information from LANL on dosimetry readings for the firefighters from special TLDs issued for incidents. [Name redacted] commented that it is hard to understand why special dosimeters do not reflect any dose, given the potential internal exposure scenarios in their jobs.</i></p> <p><i>[Name redacted] expressed doubt that NIOSH is getting any better information from LANL or DOE than he gets in his annual dose report, which usually shows no dose.</i></p> <p style="text-align: right;">(pg. 10 of 14)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>A direct response was provided at the Outreach Meeting (ORAUT 2008d, pg. 7 of 14)</p> <p><i>Dr. Macievic confirmed that the firefighters wore dosimetry badges during the fire . . . . Dr. Macievic asked if the badges are decontaminated or replaced after a contamination event . . .</i></p> <p><i>Dr. Macievic commented that the longer badge had likely been a pick dosimeter to measure “real time” contamination levels, while the other was likely used to take a cumulative reading over a longer period of time.</i></p> <p><i>Dr. Macievic explained how NIOSH calculates the radiation dose differently than the DOE radiation dose. The DOE sites limit a worker’s radiation exposures to keep dose levels under the regulated annual limits so the DOE dose records may give the impression that the worker did not receive any dose. However, during dose reconstruction, NIOSH takes into account all of the worker’s radiation doses, including doses from occupational X rays and the ambient radiation that falls below the limits of detection. The SEC class of LANL workers from 1943 through 1975 was added because NIOSH could not find enough data to determine a bounding dose for all the members of that class.</i></p> <p>ORAUT 2013a. Los Alamos National Laboratory – Occupational External Dose, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013.</p> <p><i>Beta/gamma film badge designs changed several times through the 1950s, 1960s, and 1970s as filters of various types were used to address the energy-dependent response of film. LANL officially switched to the use of thermoluminescent dosimeters (TLDs) in 1980 and is currently using its second generation of TLD badge.</i></p> <p style="text-align: right;">(pg. 13 of 79)</p> <p><i>Exchange frequencies for LANL dosimeters are summarized in Table 6-3 and later in the discussion of methods for estimation of missed dose.</i></p> <p style="text-align: right;">(pg. 17 of 79)</p>		

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[Beginning in August 1945,] “catastrophe badges” that could measure as much as 3,000 R with film, red phosphorous capsules for measuring fast neutron flux, and brass in the badge itself for measuring slow neutron flux were assigned to “anyone who could be involved in a criticality accident” [LASL 1959 (6/14/45 document)].. (pg. 26 of 79)

[Refer to Comment 5 for NIOSH’s general response/consideration regarding adequacy of external monitoring data and feasibility of external dose reconstruction.]

**SC&A Observation/Comment:**

NIOSH engaged in discussion with the outreach meeting participants to request additional information about dosimetry practices and to address the workers’ questions and concerns. The distinction made between DOE’s reporting and NIOSH’s use of data for dose reconstruction was particularly helpful in light of the somewhat widespread concern about zeroes communicated by workers at several outreach meetings.

The External Dose TBD reflects consideration of dosimeter types, exchange frequencies, and other aspects of the external dosimetry program at LANL over the years of operation. Catastrophe badges are described briefly in the TBD; no details are provided regarding how and when they were issued, but this information would not be essential for dose reconstruction.

As noted in the analysis of Comment 5, NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction with the use of claimant-favorable assumptions, particularly for periods after 1975. Missed dose is assigned for recorded or assumed zero dosimeter results, based on the individual’s typical exposure or coworker data.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: General issues were investigated and addressed in technical documents.

NIOSH was responsive to the substance of the comment.

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<b>Comment Number:</b> 29	<b>Source of Comment:</b> OTS-18: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008b) September 17, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b>		
<p><i>[Name redacted] added that the Model 776 TLDs only recorded from 25 to 50 MeV (megaelectron volts), but in 1990 LANSCE was already reaching 800 MeV on the Beam Line.</i></p> <p><i>[Name redacted] stated that the TLD that he wore was worthless since it did not detect radiation above 50 MeV. . . . [Name redacted] stated that the area TLDs at the Lagoons at the meson facility (where the ironworkers were installing shielding) read in the 2,000 to 3,000 millirem range, some of the highest at LANL. [Name redacted] added that the high range was noted in the 1999 LANL Environmental Surveillance Report. [Name redacted] stated that the surveillance said that in previous years, the readings were the same or higher. (pg. 5 of 11)</i></p> <p><i>[Name redacted] stated that when there is a space in the margin of the monthly report, the Lab is either stating that the badge is too “hot,” or the badge was lost, or a temporary badge was issued. There were lots of spaces in the margins when he looked through his records. When he started comparing his quarterly reports, they did not match up with his TLD records.</i></p> <p><i>He noted that he had kept the TLD he was wearing the last time he walked off the job and had kept it. When he looked at his TLD records, the badge had been recorded. He questioned how they could have recorded the badge when he still had it. (pg. 7 of 11)</i></p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>A direct response was provided at the Outreach Meeting (ORAUT 2008b, pp. 5–7 of 11):</p> <p><i>Dr. Macievic responded that the “missed dosed” associated with the activity can be determined from the energy range of the beam.</i></p> <p><i>Dr. Macievic noted the presence of the area TLD monitors at the Lagoons.</i></p> <p><i>Dr. Macievic responded that the yearly report is not a summation of the quarterly reports.</i></p> <p><i>[RE: dose reported for badge not turned in] Dr. Macievic responded that NIOSH will look at the data that is available and reserve judgment on the integrity of the program.</i></p> <p>[Refer to Comment 5 for NIOSH’s general response/consideration regarding adequacy of external monitoring data and feasibility of external dose reconstruction.]</p> <p>ORAUT 2013a. <i>Los Alamos National Laboratory – Occupational External Dose</i>, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013.</p> <p><i>The Model 7776 dosimeter relied heavily on the use of site- and operation-specific neutron correction factors (NCFs) for neutron dosimetry. . . . The albedo dosimeters were sensitive to the intermediate and lower energy fast neutrons that other dosimetry methods could not detect, but their net neutron signal was highly energy-dependent and required the use of site-specific NCFs to convert the response to dose. NCFs could vary by more than an order of magnitude. As a consequence, they were assigned at very conservative values such that neutron doses were typically overestimated by a factor of 2 to 3. . . . (pg. 29 of 79)</i></p>		

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*6.2.3.6.2 LAMPF (TA-53)*

*In 1987, neutron energy spectrum measurements were made at a potentially high neutron energy area at LAMPF (Mundis and Howe 1987). . . . When unfolding codes were applied to the measurement data, they revealed that more than 90% of the neutron DE was due to neutrons of energy greater than 1 MeV, and 70% was due to neutrons of energy greater than 10 MeV. The 1987 measurements showed that the LANL Model 7776 TLD badge under-responded by a factor of 5 to 7 for this particular neutron spectrum . . . NTA film also under-responded, but only by about 20%. The sum of the two dosimeters was reported to be in good agreement with the spectrum unfolding results.*

*In another study, however, 9-in. to 3-in. sphere ratio measurements at 18 locations at LAMPF (not just an area of potentially high neutron energy) yielded ratios that indicated an average neutron energy of <100 keV at LAMPF (Blackstock et al. 1978). The mean value of the ratio was 0.17, with a standard deviation of 30%. (pp. 43–44 of 79)*

[Regarding retention ponds, area TLDs, and environmental dose:]

NIOSH 2007a. *SEC Petition Evaluation Report, Petition SEC-00051*, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007, pg. 40 of 117.

*In the late 1980s, a number of radionuclides were found in the sludge in the TA-53 Wastewater Treatment Lagoon that received discharges from the machine shop at TA-5.*

ORAUT 2012. *Discussion Points for the ABRWH'S Work Group on LANL*, Rev. 0, Oak Ridge Associated Universities Team, April 6, 2012, pg. 15 of 23.

*NIOSH RESPONSE TO WG ISSUE 5-2:*

*This issue pertains to LAMPF holding pond data and the ability to bound dose. Several documents were collected from LANL in the 2/29/2012 data capture pertaining to LAMPF lagoon survey data. LANL staff was contacted about the lagoon sampling and they stated that there are sufficient sampling data available for our needs; this was confirmed during the data capture visit. [Several listed documents contain data for radionuclides other than tritium from the mid-1980s.] . . . the data contained in these files can be used to produce an estimate of dose. Specific to tritium, a PDF on 1986 tritium concentrations is provided . . . . It is entitled TA 53 Lagoon Tritium Concentration Plot 1986.*

*A model can be constructed from these data to bound dose from the east and west over-flow lagoons.*

ABRWH 2012a. *Work Group on Los Alamos National Laboratory*, Cincinnati Airport Marriott Hotel, Hebron, Kentucky, May 14, 2012, pp. 261–269.

[NIOSH/ORAUT, SC&A, and Board members discussed data obtained by NIOSH. According to the Work Group meeting transcript, the maximum tritium concentration in the retention pond (1986 data) was evaluated to bound potential internal exposure from aerosolized tritium. The ironworkers apparently occupied the trailer near the ponds and beam stop about 1988 (per recollections of meeting participants). For the purpose of bounding exposure, NIOSH assumed a worker drank two liters of the pond water; the resulting dose estimate was less than a millirem.]

**SC&A Observation/Comment:**

NIOSH engaged in discussion with the outreach meeting participants, made note of general site information (i.e., area TLDs at Lagoons), and briefly clarified the dose reconstruction approach. Consideration of neutron energy fields, dosimeter responsiveness, area monitoring, and LANL's dose reporting practices is documented in the site profile.

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<p>Although the commenter was primarily concerned with external exposures, potential internal exposures from inhalation of aerosolized pond water were also addressed during LANL Work Group review of the SEC-109 ER. NIOSH was able to obtain tritium monitoring measurements for the retention pond during the period in question and modeled the maximum airborne tritium concentrations that would have resulted in the area occupied by the iron workers (one data point was modeled to demonstrate the feasibility of doing so for all of the tritium concentration data for the years in question). No further follow-up on this issue was pursued following an SEC class being approved through 1995.</p> <p>As noted in the analysis of Comment 5, NIOSH has evaluated the pedigree of external monitoring data and generally finds it adequate for dose reconstruction with the use of claimant-favorable assumptions, particularly for periods after 1975.</p>
<p><b>NIOSH Evaluation Comment:</b></p> <p>NIOSH concurs with the SC&amp;A Observation/Comment.</p>
<p><b>SC&amp;A Conclusion:</b></p> <p>Disposition: Issues were investigated and addressed in technical documents.</p> <p>NIOSH was responsive to the substance of the comment.</p> <p>NIOSH agreed to look into a specific issue regarding an individual's exposure data; while no record was found regarding this follow-up action, it has been standard practice by NIOSH to pursue individual questions with the worker or claimant, themselves, to provide some degree of closure.</p>

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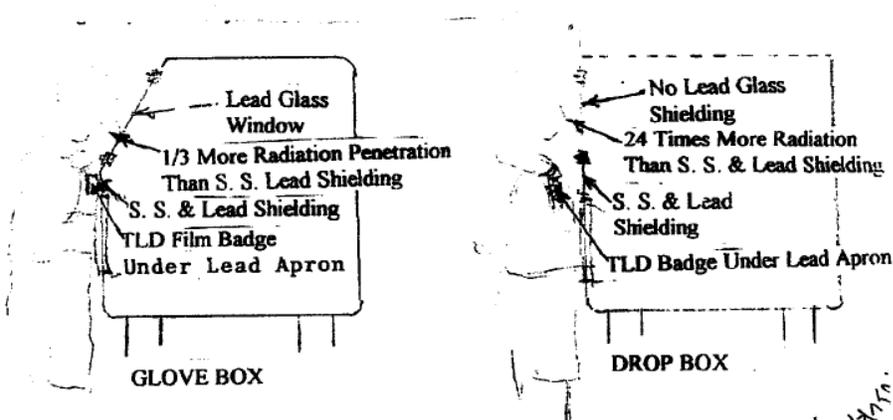
<b>Category:</b> External Dose Assumptions		
<b>Comment Number:</b> 30	<b>Source of Comment:</b> Claimant Provided Exposure Data Claim ID [redacted], [redacted]	<b>Commenter:</b> Claimant

**Comment:**  
[Applicable to TA-55, Pu separations work in the 1990s]

*My first concern is regarding radiation window exposure . . . where the exposure to the film badge (TLD) is much less exposure than the exposure through glove box window. The film badge is located on the chest shielded by lead and stainless steel. Glove box windows without lead shielding emit 24 times more radiation than the stainless steel leaded part of the glove box and obviously the head does not have the benefit of lead.*

*The drop boxes where I worked did not have leaded glass protection.* (pg. 2 of 60)

*The head and shoulders also received extreme radiation exposure, much more than [sic] the TLD film badge recorded on the chest under the lead apron. The radiation through the drop box windows, which contained no leaded glass, was 24 times more intense to the head and shoulders than the TLD badge was exposed to through the stainless steel and leaded shielding. The TLD badge was not recording the total exposure that the head and shoulders were receiving which was quite extreme.*



(pp. 7–8 of 60)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

DCAS 2011. *Best Estimate External Dose Reconstruction for Glovebox Workers*, DCAS-TIB-0010, Rev. 04, Technical Information Bulletin, Division of Compensation Analysis and Support, November 28, 2011, pp. 2–5 of 16.

[This TIB provides guidance and special dose correction factors for dose reconstructions for glovebox/dry box workers. The dose reconstructions affected are for organs in the abdominal region, which are closer to the source than a dosimeter on the lapel, and, in some glovebox models, have a Lucite-shielded pass-through opening between the glove ports.]

*Exposure geometry is a special consideration in dose reconstruction of energy employees who primarily worked in gloveboxes. An underestimation of the dose could occur if the energy employee wore his/her dosimeter on the lapel and not the center area of the chest or on the waist. This underestimation could*

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*result due to the difference in relative distance between the external radiation source, the organ of interest, and the dosimeter. Only organs in the lower torso are affected, since design of the glovebox places these organs closer to the radiological source than the dosimeter. The dose to lung is considered to have been reasonably approximated by the dosimeter at least to within the dosimeter uncertainty and the dose to the face and head would have been slightly lower than the dose measured by the dosimeter worn on the lapel.*

**SC&A Observation/Comment:**

In DCAS-TIB-0010, NIOSH addresses several issues raised by the commenter. NIOSH’s analysis of glove box design, shielding, and source location are consistent with the commenters’ description and drawings. However, the TIB assumes a dosimeter on the lapel and a target organ in the torso, while the worker is concerned about a dosimeter on the chest (shielded by metal glovebox materials and a lead apron) and exposure to the head.

For some work sites (e.g., Rocky Flats and Pantex) NIOSH has evaluated lead apron usage specific to site operations and provides guidance to dose reconstructors in the site-specific External Dose TBDs. NIOSH has not specified an approach for addressing this issue at LANL.

**NIOSH Evaluation Comment:**

NIOSH has not evaluated modifications to external dosimetry assumptions based on the use of lead aprons at TA-55. Documentation from Los Alamos guides workers to wear their TLDs on the OUTSIDE of lead aprons in some cases (e.g., 1984), and INSIDE the aprons in others (e.g., 2002). References have been identified that would allow dating these policies so that estimates could be made for organ doses to areas outside the lead (or lead-equivalent) aprons, and an approach similar to those at Rocky Flats and Pantex could be adopted.

**SC&A Conclusion:**

Disposition: NIOSH has identified some information relevant to the issue but has not evaluated modifications to external dosimetry assumptions. The issue is not addressed in LANL technical documents.

NIOSH was not responsive to the substance of the comment at the time it was made or in subsequent review documents. The NIOSH Evaluation Comment is responsive to the SC&A Observation and reflects preliminary investigation of the issue.

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<b>Category:</b> Facilities/Operations		
<b>Comment Number:</b> 31	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a), June 18, 2005	<b>Commenter:</b> Not identified

**Comment:**  
*CMR [Chemistry and Metallurgy Research building] is a place that needs to open up and fall into the ground. It's a very dirty building. Wings 3, 5, 7, 9, when we went into Wing 9 and took the gloveboxes apart, they were super hot. Even when we went in with SCUBA (filtered air) for a certain amount of time, when we did bag-outs or when we had to clean out the trash that was going to be going to WIPP (Waste Isolation Pilot Plant) – the gloves, the coveralls, the tools – there was a lot of exposure. A lot of the RCTs were really upset with the readings they were getting.* (pg. 15 of 30)

**NIOSH Response/Consideration of Comment:**

NIOSH 2007a. *SEC Petition Evaluation Report, Petition SEC-00051*, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007, pg. 28 of 117.

Location	Start	Demolished or Decomm.	Radionuclides	Comment
<i>TA-3-SM-29, Chemical and Metallurgical Research (CMR); actinide chemistry and metallurgy research (1952 to present)</i>	1951	Still active	<i>Pu-238, Pu-239, EU, U-238, DU</i>	<i>Small quantities of uranium and plutonium, mixed fission products including iodines, Pu-238</i>
<i>TA-3-SM-29, Chemistry and Metallurgy Bldg., Wings 3, 5, and 7</i>	NCD	NCD	<i>H-3</i>	<i>HTO, HT</i>
<i>TA-3-SM-29 Chemistry and Metallurgy Bldg., Wing 9; handling of irradiated U and Pu in hot cells.</i>	1961	NCD	<i>Cs-137, MFP including I-131, Pu-238, Pu-239, Pu-240, EU, U-238, DU</i>	<i>Potential for low-level chronic intake in hot cell work 0.1–10µ AMAD, oxide, nitrate, fluoride and metal. Oxide is most common.</i>

ORAUT 2013a. *Los Alamos National Laboratory – Occupational External Dose*, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013, pg. 46 of 79.

*Stack FE-19 of the CMR Building serves the glovebox processes and rooms on the south side of Wing 3. Since early 1974, FE-19 has been a major source of plutonium at LANL, up to 99% of the total released in 1980. Alpha-emitting radioactivity in liquids flowing into the TA-50 waste treatment plant rose sharply around 1973 because of increased use of 238Pu in the CMR Building (Widner et al. 2004).*

*The neutron spectrum at the CMR Building is assumed to be similar to that of plutonium processing areas but with a slight increase in the fraction in the 2–20 MeV category due to the possibility that research activities involved sources that emitted more higher energy neutrons (such as PuBe or 252Cf). . . .*

ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.

[Attachment B (pg. 103 of 117):] *Radioiodine and noble gases are released from facilities that performed fission product chemistry [Wing 9, CMR (TA-3) and TA-48] . . . .*

[Attachment D, table describing incidents resulting in internal doses (pg. 110 of 117):] *1971 – Wing 9 of CMR – Inhalation of Pu-238, minimal urine excretion for 100 days, then rose to large values. ICRP 30 model modified to time constant of 10,000 days (ICRP 1979; Miller et al. 1999); half-time for ICRP 30 model is 10,000 days, AMAD is 0.2 µm. Intakes 2,150 to 210 nCi, found to fit other Wing 9 intakes.*

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<p><b>SC&amp;A Observation/Comment:</b></p> <p>The LANL Site Profile technical basis documents present detailed information regarding the operations, radionuclides, and major incidents at the various wings of the CMR. Revision 1 of the Internal Dose TBD also reported historical airborne contamination levels in CMR (and other buildings “with high exposure potential”).</p>
<p><b>NIOSH Evaluation Comment:</b></p> <p>NIOSH concurs with the SC&amp;A Observation/Comment.</p>
<p><b>SC&amp;A Conclusion:</b></p> <p>Disposition:      Issues were investigated and addressed in technical documents.</p> <p>NIOSH was responsive to the substance of the comment.</p>

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<b>Category:</b> Facilities/Operations		
<b>Comment Number:</b> 32	<b>Source of Comment:</b> Claimant Provided Exposure Data (Claimant [redacted]), [redacted]	<b>Commenter:</b> Claimant
<b>Comment:</b>		
<p><i>I worked as [redacted] on [redacted] many long hours sometimes 7-10s. Most everybody would limit time in area come and go. It was considered a contaminated area no food, drink, smoke, chew. . . . at end of day we exited through a old beat up hand monitor most was self frisk. When TWISP Buildout was nearing completion whole body monitors were installed. No protection was ever given for time spent. Yet when [name] and [name] were assigned Ironworkers for drum removal they were in Scuba. I spent time on pigs cover maintenance also if you saw how the high level was dumped in the pigs you would freak out.</i> (pg. 262 of 458)</p> <p>[The claimant provided a Los Alamos publication from 1999 titled “Environmental Surveillance at Los Alamos during 1999” which states on page 101 that the “TWISP project entails bringing transuranic waste out of below ground storage for further characterization and ultimate shipment to WIPP. The radiological content of these drums vary greatly and the drum inventory near the TLDs is changing constantly. Until the drums are shipped to WIPP, external penetrating radiation doses near the project are expected to increase.”]</p> <p><i>Comments on ORAUT-TKBS-0010-6</i></p> <p>11 of 72            6.2.1    <i>never assigned Track Etch even supplementally</i></p> <p>12 of 72            6.2.1.1    <i>Ironworkers working at LANCE didn't get assigned NTA or TLD</i></p> <p>19 of 72            6.2.1.4    <i>When there is spacing in the margin it means that there is something wrong with records. Contact [name of records worker]</i></p> <p>25 of 72            <i>TLD mod. 7776 was used</i></p> <p><i>All tables and Information refer to LAMPF. For pages 39 thru 72. While I and other Ironworkers were working at TA53 it was called LANCE. The difference between LAMPF and LANCE is like the difference between night and day. All outdated material for pages 39 thru 72 of 72. Pages 44 of 72 they do admit to (&gt;20MeV) on beam and target area during LAMPF don't take in consideration more than (&gt;20MeV) since very little was produced during LAMPF. During LANCE there were (&gt;20MeV) neutrons produced in our area. And up to (800MeV) maybe more.</i></p> <p><i>There is nothing in consideration in any of these documents of Tables and charts and graphs. From LANCE to present I hope you take a closer look at References in this ORAUT-TKBS-0010-6 and References I supplied in back of these documents. Dates of LANCE are important.</i> (pp. 364–365 of 458)</p> <p><i>ORAUT-OTIB-0012</i></p> <p><i>Due to the incidents of not holding spallation neutrons with energies of 800MeV in crypt at beam stop and our proximity to and elevation to crypt and beam stop. One day not to long after installation of new sensors along road that is East and runs north and south of beam stop the Ironworkers were ordered they were going to get the hell out and move to TA 38 shops. Not to long after the move [name] and I were [redacted] under a RWP [redacted]. 800MeV isn't even mentioned in any of your documents. By then it was a little to late. Damage had been done. That shielding wasn't brought for nothing. During LANCE.</i></p> <p><i>Little engineering was taken into consideration for beam stop in the conversion from mason physics to high energy neutron physics. One man had concern as early as 1990. pg. 53 Los Alamos Science. See other refr. of mine in back of binder.</i> (pp. 384–385 of 458)</p>		

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**NIOSH Response/Consideration of Comment:**

[SC&A did not identify any NIOSH technical basis documents, evaluation reports, or meeting reports referencing the TWISP project.]

ORAUT 2004. *Technical Basis Document for the Los Alamos National Laboratory – Site Description*, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004, pg. 42 of 65 (emphasis added).

*The largest accelerator at Los Alamos is at TA-53. The primary facility at TA-53 is a large accelerator complex originally called the Los Alamos Meson Physics Facility (LAMPF). The original sections of LAMPF were later renamed the Clinton P. Anderson Meson Physics Facility.*

*LAMPF is a nominal 800-MeV, 1-mA intensity proton linear accelerator. . . . At the present, LAMPF serves as an accelerator generating intense pulses of neutrons (by sending the protons into such high-atomic-number targets as uranium) for scattering research at the Weapons Neutron Research (WNR) Facility and LANSCE facilities. . . .*

*The LANSCE complex includes the linear proton accelerator LAMPF, the Manuel Lujan Jr. Neutron Scattering Center, and a medical isotope production facility. . . .*

ABRWH 2012b. *Work Group on Los Alamos National Laboratory*, teleconference, September 11, 2012, pg. 12 of 45.

*We do believe that we can do external dose reconstruction as we had proposed in the previous Evaluation Report. We have a large number of external monitoring results. Virtually all workers were monitored after '75 or the majority of all workers were monitored.*

*We have good beta measurements in the field and we believe that we can reconstruct neutrons using either neutron/photon ratios or the albedo dosimeters that were in place after 1980.*

[Refer to Comment 29 for additional documentation of NIOSH’s response/consideration regarding neutron energies and dosimetry at LAMPF/LANSCE, as well as ironworkers’ potential exposure from LAMPF/LANSCE and retention ponds.]

**SC&A Observation/Comment:**

NIOSH appears to consider neutron dosimetry and radiation fields throughout the entire operations period of TA-53 in the LANL Site Profile and the SEC-109 ER. There is some confusion about the facility name. One sentence in the site description indicates LAMPF was renamed; another sentence describes LAMPF (at present) as the accelerator component within the LANSCE complex. This usage appears more commonly in NIOSH technical documents.

As noted for Comment 29, the workers’ concerns regarding external exposures from LAMPF/LANSCE were addressed by NIOSH during LANL work group review of the SEC-109 ER. From information provided by LANL, it is clear that the TLDs in use would have detected the energy ranges of the attenuated neutrons at the workers’ location down range from the beam stop.

There does not appear to be any mention of the TWISP project and exposures from waste handling from this project. The document provided by the commenter indicates external exposures to personnel were monitored, perhaps using area TLDs.

ORAUT-OTIB-0012 is Monte Carlo Methods for Dose Uncertainty Methods. The worker does not explain directly how his concern relates to this document. This section of the worker’s comments includes the statement, “800MeV isn’t even mentioned in any of your documents.” The commenter may be referring to two data tables in OTIB-0012

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concerning deep dose uncertainties and neutron energies (Attachment G for 0.1–2 MeV; Attachment H for 2–20 MeV). The worker may believe that neutron energies at LANSCE (“800 MeV”) are beyond the scope considered by NIOSH in dose reconstruction (0.1–20 MeV).

**NIOSH Evaluation Comment:**

NIOSH is continuing to work with LANL to ensure that complete internal dosimetry records are provided for claimants, particularly for the post-1995 period. NIOSH is also seeking an explanation from LANL regarding how internal doses are assessed for unmonitored workers. These efforts are ongoing.

**SC&A Conclusion:**

According to a publication (Pannell, Grogin, and Langford 1997), which SC&A found online at the OSTI SciTech website ([www.osti.gov/scitech/servlets/purl/645557](http://www.osti.gov/scitech/servlets/purl/645557)), TWISP is the Transuranic Waste Inspectable Storage Project, located in Area G of TA-54. Retrieval operations began in March 1997. SC&A assumes the commenter was involved in construction activities (“buildout”) in the post-1995 period.

TWISP is not specifically mentioned in NIOSH technical documents, but the Site Description TBD does identify TA-54 as the central waste disposal facility at LANL and indicates all radionuclides may be present. SC&A did a cursory review of retrieved records containing “transuranic waste” in the reference title. None of the documents reviewed appeared to contain information specific to TWISP or “inspectable storage” facilities or operations.

The commenter appears to be concerned about unmonitored internal exposures based on changes in PPE and contamination controls for construction and maintenance compared to operations activities. The NIOSH Evaluation Comment discusses ongoing investigation of internal dose assessments, particularly for unmonitored workers, in the post-1995 period.

Disposition: External exposures and monitoring for TA-53 have been investigated and addressed in technical documents. Investigation of internal dose issues for the post-1995 period is ongoing. The commenter’s specific concerns regarding the TWISP buildout, maintenance, and operations do not appear to have been investigated.

NIOSH appears to be responsive, in the general sense that TA-53 and TA-54 dosimetry issues were reviewed. Specific questions posed by the commenter for a specific operation in that area were not addressed in technical documents or correspondence; they may have been discussed individually with the claimant during closeout.

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<b>Category:</b> Facilities/Operations		
<b>Comment Number:</b> 33	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008a)</i> September 16, 2008	<b>Commenter:</b> Not identified Loretta Valerio
<b>Comment:</b>  <i>Ms. Valerio stated that some of the designations for the Technical Areas changed throughout LANL history; for example, TA-51 was once called the Environmental Research Site and now is a waste studies area. Another example is that the HRL facility that was located in TA-0 is now in TA-43. There was a brief discussion among the attendees as they tried to recall which areas may have changed over time. Ms. Valerio recalled that someone documented the changes because they believed that would affect exposures. [Name redacted] stated that he had included a map from a 1979 Environmental Impact Statement (EIS) in the Denver presentation to show that many of the Technical Areas are different – TA-18, TA-54, and many others.</i>  <i>Dr. Macievic asked if the technical areas shifted over time as the facilities were no longer useful. [Name redacted] explained that the nomenclature seemed to change due to growth of operations, as well as during shifts between agencies, such as the shift from the Manhattan Engineer District to the Atomic Energy Commission (AEC). He stated that the practice of numbering the Technical Area appeared to have happened shortly after the 1979 EIS, which blocked off large areas incorporating the smaller, scattered technical sites.</i>  <p style="text-align: right;">(pg. 9 of 11)</p>		
<b>NIOSH Response/Consideration of Comment:</b>  NIOSH 2007c. <i>SEC Petition Evaluation Report, Petition SEC-00051, Addendum 2</i> , National Institute for Occupational Safety and Health, June 4, 2007, pp. 4–5 of 10.  <i>NIOSH has reviewed the documentation provided by the President of the LANL Guards Union and concluded that the documentation supports a conclusion that operational technical areas TA-1-Z and TA-19 should be added to the table of Operational Technical Areas that potentially used radioactive material. NIOSH concluded TA-1-Z should be included because a number of documents (see Attachment 1) provided contain maps of the early arrangement of TA-1 and they show that TA-1-Z was in the center of the TA-1, and thus in close proximity to some of the other buildings, where radioactivity was present.</i>  <i>In addition, it is important to note that (as indicated by the President of the LANL Guards Union) technical area designations changed over time; the table above is based on the information available to NIOSH at the time of this report's publication. NIOSH will update this list and notify DOL of any changes to the list as new information becomes available which would warrant additions to the list.</i>  NIOSH 2010. <i>SEC Petition Evaluation Report, Petition SEC-00170, Rev. 0</i> , National Institute for Occupational Safety and Health, April 26, 2010, pg. 16 of 20.  <i>. . . due to undocumented worker movements across the site and limited claimant-specific information pertaining to work locations, NIOSH is unable to eliminate any specific worker from potential exposure scenarios based on assigned work location. Accordingly, NIOSH recommends that the class definition include all areas during the specified time period.</i>		

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**SC&A Observation/Comment:**

The issue of changes in technical area designations was addressed by NIOSH in Addendum 2 of the SEC-051 ER, which pre-dates the worker's comment. Additional area designations were added as a result of presentations and information shared at a Board meeting in March 2007. Addendum 2 technical area designations were superseded by SEC-170 in 2010. NIOSH determined they could not definitively place workers in work locations, so the 1943–1975 class was extended to include all LANL workers.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Issues were investigated and addressed in technical documents (some pre-dating the comment).

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Facilities/Operations		
<b>Comment Number:</b> 34	<b>Source of Comment:</b> OTS-18: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008b) September 17, 2008	<b>Commenter:</b> Not identified [Building Trades]
<b>Comment:</b>		
<p><i>[Name redacted] stated that he only found one paragraph on LANSCE in the LANL Site Profile; the rest of the information is on LAMPF (Los Alamos Meson Physics Facility), which he said is outdated material. The Beam Line was converted from low-energy meson physics to high energy neutron physics without engineering upgrades to the Beam Stop and Crypt area in 1989 and the facility's name was changed from LAMPF to LANSCE (Los Alamos Neutron Science Center). All of the engineering upgrades were done from there up. He said that he has a problem with there being only a single paragraph about LANSCE because the experiment went from 1989 to 1998. . . . The Beam Stop and Crypt is the only Category 3 area in that area.</i></p> <p><i>Dr. Macievic asked if any of the attendees worked in the area while LANSCE was operating, or if work was only done in the area when the operation was shut down. [Name redacted] responded that the ironworkers were stationed at end of the Beam Line. He said that someone had explained to him that the ironworkers were positioned like they were "behind targets on a rifle range."</i></p> <p><i>Dr. Macievic asked which building [name redacted] worked in at the time. [Name redacted] responded that he was working in Building 3M, the category 3 fission reactor. He said that he had given NIOSH a 1994 report that places the ironworkers at those buildings.</i></p> <p><i>[Name redacted] commented that LANL scientists wrote articles for periodicals to explain the experiments at LAMPF and LANSCE. He added that the Lab is holding back information on the transition from meson physics to neutron physics. He stated that a 1998 surveillance study stated that the TLD stations were recording in the thousands.</i></p> <p><i>[Name redacted] told Dr. Macievic that he had started working in the area in [redacted]. . . . [Name redacted] explained that he was among the ironworkers who added 20,000 tons of additional shielding blocks because the beam stop was not stopping the neutrons. . . . Additional shielding was also placed on the hangar doors to stop the scatter. [Name redacted] stated that he would provide the periodical in a pdf file.</i></p> <p><i>[Dr. Macievic] asked [name redacted] when the Lab added the extra shielding. [Name redacted] responded that the project lasted for two years. The project originally called for the addition of 10,000 tons of additional shielding but another 10,000 tons was added because the first 10,000 tons could not stop the neutrons. At one point during the project, the Lab installed new sensors at the end of the Beam Line and then the ironworkers were transferred to the 38 Shop. (pp. 4–5 of 11)</i></p> <p><i>[Name redacted] stated that after the ironworkers were transferred to the 38 Shop from the beam stop, the Lab "wiped out all evidence" that the ironworkers had been there and destroyed the Burn Shed where he and [name redacted] had worked day and night to burn the shielding block to fill the orders for the different shapes and sizes. The blocks were between six inches and three feet thick and were drilled and tapped with a picking eye. The first 10,000 tons of shielding block was gathered from used shielding block from all the LANL facilities because they were in a hurry to get the shielding block up at the Beam Line. The second 10,000 tons of used shielding block came from Oak Ridge (500 semi loads of two 10-ton pieces). [Name redacted] stated that he had been told that some of the blocks from Oak Ridge were going to be "hot." Some of the LANL blocks came from the Bone Yard at the meson facility where the bulk shielding was discarded after the Beam Line shots blew holes through them.</i></p> <p><i>Dr. Macievic asked if the Bone Yard was a posted area. [Name redacted] stated that people jogged through the area even though there was a cable across the road. (pp. 5–6 of 11)</i></p>		

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**NIOSH Response/Consideration of Comment:**

A direct response was provided at the outreach meeting:

*Dr. Macievic confirmed that neutron radiation produces a lot of scatter.*

*Dr. Macievic commented that there had to have been a lot of activation in the steel, which might have caused the 500+ rem dose in [name redacted] record.*

(pp. 5–6 of 11)

[Refer to Comment 29 for NIOSH’s Response/Consideration regarding the worker’s concerns about LANSCE and LAMPF operations, neutron exposures, and the transition from meson physics to neutron physics.]

**SC&A Observation/Comment:**

Worker concerns regarding LAMPF and LANSCE accelerator operations are discussed in detail for Comment 29. The workers’ concerns regarding external exposures from LAMPF/LANSCE (as well as potential internal exposures from TA-53 retention ponds) were addressed during the LANL Work Group’s review of the SEC-109 ER.

NIOSH interacted with the commenter during the outreach meeting to solicit additional information regarding the time frame and the exposure scenarios described.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Issues were investigated and addressed in technical documents (some pre-dating the comment).

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Facilities/Operations		
<b>Comment Number:</b> 35	<b>Source of Comment:</b> <i>Interview of [redacted] CMR Operations (Bihl 2012) February 28, 2012</i>	<b>Commenter:</b> [redacted]
<b>Comment:</b> [redacted] – [redacted] <i>for many years, recently has taken new position. Impromptu interview on 2/28.</i>  <i>Said fission products were part of work in hot cells on irradiated fuel targets – not concentrated/isolated in any significant way – or small sources. Said some work on pure Np-237 in early 2000 in gloveboxes inside hot cells – so double containment. Mentioned he thought there had been a Tc-99 spill in the bldg very early – before his time.</i>  <i>CMR was only place at Los Alamos for radiochemistry on samples for most years. Small labs at other bldg recently or even earlier but not significant.</i> <span style="float: right;">(pg. 2 of 7)</span>		
<b>NIOSH Response/Consideration of Comment:</b>  [Refer to Comment 31 for NIOSH’s consideration of work activities, source terms, and incidents at the CMR Building (TA-3-29)]  ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i> , ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.  <i>Limited information was found about neptunium at LANL, but it appears that 237Np activities have primarily been associated with the Nuclear Fuels Group. The 237Np metal for the bare criticality experiment in 2002 (Roark 2003) was prepared at the CMR Building (Bodenstein et al. 1999). At that time, LANL maintained a routine dosimetry threshold for 237Np in internal dosimetry TBDs (Hoover 2008); however, no workers at that time were on routine bioassay programs. This is likely due to the isolation that is afforded by the hot cells facilities in Wing 9 of the CMR Building. These facilities had been available at LANL since their dedication in 1961 (Bodenstein et al. 1999).</i> <span style="float: right;">(pp. 56–57 of 117)</span>		
<b>SC&amp;A Observation/Comment:</b>  The handling of fission products in the hot cells at CMR has been recognized from the first issuance of the Site Description in 2004. Radiochemical process with irradiated fuels, a campaign with Np-237, CMR incidents, monitoring, and implications for dose reconstruction have been considered through the Work Group, SEC ERs and site profile TBDs.  SC&A could not find a specific mention of a Tc-99 spill in the CMR building. The time period for this incident is not specified in the comment, beyond stating it was “early.” NIOSH does not claim to include a comprehensive list of incidents in the Site Profile.  This “impromptu interview” was an informal discussion that occurred during a data capture activity. The document posted to the SRDB contains the contractor’s handwritten notes from the conversation and the data capture, marked “Unclassified” by site personnel. There is no indication that the site expert reviewed the notes for accuracy. Current OCAS <i>Data Access and Interview Procedures</i> state, “Once the interview notes are reviewed, marked unclassified, and obtained from the DOE Classification Officer, the interview notes should be provided to the interviewee to ensure concurrence with the statements within the interview” (OCAS 2009, p. 9).		

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**NIOSH Evaluation Comment:**

The discussion that took place between Don Bihl (ORAUT) and [redacted] on 2/28/12 was not a formal interview and was never documented as such. The information provided in Don's handwritten notes from that interview (SRDB 109092) is consistent with what is described in *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, and is supported by other referenced documents.

**SC&A Conclusion:**

Disposition: Issues were investigated and addressed in technical documents (some pre-dating the comment).

NIOSH was responsive to the substance of the information provided by the commenter.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 36	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>You'll have another problem with people in the range from 60 to 70 years of age, the ones who worked in the Rover program. We ingested a lot of enriched uranium. . . . I used to blow my nose and it would be black, uranium mixed with graphite from the fuel rods.</i>  <i>They used to dump the graphite containing uranium at TA-54 in the dumpsters. It was a just a black cloud when I got on the bulldozer, and it would go out in the air to White Rock down below.</i> (pg. 15 of 30)		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  NIOSH 2007a. <i>SEC Petition Evaluation Report, Petition SEC-00051</i> , Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007.  <i>Project Rover was a major reactor research project that attempted to develop a practical nuclear rocket. No less than 16 Project Rover reactors (which included the Kiwi reactors) were developed by the Critical Experiments Group at TA-18 (Pajarito Site) between 1959 and 1972. These reactors were made and assembled in TA-18 where they underwent initial testing prior to being shipped to NTS where they underwent additional rigorous (and sometimes destructive) testing. Project Rover was terminated in 1973.</i>  <i>. . . Evaluations of reactor fuel elements and spent fuels were also associated with reactor projects. These activities were performed within hot cells located in TA-3, -21, and -48.</i> (pg. 23 of 117)  <i>Prior to 1971, air monitoring data for most TAs were not available, or if available, do not provide a complete record. Estimates of occupational intakes provided in the LANL Internal TBD rely on emissions data provided by LANL. These data indicated several years prior to 1971 in which potentially significant releases (and thus intakes) might have occurred.</i> (pg. 65 of 117)  <i>The co-worker data were sufficient to derive dose estimates for unmonitored workers for uranium after January 1, 1950.</i> (pg. 77 of 117)  ORAUT 2004. <i>Technical Basis Document for the Los Alamos National Laboratory – Site Description</i> , ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004.  <i>. . . According to a 1969 memorandum regarding waste management information for various LANL technical areas, the DP East facility processed Rover fuel elements containing enriched uranium. Air from the exhaust systems for radioactive materials passed through HEPA filters. All four stacks from these systems were monitored but concentrations were below detectable levels.</i> (pg. 41 of 65)  ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i> , ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013, pg. 19 of 117.  <i>As bioassay sensitivities and respiratory protection equipment improved, the potential for intakes decreased. Due to rigorous workplace monitoring, the probability that a worker could have received a large intake of radioactive material that was unmonitored and unnoticed was less after 1946, although the probability of unmonitored small intakes was larger. Periodic reports from H Division of air samples, contamination incidents, and hot spots continued to identify a significant number of over-tolerance occurrences throughout the 1960s. Respiratory protection was available but, except in a few locations,</i>		

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*was only donned when a continuous air monitor (CAM) alarmed or when airborne levels approached tolerance or action levels (ALs). Therefore, a potential existed for an intake before the alarm. Review of Summary of Radiological Incident Reports (RIR) through June 1998 indicates that, while the number of RIRs has decreased significantly, the potential for unmonitored small intakes continues to exist (Bates 1998).*

**SC&A Observation/Comment:**

SC&A was unable to determine if this comment was considered or investigated. NIOSH provides a general description of the Rover Project in the LANL site profile, and this description does acknowledge the use of enriched uranium in fuel elements. However, information about specific work processes and radiation controls is only given for fuel elements handled in DP East [TA-21]. According to the TBD, stack emissions did not contain detectable levels of enriched uranium.

The commenter does not indicate whether or not the Rover workers wore respiratory protection or were monitored for uranium intakes. Although the SEC-051 ER and the Internal Dose TBD indicate some potential for unmonitored intakes during these years (1955–1973), these scenarios are characterized as off-normal, over-tolerance conditions occurring within a context of “rigorous workplace monitoring.” The commenter’s description seems to imply more of a habitual condition of exposure to black powder the worker believed to contain enriched uranium and graphite.

**NIOSH Evaluation Comment:**

The issues described in this comment all took place prior to 1996. NIOSH has recognized that personnel exposure data may be incomplete prior to 1996 and that unmonitored workers may have received significant internal dose. Partially due to this situation, an SEC class has been designated for all workers at LANL through 1995.

**SC&A Conclusion:**

Disposition: NIOSH investigation of the issue is unclear. Rover project is described in technical documents. The SEC-051 ER indicates internal dose reconstruction for uranium is feasible from 1943-1975. The commenter’s descriptions of potential internal exposures do not seem to be consistent with the SEC-051 ER and the Internal Dose TBD.

NIOSH responsiveness is inconclusive. The internal exposure concern appears to be retroactively dismissed on the basis of a later awarded comprehensive SEC class encompassing the period in question.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 37	<b>Source of Comment:</b> E-mail from [redacted] to Jack Buddenbaum Subject: Pre-1969 in vivo Results at LANL (Hoover 2006) November 17, 2006	<b>Commenter:</b> [redacted]
<p><b>Comment:</b></p> <p><i>Electronic records of InVivo measurements exist from ~June 1969 through the present; these are available on the dosimetry data repository (that Jim O'Brien helped build and populate), and are being accessed regularly when researching dose histories and in response to claims. Original records from June 1969 (until a later time when results began being stored electronically) were paper files (approximately 6 file cabinets worth) – these records are in LANL archives on site. There are no electronic records of InVivo measurements prior to June 1969.</i></p> <p><i>There was no routine InVivo measurement program targeting occupational dose prior to June 1969. The only occupational-related InVivo measurements were made in association with significant radiological events. Records of these measurements are in logbooks, but may only indicate that measurements were made, without associated results. Early InVivo measurements were made in “go / no-go” fashion, using instruments with little or no energy discrimination capability. We understand that negative results may not have been recorded, only verbally communicated to the subject. Logbooks with early InVivo measurement results are in LANL archives on site.</i></p> <p style="text-align: right;">(pg. 2 of 3)</p>		
<p><b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b></p> <p>NIOSH 2007a. <i>SEC Petition Evaluation Report, Petition SEC-00051</i>, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007.</p> <p><i>The first whole-body counter used was the HUMCO I. This “human counter” became operational in 1955 . . . . This system was used to screen individuals who might have been exposed to fission products at the reactors or in fly-overs during weapons testing. It was also used to detect the Bremsstrahlung from Sr-90 intakes. The energy resolution of these counters was poor. . . .</i></p> <p><i>The HUMCO II became operational in 1958. . . .The resolution was improved, but it remained a screening counter. As both of the early in vivo monitoring systems (HUMCO I and II) were used as screening counters, NIOSH has not identified that quantitative data are available.</i></p> <p><i>In 1970, an in vivo counter capable of measuring four separate regions of the body began operation . . . . This detector was primarily for whole-body assessment. This system could both identify radionuclides and quantify the burdens . . . .</i> (pp. 60–61 of 117)</p> <p><i>Prior to the recent consolidation efforts by LANL and NIOSH (see Section 7.1.1 and ORAUT-OTIB-0063, draft), in vivo counting data from 1960–2003 were maintained in a legacy system called “OMNIS7.” This older database does not provide MDA values and only contains count data for positive results. Some in vivo measurements are available for the pre-1960 period; however, these measurements were not considered routine, and therefore are not described as a regular part of the LANL in vivo bioassay program. . . . Some paper records do exist . . . .</i></p> <p><i>As a result of LANL and NIOSH consolidation efforts, the 1960–2003 in vivo data have been combined with post-2003 data into one Oracle database. . . . [The database is configured so scans of paper records can be added.]</i> (pg. 71 of 117)</p>		

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**SC&A Observation/Comment:**

The site expert communication was identified as a source reviewed by NIOSH in their evaluation of the SEC-051 petition. The ER reflects consideration of information provided by the site expert, including the lack of *in vivo* results before 1969, the poor energy discrimination of early counters, and the use of *in vivo* counts as screening tools for incidents/exposures prior to 1970. NIOSH and LANL collaborated to consolidate available data into an accessible system to support dose reconstruction.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      Issues were investigated and addressed in technical documents.

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 38	<b>Source of Comment:</b> OTS-16, 9:00 a.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008c)</i> September 16, 2008	<b>Commenter:</b> Not identified Loretta Valerio
<b>Comment:</b>  <i>[Name redacted] asked whether [name redacted] had ever been issued a bioassay kit to submit urine samples after an incident. He responded that guards had been issued kits on a monthly basis in the 1980s in TA-55, TA-18, CMR (Chemical and Metallurgical Research), DP Site, and TA-41, but that practice stopped in the early 1990s after the Mason &amp; Hanger contract ended.</i> <p style="text-align: right;">(pg. 2 of 11)</p> <i>Ms. Valerio stated that she rarely sees evidence of in vivo testing when she gets bioassay records for LANL security guards. [Name redacted] replied that LANL stopped regular bioassay testing for the guards in 1989 or 1990. Ms. Valerio stated that when she worked at TA-55 scheduling whole body counts for employees, some of them had not had one for seven or eight years. She often received phone calls from the medical testing department because their in vivo equipment was not working properly. [Name redacted] responded that the security force does not receive in vivo monitoring now because LANL considers them “administrative” personnel.</i> <p style="text-align: right;">(pg. 5 of 11)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  NIOSH 2012a. <i>SEC Petition Evaluation Report, Petition SEC-00109</i> , Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012.  <i>The petitioner also provided ten affidavits (listed in Section 4.7). A number of these affidavits asserted that Service Support Workers with inadequate or no PPE were routinely assigned to areas in which workers were using full PPE. They also asserted that these Service Support Workers had little or no participation in the LANL urine sampling or whole-body counting program. . .</i>  <i>Based on its LANL research and data capture efforts, NIOSH determined that it has access to chest counts, whole-body counts, bioassay results, urinalysis results, external dosimetry data, and air monitoring data for LANL workers during the time period under evaluation. However, NIOSH also acknowledged that certain issues raised during the research for SEC-00051 remain unresolved, in particular the assessment of dose from mixed fission products. NIOSH concluded that there is sufficient documentation to support, for at least part of the proposed time period, the petition basis that radiation exposures and radiation doses were not adequately monitored at LANL, either through personal monitoring or area monitoring.</i> <p style="text-align: right;">(pg. 11 of 98)</p> <i>NIOSH reviewed each claim to determine whether internal and/or external personal monitoring records could be obtained for the employee. As indicated in Table 4-1, NIOSH has been able to obtain monitoring data for many of the claims that meet the proposed class definition. Of the total number of claims submitted for energy employees who meet the class under evaluation [863 claims], 736 (85%) contain internal monitoring data and 495 (57%) contain external monitoring data [for the identified years in the proposed class definition].</i> <p style="text-align: right;">(pg. 16 of 98)</p> <i>At the time of this Rev. 1 to the SEC-00109 Evaluation Report, NIOSH has been unable to satisfactorily demonstrate that the Employee Health Physics Checklists were effective for purposes of identifying individuals requiring bioassay monitoring. NIOSH will continue to evaluate this issue for the post-1995 period. . .</i>		

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... Many of the Service Support Workers, as defined in the petitioner-proposed class definition, were Zia Company employees. The Zia Company was the service workers' contractor for many years. Zia employees participated in a plutonium bioassay program that required annual urine samples. In 1976, a program was used for Zia employees that restricted access to plutonium areas if participation in the plutonium bioassay program was not recorded within 425 calendar days.

Table 7-1 contains a list of criteria and exempt job categories (LASL, 1978a). In more recent years, other service contractors have participated in site activities and would be subject to these criteria.

Area	Urine Sample Within 425 Days of Entry	Exempt
Job requiring respiratory protection	X	
Modifications or repairs on dry boxes or other highly contaminated equipment	X	
Replacement of plutonium-contaminated filters at all sites	X	
Janitorial (long-term) work in plutonium operation areas	X	
Long-term operations (weeks) in areas of low levels of plutonium contamination (>1,000 dpm-60 cm <sup>2</sup> and <10,000 dpm-60 cm <sup>2</sup> )	X	
Decontamination of plutonium spills with >10,000 dpm-60 cm <sup>2</sup>	X	
Work in burial pits at TA-54 when personnel contamination potential is moderate to high	X	
Short-term jobs (2-3 d) when sizable quantities of plutonium (grams of Pu-238 or kilograms of Pu-239) are present in dry boxes (even when work is being done outside dry box)	X	
Supervisory personnel (base urine sample on record)		X
Short-term jobs (2-3 d) in areas of CMR Building, Ten Site, TA-50, TA-55, TA-54, TA-18, TA-48, or TA-21, where there is little plutonium contamination (<1,000 dpm-60 cm <sup>2</sup> )		X
Jobs in other minimum exposure potential areas when respiratory protection is not required and possibility of plutonium contamination is minimal		X

(pp. 43-45 of 98)

**SC&A Observation/Comment:**

In the petition evaluation report for SEC-109, NIOSH noted the concern that support service workers had little or no participation in LANL internal dose monitoring programs. NIOSH determined that 85% of claimant files for members of the evaluated class included some internal monitoring data from the years under consideration (1976-2005). Discussions of support service workers' participation in internal monitoring programs (in the SEC-109 ER and the Internal Dose TBD) seem largely limited to Zia employees' monitoring requirements in plutonium areas.

This issue was cited in the work group's matrix of SEC issues but had not been closed when an SEC class for all LANL workers up through 1995 was approved in 2012. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of specific support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH acknowledged the substance of the comment and conducted multiple outreach meetings with support service workers's. Extent of issue-specific investigation is uncertain.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 39	<b>Source of Comment:</b> OTS-16, 1:00 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008e) September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b> [Most attendees at this session had six or fewer years at LANL.]  <i>Mr. Cameron asked if any of the attendees had bioassay testing at any time. The consensus response was that a baseline bioassay is conducted when employment begins.</i>  <i>[Name redacted] stated that he had already worked in TA-55 for two or three years before he was given a bioassay test kit. He had not received a baseline screening when he began working at LANL. He had also received an in vivo screening after approximately three years on the job. He has not had any bioassay testing since then.</i>  <i>[Name redacted] and [name redacted] responded that the site was divided into four zones in 1993 when they were assigned to groups that stayed in a particular zone. [Name redacted] noted that he works primarily in TA-55, but may be sent to other areas at times. He explained that the zones are like precincts and officers are trained for a specific zone.</i> <span style="float: right;">(pg. 3 of 9)</span>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b> [The workers' concerns were discussed during the outreach meeting (ORAUT 2008e, pg. 3 of 9):]  <i>Dr. Macievic stated that since guards have worked throughout the site, it is important for NIOSH to know when LANL started monitoring guards for bioassay in what areas, what was the frequency of the testing, and what radionuclides were being monitored.</i>  <i>Dr. Macievic observed that over the course of a long career, a security guard has the potential to work in many areas.</i>  [Refer to Comment 38 for NIOSH's Response/Consideration of support service workers' participation in bioassay program.]		
<b>SC&amp;A Observation/Comment:</b>  NIOSH's responses to participants at the outreach meeting indicate acknowledgment of the concern and its relevance to dose reconstruction.  As noted for Comment 38, limited consideration of support service workers' internal monitoring and data is provided in the SEC-109 ER and the Internal Dose TBD. Additional consideration of internal data adequacy and completeness is provided in these documents for the general population of LANL workers. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		

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**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 40	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008a) September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b>  <i>Dr. Macievic asked if the guards had ever participated in regular bioassay testing. [Name redacted] responded that guards had monthly urinalysis bioassay until PTLA (Protection Technology of Los Alamos) came to the Lab in 1992. After 1992, the only regular bioassay testing was an in vivo lung count at the beginning of employment for baseline data and at [sic] another at termination of service, but that has stopped in more recent years.</i>  <i>[Name redacted] asked Dr. Macievic if he had seen the Lab's 1969 bioassay policy that was included in the LANL SEC petition for 1943 to 1975. [Name redacted] offered to send the document to NIOSH.</i> <p style="text-align: right;">(pg. 2 of 11)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  [The workers' concerns were discussed during the outreach meeting (ORAUT 2008a):]  <i>Dr. Macievic stated that the bioassay records he has seen do not give him a clear idea of who participated in the bioassay program. [Commenter question RE: 1969 bioassay policy] Dr. Macievic responded that he had seen LANL documents on the bioassay program but was uncertain if had seen the 1969 policy.</i> <p style="text-align: right;">(pg. 2 of 11)</p> <i>Dr. Macievic asked if the attendees could recall the names of workers who had a lung count or other bioassay testing after any of the incidents that they had discussed. [Name redacted] recalled that the RCTs took [Name redacted] to H2 for decontamination, but did not know if he had been tested.</i>  <i>Dr. Macievic explained that NIOSH may be able to search the claims database if an employee has a claim. A claim file may yield the names of other employees who were involved in the same incidents, which may be of help in locating incident reports, survey reports associated with the incident, or possibly even dosimetry records of a co-worker. Monitoring data found in survey reports and co-worker dosimetry data can be used to model the radiation dose for an unmonitored worker.</i>  <i>Dr. Macievic stated that NIOSH is particularly interested in learning when activities or incidents occurred so they can search the records from LANL's dosimetry group to find out when they actually started monitoring for that information.</i> <p style="text-align: right;">(pg. 3 of 11)</p> [Refer to Comment 38 for NIOSH's Response/Consideration of support service workers' participation in bioassay program.]		
<b>SC&amp;A Observation/Comment:</b>  NIOSH indicated consideration of the guards' concerns (raised in previous sessions of the outreach meeting) by soliciting information from participants in this session. NIOSH requested names of coworkers involved in incidents, as these workers would be potential sources of monitoring data. SC&A is not able to evaluate NIOSH's follow-up in response to the workers' input, since much of this information would not typically be included in Site Profile TBDs.  One participant mentioned a 1969 bioassay policy that was included in the SEC petition for 1943–1975. SC&A reviewed the list of submitted documents reported in the SEC-051 ER, but could not identify a document consistent		

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with this description. NIOSH has retrieved and reviewed other documents describing historical bioassay policies at LANL.

As noted for Comment 38, limited consideration of support service workers' internal monitoring and data is provided in the SEC-109 ER and the Internal Dose TBD. Additional consideration of internal data adequacy and completeness is provided in these documents for the general population of LANL workers. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 41	<b>Source of Comment:</b> OTS-16, 6:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008f) September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>Dr. Macievic asked if the attendees who worked in the early 1980s recalled bioassay testing or special dosimetry in radiation areas, or leaving bioassay samples after responding to specific incidents during the early 1980s.</i>  <i>[Name redacted] recalled that he gave urine samples when he worked in a “nuclear facility” as well as occasional in vivo monitoring but did not remember specific dates. [Name redacted] added that he had never received results from any of the bioassay or in vivo monitoring.</i>  <p style="text-align: right;">(pg. 2 of 6)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b> Response from the outreach meeting (ORAUT 2008f, pg. 2 of 6):  <i>Dr. Macievic stated that information of this type may help NIOSH find survey reports from facilities during that period so that actual data can be used to model potential radiation doses.</i>  [Refer to Comment 38 for NIOSH’s Response/Consideration of support service workers’ participation in bioassay program.]		
<b>SC&amp;A Observation/Comment:</b>  NIOSH indicated consideration of the guards’ concerns (raised in previous sessions of the outreach meeting) by soliciting information from participants in this session.  As noted for Comment 38, limited consideration of support service workers’ internal monitoring and data is provided in the SEC-109 ER and the Internal Dose TBD. Additional consideration of internal data adequacy and completeness is provided in these documents for the general population of LANL workers. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers’ concerns in technical documents. Ongoing investigation of post-1995 period.  NIOSH was responsive to the substance of the comment in a general sense.		

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 42	<b>Source of Comment:</b> OTS-17: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008d) September 17, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>[Name redacted] stated that he had originally intended to name only the security guards in the petition but had discovered that the air monitoring at LANL was inadequate. Since the air quality affects many workers at LANL, he included other support services workers who are not included in the bioassay program. [Name redacted] explained that lack of bioassay and air monitoring data takes away the internal dose component from the dose reconstructions for these workers.</i></p> <p><i>Dr. Macievic asked the attendees if they had given a bioassay sample or had a lung count at the beginning of their employment at LANL, or if they did so after a particular event. [Name redacted] stated that the firefighters had given a yearly bioassay sample, but the Lab stopped that when Los Alamos County took over the fire department in the early 1990s. Dr. Macievic asked if the samples were required as part of the annual physicals or as part of the dosimetry program. . . .</i> (pg. 4 of 14)</p> <p><i>[Name redacted] commented that he had started working for LAFD in 1997 and had never had bioassay. [Name redacted] recalled that he had seen the bioassay kits when he was hired in 1991, but the program ended soon after that. [Name redacted] recalled that he had given urine samples in 1992, but the program ended about that time.</i> (pg. 5 of 14)</p> <p><i>[Name redacted] indicated that the RCTs sometimes provide breathing zone samplers during incidents such as the Cerro Grande fire to check contamination levels to determine the length of time the firefighters can stay in an involved area. He stated that the RCTs do not advise them of the contamination levels.</i></p> <p><i>[Name redacted] stated that the bioassay program at LANL primarily involved the workers who handled the radioactive materials. The security guards give a baseline sample for bioassay when they are hired, but he understood that the firefighters have not done so since 1992. Neither group is included in the Lab's annual program for bioassay, which may include urine or fecal samples, nasal swipes, and in vivo monitoring (whole body or lung counts). [Name redacted] and [name redacted] discussed the necessity of both a baseline bioassay and regular monitoring to determine the extent of a worker's internal dose in an incident.</i></p> <p><i>Firefighters respond to situations such as the shot activities during which they may have an uptake but are not given the bioassay testing that the production workers have for similar events.</i> (pp. 7–8 of 14)</p> <p><i>[Name redacted] asked [name redacted] if the Lab is still doing a baseline bioassay for the guards when they hire in. [Name redacted] replied that the Lab has changed its policy now to only include material handlers in the bioassay program.</i> (pg. 9 of 14)</p> <p><i>Dr. Macievic asked if the areas were posted to indicate the contamination levels. [Name redacted] stated that some of the signs warned of "Grave Bodily Danger," for example. [Name redacted] commented that some of the signs stated that smocks and booties should be worn in the area, but they were never required to wear respiratory protection, even when he worked with Pro Force. It was routine to see other workers in the area fully dressed in protective gear, including respiratory protection.</i></p> <p><i>[Name redacted] commented that the Lab will not let firefighters into an area where "hot" work is being done. [Name redacted] stated that the only monitoring they had most of the time was a self-check at a hand-foot meter. [Name redacted] said that they still use that system at TA-54.</i></p>		

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*Dr. Macievic asked if the firefighters recalled whether the health physics practices were better in some areas than in others before LANL consolidated all of the health physics groups into one group. [Name redacted] responded that he did not remember the particular time that LANL made that change because the Lab does not notify the LAFD of changes. [Name redacted] commented that even at present, some areas are more stringent than others about monitoring practices. The monitoring system at PF-4 is different than at TA-54. He sometimes wonders if events are reported correctly.* (pg. 11 of 14)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[The workers' concerns were discussed during the outreach meeting (ORAUT 2008d):]

*Dr. Macievic explained that the Petition Evaluation Report is due at the end of October, but the LANL records search efforts will likely continue through the end of 2008. NIOSH will continue to sample LANL records to determine if there are survey data for the petition time period. If there is a sufficient amount of data, then NIOSH will code it, analyze it by job category and building so co-worker models can be developed for the upper bound of the "missed" dose, and figure how to apply that dose to the unmonitored employees for the amount of time they spent doing their jobs in contamination areas. If there is not sufficient data to develop the co-worker models, then the question NIOSH must answer is, "Can dose reconstructions be done at all?"* (pg. 4 of 14)

*Dr. Macievic commented that each program at LANL had its own methodology. It is NIOSH's job to determine if that methodology can provide sufficient information to model the "missed" dose and to perform accurate dose reconstructions for the SEC class.*

*[Name redacted] asked Dr. Macievic if other DOE sites have a baseline bioassay for their workers. Dr. Macievic responded that most sites include that in the initial physical so there is a point of reference in case there is an incident. The site may decide at a later date that it is not necessary for that worker to be screened for any number of reasons, including a low exposure job assignment or as a cost-cutting measure. The lack of bioassay data in the LANL records is why NIOSH is going back to the source data to generate information. Dr. Macievic explained that the ABRWH review of the evaluation report will likely include an involved review of the data that NIOSH finds during the evaluation. Dr. Macievic commented that the ideal situation is to have a worker's bioassay data from 30 years of employment. That is not the case for the LANL support services workers, which is why NIOSH is looking for the source term data to develop the "missed" dose for those workers.* (pg. 9 of 14)

*Dr. Macievic explained that bioassay is the key for internal exposure scenarios for firefighters and other support services. The special dosimeters are used to show that workers in a contamination area are not being exposed to neutron radiation or X rays above the levels of detection, for example, and do not address the potential internal exposures to firefighters and other support services personnel.*

*Dr. Macievic stated that NIOSH sees different levels of information than the summary data that is given to the workers. NIOSH looks for the survey reports containing the actual raw data taken by the RCTs in the field before it is filtered by the health physics organization several times before the report is generated for the workers' annual dose reports. NIOSH also counts on information from workers to determine the number of incidents, the amount of time involved in contamination incidents, and other details that help NIOSH to understand the "real picture." The LANL health physics groups look more at keeping the worker under the regulated dose limits, whereas NIOSH looks at all of the potential doses a worker may have received.* (pg. 10 of 14)

[Refer to Comment 38 for NIOSH's Response/Consideration of support service workers' participation in bioassay program.]

**SC&A Observation/Comment:**

NIOSH solicited information from the workers regarding their participation in LANL bioassay programs. NIOSH acknowledged that support service workers were not routinely monitored, and staff explained that coworker and source term data could be used to estimate exposures for unmonitored workers if sufficient data are available.

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As noted for Comment 38, limited consideration of support service workers' internal monitoring and data is provided in the SEC-109 ER and the Internal Dose TBD. Additional consideration of internal data adequacy and completeness is provided in these documents for the general population of LANL workers. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Internal Dose Assumptions		
<b>Comment Number:</b> 43	<b>Source of Comment:</b> OTS-18: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008b) September 17, 2008	<b>Commenter:</b> Not identified Loretta Valerio
<b>Comment:</b>		
<p><i>Dr. Macievic asked if the attendees had participated in a regular bioassay program or if they had been given a baseline bioassay test the first time they had worked at LANL. Several attendees responded that they gave a baseline sample. They did not recall participating in a regular bioassay program. The consensus response was that LANL required bioassay testing for trades workers only if there was a contamination event.</i></p> <p style="text-align: right;">(pg. 6 of 11)</p> <p><i>Loretta Valerio stated that when she worked at TA-55 scheduling whole body counts for employees, some of the workers had not had one for seven or eight years. Her job had been to prioritize the schedule based on worker's job descriptions and if they were in the plant on a daily basis. [Name redacted] added that they had whole body counts every year from about 2000 or 2001.</i></p> <p><i>[Name redacted] replied that he gave a bioassay sample yearly. He recalled doing a nasal swipe for every "hot" job. He was given a bioassay kit to take home if a nasal swipe was contaminated.</i></p> <p><i>[Name redacted] said that it depended on whether the nasal swipes were available when they left a "hot" job, but almost always at TA-55, CMR, and TA-50. If the CAMs (continuous air monitors) went off while they were in an area, they had to go to the hallway for a nasal swipe and had to leave PF4 until the swipes were counted.</i></p> <p style="text-align: right;">(pp. 7–8 of 11)</p> <p><i>Some workers may have gotten a small radiation exposure in addition to lot of chemical exposure. . . [Name redacted] commented that the cans on their respirators often leaked enough that they could taste and smell the chemicals.</i></p> <p style="text-align: right;">(pg. 9 of 11)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>A response was provided in the outreach meeting (ORAUT 2008b, pp. 7–8 of 11):</p> <p><i>Dr. Macievic said that the records for whole body counts for specific materials are sporadic depending on what group was involved. He would like to find more information about the criteria over time. The site profile has some information, but he is interested in the 'triggering mechanisms' for requiring urine samples, fecal samples, and whole body counts – is it an incident or a particular job, does a contamination incident do it or does a certain contamination threshold trigger the request for a bioassay sample.</i></p> <p><i>Dr. Macievic asked if the nasal swipes were done all the time or only in plutonium areas or where there were other radionuclides.</i></p> <p>NIOSH 2012a. SEC Petition Evaluation Report, Petition SEC-00109, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 44 of 98.</p> <p><i>. . . Although the number of monitored individuals increased over the years, not all individuals working at LANL were monitored. The Employee Health Physics Checklist was used to ensure that workers with the highest exposure potential were monitored. These checklists were completed for LANL employees, contractor employees, students, and visitors (Checklist, 1977). Workers involved in radiological incidents were also often monitored . . . Nasal swipes and wound counts have also been used extensively at LANL to identify the need for bioassay.</i></p>		

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ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.

*. . . Positive nasal swipes can aid the dose reconstructor in determination of a plausible intake date. . .*

*Intakes are not calculated from nasal swipe results, but the results of nasal swipes are used as indicators of possible intakes. Nasal swipes continue to be used in the present bioassay program as an indicator of possible intakes.*

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*Routine sampling frequencies place upper bounds on the potential exposure for monitored individuals with all results less than detection levels. . . Although sampling of individuals with the highest potential for intakes was performed from the beginning of the program in 1944, no specific information on the nonincident sampling program is available before Lawrence (1967). [Routine sampling frequencies, as well as the years when routine sampling was initiated, are given for plutonium, americium, tritium, and uranium.] Routine work or frequent entry in an area with beta/gamma emitting radionuclides currently requires annual whole-body count (LANL 2004a).*

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**SC&A Observation/Comment:**

NIOSH solicited information from the workers regarding their participation in LANL bioassay programs. The Internal Dose TBD and the SEC-109 ER reflect consideration of monitoring frequency and triggers for bioassay. Nasal swipes are considered as a screening assessment to determine the need for urine bioassay, and NIOSH considers implications of historical practices, such as action levels, on dose reconstruction.

As noted for Comment 38, limited consideration of support service workers' internal monitoring and data is provided in the SEC-109 ER and the Internal Dose TBD. Additional consideration of internal data adequacy and completeness is provided in these documents for the general population of LANL workers. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 44	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 20, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>My father. . . worked on the [redacted] at Los Alamos National Laboratory [[redacted]].</i></p> <p><i>At Los Alamos, my father's job took him into all areas of the facility and site. . . at the [redacted].</i></p> <p><i>One evening . . . a group of laboratory personnel showed up at our home and conducted tests. The marks of his footprints were clearly visible to the testing instruments. His clothing was all confiscated and he never saw any of it again. . .</i></p> <p style="text-align: right;">(pg. 42 of 50)</p> <p><i>. . . my mother worked at LANL as a Laboratory Technician [[redacted]]. She was responsible for [redacted], and was the [redacted] so others could safely perform their tests. In [redacted], my mother witnessed an [redacted] in the open atmosphere at the Nevada test site, during which she stood outside without protective clothing in a fallout zone. . .</i></p> <p><i>. . . Because of security issues, my mother never discussed much about her work at Los Alamos . . . I interviewed her on videotape in January of 1996, and she discussed her job and the trip to the Nevada Test site. On the tape she mentioned that she was outside, with her head uncovered, and that she was exposed to fallout. She also mentioned . . . running the initial tests.</i></p> <p style="text-align: right;">(pg. 43 of 50)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>NIOSH 2007a. <i>SEC Petition Evaluation Report, Petition SEC-00051</i>, Rev. 0, National Institute for Occupational Safety and Health, February 1, 2007, pg. 105 of 117.</p> <p>[from petitioner's concern:] <i>In many cases from 1943–1975 personal exposures in some job categories with significant radiation exposures were unrecorded. . . There are many incidents and accidents documenting the history of occurrences at the LANL which are not included or made available in the dose reconstruction process.</i></p> <p>[from NIOSH response:] <i>The purpose of the LANL site profile (ORAUT-TKBS-0010) is not to report every incident or accident (collectively referred to as occurrences) that ever transpired at LANL, but rather to serve as a guide to dose reconstructors for uniformly assessing LANL claims. While it is known that some reported occurrences resulted in worker radiation exposures, it is also known that an equal or larger number of occurrences resulted in minimal or no exposures at all.</i></p> <p><i>The site profile provides useful data to the dose reconstructors for completing claimant dose assessments. To this end, the site profile provides a summary of major events highlighting potentially significant releases or exposure events. Upper-bound values for the types and magnitudes of incidents that occurred can allow dose reconstructors to develop conservative estimated intakes for both monitored and unmonitored workers. Work continues on characterizing and quantifying the intakes for both maximizing and general conditions. Other approaches being used to account for missed dose or to assign dose to unmonitored workers include the use of co-worker data and other workplace survey data (when available).</i></p>		
<p>ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i>, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.</p>		

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[Regarding early years of LANL operations:] *Research indicated that there was potential for work and casual encounters with plutonium and other radionuclides at various air concentrations or surface contamination levels, including levels that exceeded radiation exposure or control limits. . . some level of chronic or episodic intake during this early period would be a reasonable assumption for any worker in the Laboratory (Hempelmann, Richmond, and Voelz 1973). . . Consideration of this fact is a part of the basis for the additions of classes of LANL workers to the SEC as discussed above. . .*

*. . . Over the years, many improvements have been made in monitoring, bioassay techniques, safety equipment, and safety procedures (Schulte and Meyer 1957). Nevertheless, the potential for monitored and unmonitored intakes has existed throughout the history of the site. . .*

(pp. 15–16 of 117)

ORAUT 2004. *Technical Basis Document for the Los Alamos National Laboratory – Site Description*, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004.

*The development of these LANL Technical Basis Documents (TBDs) is particularly challenging due to the wide range of research and development activities and intermittent involvement in the production and testing of nuclear weapons.*

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*TA-48: Radiochemistry Site: actinide chemistry and hot cell isotope production, area used for analyzing samples from weapon test shots, 1950s to present*

(pg. 15 of 65)

**SC&A Observation/Comment:**

[Note: The comment describes routine work practices and specific exposure incidents from the 1940s and 1950s.]

The incidents described by the commenter are limited in scope and severity. NIOSH's responses to other commenters at outreach meetings (e.g., Comment 2) indicate that such incidents are considered in individual dose reconstruction. The SEC-051 ER explains that the site profile provides examples of major incidents rather than a comprehensive list of all occurrences; it also indicates that missed dose and coworker dose are likely to account for workers' exposures in routine work and minor incidents (for claimants ineligible for the SEC classes).

The practice of [redacted] all over the site is discussed in other comments, particularly in Comment 58 and Comment 65. NIOSH's technical documents do not specifically discuss exposure potentials of [redacted]. The Internal Dose TBD indicates that unmonitored exposures for all LANL workers were likely in the early years and possible throughout LANL history.

SC&A did not locate information in LANL technical documents regarding workers' participation in [redacted] at Nevada Test Site (although it is understood that any such participation would have been recorded, in terms of dosimetry results, at NTS). The Site Description TBD indicates LANL was intermittently involved in nuclear weapons testing and samples from weapon test shots have been analyzed at TA-48 since the 1950s.

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**NIOSH Evaluation Comment:**

Dose reconstructor experience with claims involving Los Alamos employees working at the Nevada Test Site shows that, for the most part:

- Workers are monitored at NTS with NTS dosimeters; and
- NTS-recorded doses are included in Los Alamos records (though NIOSH also receives the records from NTS when requested); and
- It is possible for the dose reconstructor to see whether they were also monitored separately at Los Alamos. Missed dose is assigned for all zero dosimeter results.

**SC&A Conclusion:**

Disposition: General issues were investigated and incorporated into technical documents.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 45	<b>Source of Comment:</b> Claimant Provided Exposure Data Claim [redacted], January 15, 2011 CATI Claim [redacted], January 9, 2008	<b>Commenter:</b> Claimant [redacted]
<b>Comment:</b> [The following information is taken from CATI of claimant [redacted], which claimant [redacted] included in the Claimant Provided Exposure Data. The interview date was 1/9/2008. Both claimants worked in Security in the late 1940s and early 1950s.]  [Claimant] noted that there was a fire in a building where they welded radioactive materials. He said there was a large lathe in the area and right next to the lathe was a control room. The area was separated by a thick Plexiglas window so that people could look in and watch the lathes work. [Claimant] said during one swing shift there was a fire in the Old Tech Area. He said when this incident occurred he rushed down to the area and the first thing he was told by the man in charge was to stand in front of the door and not let anyone in; including the Fire Department. [Claimant] said as he was standing in front of the door smoke started to ooze out from under the door; the whole building was filled with smoke.  [Claimant] said from conversations he has had, it is his understanding that the fire burned down through a concrete floor into the basement. He said the fire went from the lathe, down through the floor, and into the basement where the lathe wiring/connection was. [Claimant] said he believes the day after the incident he spoke with the supervisor and was told they were making an effort to clean the building up. He said the supervisor never expressed a concern about if he had been contaminated and he was never required to have any form of testing. [Claimant] said it was his understanding that something went wrong; however, he was never given details about the incident.  . . . the building was closed for about a week for clean up and then they started the rebuild of the floor and lathe. <span style="float: right;">(pp. 55–56 of 64)</span>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  [Refer to Comment 44 for NIOSH’s Response/Consideration regarding unmonitored exposures and small-scale incidents.]  [Refer to Comment 57 for NIOSH’s Response/Consideration of internal dose assessment for support service workers.]		
<b>SC&amp;A Observation/Comment:</b>  SC&A did not identify specific consideration of the incident described by the commenter. The Site Description TBD (ORAUT 2004, pg. 21 of 65) describes two fires in TA-1 in 1945, which pre-date the claimants’ employment at LANL. As noted for Comment 44, the SEC-150 ER explains NIOSH’s emphasis on larger-scale incidents in the site profile, and it indicates that missed dose and coworker dose are likely to account for workers’ exposures in routine work and minor incidents (for claimants ineligible for the SEC classes).  While similar issues are broadly addressed in TBDs and SEC evaluation reports for all LANL workers, NIOSH’s technical documents for LANL generally do not communicate how these concerns are considered in dose reconstruction for support service workers. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		

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**SC&A Conclusion:**

Disposition: The specific incidents described by the commenter do not appear to have been investigated.  
General consideration of small-scale and large-scale incidents is reflected in technical documents.  
Ongoing investigation of support service workers' concerns post-1995.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 46	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>The Cerro Grande Fire was a large scale event that affected workers at LANL. Fires burned on Laboratory property where radionuclides were either released or disposed. Monitoring of radionuclides in the air was affected by the amount of smoke and the winds during the fire.</i></p> <p><i>. . . On May 08 [2000] LANL shut down operations. Security guards, other essential personnel, and of course fire fighters continued to report to work. . . The entire town of Los Alamos was evacuated. . .</i></p> <p><i>. . . The fire burned over a 47,000 acre area. 7,500 acres of land and 112 structures were burned on LANL Property.</i></p> <p><i>According to LANL, the fire did not burn any structures containing radionuclides. It did burn land areas that were contaminated or suspected of being contaminated with radionuclides. [Petitioner provided a list of potential release sites by Technical Area throughout LANL property.]</i></p> <p><i>. . . Air monitoring was conducted during the fire, but it was not continuous. When the fire was burning on LANL property, power was lost and the AIRNET monitors were turned off. . .</i></p> <p><i>Also, the filters became clogged from the large amount of particulate in the air. Filters are normally changed every 2 weeks. However, during the fire filters were exchanged as often as every day. LANL was aware of the sampling problems and stated in a report concerning the effectiveness of air monitoring, “Because the samples represented much smaller air volumes than normal samples, the uncertainties associated with the isotopic analyses of plutonium and americium were more than an order of magnitude larger than our usual uncertainties. [LA-UR-01-1132 page 5]</i></p> <p><i>To continue, the filters from the AIRNET sampler located at TA-2 were not collected because they were not considered important for data that would pertain to emissions from the fire. However, the decision to exclude this AIRNET sampler did not take into account the rotor winds that occur in the canyons. Winds during the fire were extreme. The winds reached speeds up to 70 miles per hour. The AIRNET samplers lose accuracy at higher wind speeds. Gross radioactivity was elevated from normal during the fire. One measurement retrieved from Tsankawi Monument . . . was 8800aCi/m<sup>3</sup>. Uranium samples were not considered because they were considered to be natural in origin. However, the act does not differentiate from natural or man-made sources. Also, LANL often used natural uranium in explosives testing. . . Security guards were not provided with any breathing apparatus throughout this period. Additionally, overtime restrictions were lifted during the fire. Security Guards were working 16 hour days, 7 days a week during the fire.</i> (pp. 55–63 of 112)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>ABRWH 2011. <i>Work Group on Los Alamos National Laboratory</i>, Cincinnati Airport Marriott Hotel, Hebron, Kentucky, May 2, 2011, pp. 313–314 of 342.</p> <p><i>[redacted]: . . . And the issue that I raised and I still haven't heard really addressed that well is the filters, the sampling filters were getting clogged because of all the particulate in the air, and one of the reports referenced the uncertainty in the data capture increased by an order of magnitude because of this.</i></p> <p><i>And additionally when the fire was burning on LANL property, the air monitors were not working due to a loss of power. So you are not capturing data for the actual fire I itself, when it's on the laboratory property.]</i></p>		

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*MR. STEWART: The report . . . does mention that some samples were not available because [of] power losses. Overall coverage was pretty good . . . though there were samplers that lost power. For the most part, sampling was conducted during the fire.*

ORAUT 2012. *Discussion Points for the ABRWH'S Work Group on LANL*, Rev. 0, Oak Ridge Associated Universities Team, April 6, 2012, pp. 17–18 of 23.

*For particle sizes in the range of dosimetric interest (1–5 microns), settling velocities are low over the entire range (for wildland fire research, PM10 are considered as a group). Thus, concentrations would not vary significantly between sampling height (approximately 48–66 inches) and closer to the ground. . . Similarly, low settling velocities also mean that samplers near the fire are likely to be representative, for particles in the range of interest. Since some samplers were close enough for clogging to be an issue, AND the highest concentrations were used, the method used in the white paper is both unrealistic and overestimating. AIRNET stations actually do measure resuspended dust (Reference SRDB Ref ID 35741, page 94) at all times.*

NIOSH 2012a. *SEC Petition Evaluation Report, Petition SEC-00109*, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 57 of 98.

*A study performed soon after the Cerro Grande fire included two dose calculations: [hypothetical maximally exposed firemen or volunteer in the Los Alamos area and maximally exposed member of the public]. . . In addition, a third calculation is added: a fireman or other worker in the vicinity of AIRNET (LANL's ambient air monitoring network) Station #23 in Mortandad Canyon where elevated levels of LANL-derived airborne uranium occurred during the peak of the fire. In the initial (Rev. 0) SEC-00109 Evaluation Report, NIOSH concluded that these data could be used to bound the dose for any Service Support Worker who might have been exposed during the fire. NIOSH will continue to evaluate this issue in its ongoing evaluation of the post-1995 period.*

ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.

*In May of 2000, areas of Los Alamos were overrun by the 48,000-acre wildlands fire that came to be known as the Cerro Grande fire. Some LANL structures were destroyed and damaged, but there was no damage or destruction of stored special nuclear material. According to meetings conducted with personnel employed by LANL, responders to that incident included LANL staff and members of outside emergency response organizations who were not monitored for potential intakes of radioactive material.*

*During the fire, sampling of airborne particulate was conducted using LANL's AIRNET system. The most abundant detected radioactive materials resulted from resuspension of radon progeny that had accumulated on vegetation and on the forest floor, but concentrations of plutonium, americium, and uranium were also measured. These results were, in general, consistent with measurements that were made outside the fire period (Eberhart 2010). For estimation of doses from potential intakes of anthropogenic radionuclides, the results of the monitoring were evaluated as described in Attachment F. . .*

*Because no organ dose was greater than 0.001 rem, no additional unmonitored dose, beyond doses from environmental concentrations of radioactive material, are necessary for potential exposure during the Cerro Grande fire.* (pp. 20–21 of 117)

[from Attachment F]

*. . . For the purpose of an overestimate of potential internal dose to Los Alamos workers, intakes for plutonium, americium, and uranium were calculated based on the highest measured values without*

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*considering likely background intakes. That is, material of natural origin was not rejected for the purpose of the maximum dose calculation described here. . .*

[Assumptions to overestimate internal dose consequences to workers include: 60-hour continuous exposure at the location of highest potential intake; maximum measured concentrations of Am-241, Pu-238, Pu-239, U-234 and U-238; breathing rate and volume for heavy work; no respiratory protection; maximizing absorption type.] (pg. 114 of 117)

**SC&A Observation/Comment:**

NIOSH considered potential unmonitored intakes resulting from the Cerro Grande fire. All activity detected on the AIRNET filters was considered occupational exposure (regardless of non-LANL contributions to background). NIOSH assumed continuous exposure at the highest measured air concentration, a heavy breathing rate, and no respiratory protection. NIOSH concluded that personnel exposures would be minimal and would be bounded by existing dose reconstruction practices for occupational environmental dose.

A few of the petitioner’s concerns—interruptions in AIRNET monitoring (due to power loss), interference from high, turbulent winds, and the impact of clogged filters—were not directly discussed in the TBD. Some of these issues were discussed during the LANL Work Group’s review of the SEC-109 ER, as reflected in the May 2011 transcript cited above. NIOSH is continuing to investigate this incident as part of its ongoing review of the post-1995 period. A recent data request (NIOSH 2012b) includes inquiries regarding LANL’s assessment of internal dose to unmonitored workers and the representativeness and accuracy of environmental monitoring sampling.

**NIOSH Evaluation Comment:**

NIOSH will evaluate new data as they become available.

**SC&A Conclusion:**

Disposition: Issues were investigated and partially incorporated into technical documents.  
Ongoing investigation.

NIOSH has been responsive to date to the substance of the comment.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 47	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>The Sigma Americium Contamination Incident</i></p> <p><i>Another serious incident at LANL occurred when Americium-241 was released off-site from the TA-3, SM-66 Sigma Complex.</i></p> <p><i>On July 14, 2005 a significant contamination incident occurred at the Sigma building, SM-66 in Technical Area-3 at LANL. Americium contaminated uranium nitride pellets were shipped from PF-4 at TA-55 to SM-66 TA-3. The person that received the shipment opened the package without a Radiological Control Technician (RCT) present. . . . The worker opened the packages and contaminated the glovebox and laboratory with americium. . . the following week the worker continued performing work in the contaminated glove box. The worker also worked at other Sigma locations as well as other LANL locations. . .</i></p> <p><i>The contamination was not discovered until July 25, 2005. An RCT discovered the open packaging and conducted surveys. The survey indicated 600,000 dpm/ 100cm<sup>2</sup> total contamination on the glove box door. The worker’s thumb and identification badge had 9,000 dpm alpha contamination. The worker’s dosimetry badge had contamination of 18,000 dpm alpha. The worker’s computer keyboard had contamination of 10,000 dpm. Objects in the worker’s office had contamination of 4,000 dpm. RCTs discovered in room R-108 contamination of 50,000 dpm. The worker also handled a paper that recorded the shipment. RCTs found contamination of 1,000,000 dpm/100cm<sup>2</sup> on that paper. The worker’s home and automobile had contamination. [Swipes at the main guard station at Sigma did not reveal contamination, but the station had been thoroughly cleaned and mopped that morning (prior to the survey), and guards regularly cleaned the badge reader.]</i></p> <p><i>Guards routinely handled the worker’s badge. Whenever a person entered or exits the Sigma area through the guard station, the guard physically inspects the badge. Guard stations are also located on Pajarito Road. The worker drives this road to and from work. His badge would be physically inspected by the guards manning these stations. The worker often entered and exited the guard station during the day as he routinely walked in the TA3 and TA-60 areas. It is unknown how many guards actually handled the worker’s badge during the period from when the contamination occurred and when it was discovered. The type B investigation of the incident said that the worker’s hands likely had 2,000,000 dpm/cm<sup>2</sup> contamination.</i></p> <p><i>. . . The total contamination present in this accident was about 4,000 microcuries . . .</i></p> <p style="text-align: right;">(pp. 63–65 of 112)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>NIOSH 2012a. <i>SEC Petition Evaluation Report, Petition SEC-00109</i>, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 57 of 98.</p> <p><i>SEC-00109: The petitioner identified the “Sigma Americium Contamination Incident” in 2005 as an unmonitored, unrecorded, or inadequately monitored exposure incident.</i></p> <p><i>The Type B Accident Investigation report on the July 14, 2005 americium contamination accident at the LANL Sigma Facility states that the maximum dose to Worker 1 (the maximally-exposed individual) was 500 mrem CEDE. Based on this assessment, a maximum intake may be estimated, which could then be used to bound the dose for service workers (Investigation, 2006).</i></p>		

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ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013, pg. 53–55 of 117.

*Exposure circumstances discussed throughout this TBD indicate that for Los Alamos National Laboratory employees, there is a potential for unmonitored intakes of secondary radionuclides. Partially as a result of this potential, NIOSH has added classes of LANL employees to the SEC that include all workers through December 31, 1995. For workers for whom partial dose reconstructions are performed, internal doses that may be assigned are limited to those based on bioassay monitoring information in the claim records and to potential intakes (implied by case-specific information) that may be assigned using coworker intakes. For determining when unmonitored intakes may have occurred, the most useful sources of information for this review (beyond internal dose monitoring records) are [the Energy Employee or Survivor Interview and the Initial Case file from DOL].*

**SC&A Observation/Comment:**

NIOSH reported consideration of this incident in both revisions of the SEC-109 ER. The ER does not specifically discuss how dose reconstructors determine which workers are assigned dose from the incident. The Internal Dose TBD indicates that internal dose is only assigned on the basis of monitoring data or case-specific information.

**NIOSH Evaluation Comment:**

Dose reconstructions are not approached from a universal point of view; rather, the individual case information is used to identify likely exposures. In other words, the TBD (or ER) would not identify the two or three workers involved in an incident and caution the dose reconstructor to ensure that appropriate doses are assigned.

For the incident discussed here, the presence of americium bioassay results in a claimant file would mean that the dose reconstructor would, typically, either: (a) assign dose implied by positive results and/or missed dose implied by negative results; or (b) overestimate any likely internal dose.

**SC&A Conclusion:**

Disposition: Issues were investigated and incorporated into technical documents.

NIOSH was responsive to the substance of the comment and provided additional clarification in the NIOSH Evaluation Comment.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 48	<b>Source of Comment:</b> OTS-16, 9:00 a.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008c)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple] Loretta Valerio

**Comment:**

*[Name redacted] explained that the area affected by the Cerro Grande fire in 2000 had many structures that contained equipment used in nuclear weapons production as far back as the creation of the Fat Man atomic bomb during the Manhattan Project. The guards who responded to the fire were exposed to heavy smoke both inside and outside the buildings. He recalled being inside the Communications Center and the smoke being “so thick that it was really unbearable sometimes.” [Name redacted] recalled that the guards were issued dust masks. [Name redacted] stated that he worked ten 16-hour shifts during that time. He remembered that his home in Los Alamos had been filled with smoke, but he had gotten special permission from the National Guard to stay there because of his duty assignment. There was no electricity in his home and the beam of his flashlight seemed more like a solid object because the smoke was so thick. [Name redacted] asked whether he recalled any bioassay monitoring because of his duty assignments during the fire. He replied that only those who complained to their immediate shift supervisor or the shift commander were sent for bioassay testing. [Name redacted] questioned whether there had been mass testing of the guards and the firefighters who were working on the front lines during the fire. [Name redacted] stated that he did not recall being tested. [Name redacted] said that there was no special testing unless someone complained of feeling ill during a shift. . . [the worker’s] home was located approximately a quarter mile from TA-55, as well as in close proximity to the canyon at TA-41 and TA-42.*

*Ms. Valerio stated that she had been assigned to TA-42 prior to the fire. When she returned to work after the fire was contained, a sooty residue still covered everything in the office even after the area had been cleaned. She recalled that S Site and R Site were worse. . . [Name redacted] stated that the entire city of Los Alamos was evacuated during the fire and the period that followed, so the area was restricted to emergency personnel only – National Guard, Los Alamos Fire Department, LANL guards, and monitoring personnel. They were exposed to a lot of smoke but were never told what contaminants were in it. The canyon in S Site burned as well as many contaminated buildings. [Name redacted] did not recall being told of any readings that were taken during or following the fire.* (pp. 3–4 of 11)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[Refer to Comment 46 for NIOSH Response/Consideration regarding Cerro Grande fire.]

**SC&A Observation/Comment:**

As noted for Comment 46, NIOSH has considered potential unmonitored intakes resulting from the Cerro Grande fire. NIOSH concluded that personnel exposures would be minimal and would be bounded by existing dose reconstruction practices for occupational environmental dose.

The Internal Dose TBD recognizes that some responders did not participate in bioassay. NIOSH’s analysis indicates that some LANL buildings burned. It does not indicate the proximity of workers and/or AIRNET stations to burned contaminated buildings. It is not clear if the 60-hour exposure period assumed in NIOSH’s analysis bounds the commenter’s description of 10 x 16-hour work shifts, as well as emergency workers residing in and near Los Alamos during the fire. NIOSH is continuing to investigate this incident as part of its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

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**SC&A Conclusion:**

Disposition: Issues were investigated and partially incorporated into technical documents. Ongoing investigation.

NIOSH was responsive to the substance of the comment.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 49	<b>Source of Comment:</b> OTS-16, 1:00 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008e)</i> September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b>		
<p><i>Mr. Lewis asked [name redacted] to talk about the historical area where the Fat Man and Little Boy bombs were built. [Name redacted] stated that the buildings had been established as historic sites by the Historic Preservation Act and had been set aside for preservation but were mostly destroyed by the Cerro Grande fire.</i></p> <p><i>Dr. Macievic asked if the responders wore self-contained breathing apparatus during the fire. [Name redacted] replied that none of the personnel who responded wore air masks because the fire was a wildlands fire, not a structural fire. He explained that the U.S. Forestry Service personnel wore protective clothing and a pack and used tools to create a firebreak to contain the fire, which resuspended material from the soil into the air. The firefighters who responded used water to extinguish the blaze. He did not recall if the firefighters wore masks, but they did not wear protective gear because it was too hot.</i></p> <p><i>[Name redacted] asked if NIOSH has reviewed the RCRA (Resource Conservation and Recovery Act) permits that were submitted with the petition. He stated that the permits show areas of concern and potential release sites that list either unknown radionuclides or radionuclides of unknown quantities, or areas that have not been characterized for radiation or chemical contamination. The areas of concern and potential release sites affected by the fire are shown on maps that were included in the petition.</i></p> <p style="text-align: right;">(pg. 4 of 9)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>[NIOSH discussed the issue during the outreach meeting (ORAUT 2008e, pg. 4 of 9):]</p> <p><i>Dr. Macievic stated that, in order to address the resuspension issue, NIOSH needs to review environmental reports to determine what materials were present in the soil and potentially in the plant life. . .</i></p> <p><i>Dr. Macievic replied that the information may help NIOSH determine source terms for the materials that may determine whether or not dose reconstructions can be done for the responders involved in the fire. Dr. Macievic noted that data on resuspension may also help define the SEC class to the responders and other personnel involved in the Cerro Grande fire incident. The petition evaluation requires the review of a large number of documents about many incidents to paint a picture of LANL for a particular period of time.</i></p> <p>[Refer to Comment 46 for NIOSH Response/Consideration regarding Cerro Grande fire.]</p>		
<b>SC&amp;A Observation/Comment:</b>		
<p>As noted for Comment 46, NIOSH has considered potential unmonitored intakes resulting from the Cerro Grande fire. NIOSH concluded that personnel exposures would be minimal and would be bounded by existing dose reconstruction practices for occupational environmental dose.</p> <p>NIOSH's analysis indicates that some LANL buildings burned. It does not indicate the proximity of workers and/or AIRNET stations to burned contaminated buildings. NIOSH is continuing to investigate this incident as part of its ongoing review of the post-1995 period.</p>		

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<b>NIOSH Evaluation Comment:</b>	
NIOSH concurs with the SC&A Observation/Comment.	
<b>SC&amp;A Conclusion:</b>	
Disposition:	Issues were investigated and partially incorporated in technical documents. Ongoing investigation.
NIOSH was responsive to the substance of the comment.	

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 50	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008a) September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>[Name redacted] . . . stated that the guards were not informed of the airborne contaminants that they were exposed to during their duties at S Site and surrounding areas as the [Cerro Grande] fire was being contained.</i> <p style="text-align: right;">(pg. 1 of 11)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b> [NIOSH responded to the comment during the outreach meeting (ORAUT 2008a):]  <i>Dr. Macievic stated that NIOSH is evaluating the radiological problems associated with incidents that may have occurred during the period covered by the petition (January 1, 1976 through December 31, 2005). Incidents or activities in which guards were involved without knowledge of the potential contamination involved, but were informed of the contamination after the event are of particular interest. The information from the guards may help NIOSH find data that can be used to determine their radiological exposures during those activities. NIOSH will use the data to evaluate whether dose reconstruction is feasible for the proposed class of workers during the covered time period.</i> <p style="text-align: right;">(pg. 2 of 11)</p> <i>Dr. Macievic asked the attendees if the guards respond to fires along with the firefighters. [Name redacted] responded “Yes.” Dr. Macievic noted that the airborne contamination would affect both groups.</i> <p style="text-align: right;">(pg. 3 of 11)</p> [Refer to Comment 46 for NIOSH Response/Consideration regarding Cerro Grande fire.]		
<b>SC&amp;A Observation/Comment:</b>  As noted for Comment 46, NIOSH has considered potential unmonitored intakes resulting from the Cerro Grande fire. NIOSH concluded that personnel exposures would be minimal and would be bounded by existing dose reconstruction practices for occupational environmental dose. NIOSH is continuing to investigate this incident as part of its ongoing review of the post-1995 period.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition:      Issues were investigated and incorporated into technical documents. Ongoing investigation.  NIOSH was responsive to the substance of the comment.		

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 51	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008a) September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>[Name redacted] described an event between 1985 and 1988 at Kiva 2 in TA-18. The RCTs “forgot” to notify [name redacted], who was posted in the guard tower, when they evacuated the area before the kiva was started. The guard was tested after the incident. . .</i></p> <p><i>[Name redacted] described an exposure incident in the mid-1990s: [Name redacted] and another guard received radiation doses at a high-energy radiography facility for examining materials when a technician activated the machine before they had finished clearing the roof. The Lab fired the technician. [Name redacted] stated that the incident had been disclosed to NIOSH during the LANL Site Profile meeting in 2005. (pg. 2 of 11)</i></p> <p><i>[Name redacted] stated that roads in TA-18 were closed off during gamma experiments at the kivas in the Mason-Hanger era. [Name redacted] added that the Godiva neutron experiments at Kiva 3 had been of concern to CCNS (Concerned Citizens for Nuclear Safety), which had raised an issue regarding air monitoring for activation products at LANL. He stated that LANL may have responded by conducting air monitoring for neutron activation products after some of the shots, but he has not found any documentation of that activity. (LANL conducted neutron experiments in that area in the early to mid-1980s during the development of the neutron bomb.) (pg. 8 of 11)</i></p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>NIOSH Response from the outreach meeting (ORAUT 2008a, pg. 2 of 11):</p> <p><i>Dr. Macievic commented that the incident [failure to clear the roof before activating radiography machine] was unique to the individual involved. NIOSH would like to have more information that shows how guards are excluded from the monitoring and safety practices in place for other employees.</i></p> <p>ORAUT 2004. <i>Technical Basis Document for the Los Alamos National Laboratory – Site Description</i>, ORAUT-TKBS-0010-2, Rev. 00, Oak Ridge Associated Universities Team, May 7, 2004.</p> <p><i>Other impacts of operations at the Pajarito Site include: 1) instances of releases of airborne radioactive material from the Kivas . . . Examples of TA-18 activities include:</i></p> <p><i>. . . Air samples in 1957 in the vicinity of the Honeycomb assembly were half of the applicable tolerance level for that era, and samples in the vicinity of the Lady Godiva assembly were asserted to be excessively high. This is cited as justification for plating the new Godiva (presumably Godiva II). (pg. 46 of 65)</i></p> <p><i>[Table 2-1 lists the Technical Areas and shows the radionuclides known to have been used in operations in each TA. Radiation sources noted for TA-18 are “<sup>235</sup>U; <sup>239</sup>Pu; <sup>240</sup>Pu; <sup>233</sup>U; MFP; <sup>131</sup>I; polonium; neutron.”] (pp. 12–16 of 65)</i></p> <p>ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i>, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.</p> <p><i>5.5.3.8 Mixed Fission and Activation Products</i> <i>MFPs are typically associated with reactors or with facilities where irradiated reactor fuel is processed. Mixed activation products (MAPs) are the result of neutron irradiation in a reactor core or an accelerator. (pg. 58 of 117)</i></p>		

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[Table A-8 lists the historical and current typical locations of radionuclides of interest for internal dose reconstruction. Radionuclides noted for TA-18 are “U-235; U-233; Pu-239; Pu-240; MFP; I-131; polonium.”] (pg. 80 of 117)

**SC&A Observation/Comment:**

NIOSH responded during the outreach meeting to clarify the distinction between incidents of interest to individual dose reconstructions and incidents of broader scope or severity that are listed in the Site Profile.

As noted for Comment 25, the site description indicates awareness of the potential for worker exposures at some distance from the critical assemblies and of road closures in the vicinity of TA-18 kivas.

SC&A did not identify specific consideration of potential internal exposures to MAP at TA-18. NIOSH documents clearly acknowledge neutron radiation (as an external exposure source) from critical assemblies. The Site Description notes some concerns regarding airborne radioactive releases and elevated air sample results in TA-18, but does not specify what radionuclides were monitored. The Site Profile specifically associates activation products with reactors and accelerators, but not with critical assemblies.

**NIOSH Evaluation Comment:**

Air monitoring results are not typically used for dose reconstruction, other than for environmental internal doses, which are typically based on the maximum values of environmental air concentration measurements.

The lack of assurance of the presence of adequate data to estimate intakes of activation products is one of the bases for the addition of a class of Los Alamos employees to the SEC through 1975. The SEC class was subsequently extended to include claimants with employment through the end of 1995.

**SC&A Conclusion:**

Disposition: Most issues were investigated and incorporated into technical documents.  
Investigation of potential internal exposures to MAP at TA-18 has not been identified.

NIOSH was partially responsive to the substance of the comment and the SC&A Observation.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 52	<b>Source of Comment:</b> OTS-16, 6:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008f) September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>Mr. Lewis asked if any of the attendees could provide any information about the Cerro Grande fire.</i>  <i>[Name redacted] replied that the guards who responded to the fire had no idea what types of materials had been used around many of the old test facilities that were destroyed by the fire. . . [Name redacted] commented that the guards were stationed at roadblocks for 12- and 16-hour days during the fire. [Name redacted] added that the guards were probably exposed to many contaminants since the only PPE they were issued was paper masks. Other LANL personnel were sent home and the city of Los Alamos was evacuated.</i> (pg. 3 of 6)		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  NIOSH response from outreach meeting:  <i>Dr. Macievic stated that specific information about those facilities may help NIOSH find reports during the data capture efforts. The reports may contain information that can help NIOSH estimate the amount of dose the guards may have received during the fire.</i>  <i>Dr Macievic stated that he had seen many quarterly reports in which mention was made that firefighters had been tested after an incident because RCTs had found that radioactive material was involved.</i> (ORAUT 2008f, pg. 3 of 6)  Refer to Comment 46 for NIOSH Response/Consideration of Cerro Grande fire.		
<b>SC&amp;A Observation/Comment:</b>  NIOSH representatives solicited information about the Cerro Grande incident and indicated that some internal monitoring data are available for other fire-related incidents.  As noted for Comment 46, NIOSH has considered potential unmonitored intakes resulting from the Cerro Grande fire. NIOSH concluded that personnel exposures would be minimal and would be bounded by existing dose reconstruction practices for occupational environmental dose.  NIOSH’s analysis indicates that some LANL buildings burned. It does not indicate the proximity of workers and/or AIRNET stations to burned contaminated buildings. It is not clear if the 60-hour exposure period assumed in NIOSH’s analysis bounds the work time spent in multiple 12- to 16-hour work shifts. NIOSH is continuing to investigate this incident as part of its ongoing review of the post-1995 period.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b> Disposition: Issues were investigated and partially incorporated into technical documents. Ongoing investigation.  NIOSH was responsive to the substance of the comment.		

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 53	<b>Source of Comment:</b> OTS-17: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008d) September 17, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b> [Specific incidents:]		
<p>[PHERMEX incident 1995] when 10 firefighters had been sent to the Los Alamos Medical Center after reporting to PHERMEX to put out the small fires that routinely occur after the bursts. The firefighters were told after the fact that they should have been wearing a different type of equipment.</p> <p>[Name redacted] recalled a similar event at PHERMEX 12 years later. A rad tech came to the facility after the testing had started and told the firefighters that they should not be in the area. Another RCT told them that they could go back into the facility, only to be directed again by another RCT to get out of the area. The firefighters ended up donning respirators and other PPE midway through the shift. [Name redacted] stated that the firefighters relied on the RCTs to keep them safe, but had no assurance that the RCTs are always right.</p> <p>Dr. Macievic asked if the firefighters were required to wear PPE when they responded to the calls at PHERMEX. [Name redacted] stated that the RCTs were supposed to tell them whether or not they needed respiratory equipment. He recalled that the firefighters were called to put out fires outside the facility fence after the shots were fired. They had been digging firebreaks for two or three hours when the RCT stopped to tell them that they should not even be standing in the area. After that incident, they were required to wear SCBAs (self-contained breathing apparatus) when they were dispatched to PHERMEX for shot activities. . .</p> <p>. . . [Name redacted] described an incident that happened in approximately 1990 . . . The firefighters were “going through evolutions” on the roof and around the building perimeter at DP Site in TA-21, practicing response procedures. Station 2 was not notified prior to the exercise that there had been a tritium release at the facility. . . [Name redacted] added that the incident happened during an academy class in July or August of 1990. (pp. 2–3 of 14)</p> <p>[Name redacted] stated that he cannot recall if the firefighters who were involved in the 1995 incident at PHERMEX gave urine samples. He speculated that even if the hospital took the samples, they probably were not set up to check for radioactive materials. (pg. 9 of 14)</p> <p>[Name redacted] recalled that in the 1970s and 1980s, firefighters were called to S Site frequently for shot activities. They reported to the site, waited at a safe distance for the shot to be fired, were given a signal when the shot was over, and then went out into the area to extinguish the fires that resulted from the bursts. They were not monitored, even though there were many “hot spots” from the shots. [Name redacted] commented that firefighters are still doing the same activity; he had worked at S Site the previous day (9/16/08).</p> <p>[Name redacted] asked if firefighters stand by at PHERMEX during shots. An unidentified attendee responded that the firefighters have had the same shot activities at PHERMEX and DARHT (Dual Axis Radiographic Hydrodynamics Test). [Name redacted] pointed out that the distance comes into play at those facilities because they may be exposed to X rays if they are too close. [Name redacted] commented that a barrier was raised during the shot so they couldn’t get too close. He referred again to the 1995 incident at PHERMEX. The fire had grown too large for the three initial responders to contain, so additional firefighters were sent to the scene. [Name redacted] stated that he still does not know what</p>		

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*contaminant caused the breathing problem that sent the firefighters to the hospital. He added that firefighters also had shot duty at I and J points (firing sites) in TA-15 near PHERMEX and DARHT up through the 1980s. I and J points were established in the 1940s.* (pp. 5–6 of 14)

*[Name redacted] stated that the Cerro Grande fire consumed parts of TA-8, TA-9, TA-11, TA-16, and TA-22. Firefighters were not monitored during the fire, even though those areas contained legacy waste from nearly 60 years of operations at LANL. He said that the flames turned colors as the different materials burned. . .*

*. . . [Name redacted] recalled that during the Cerro Grande fire, firefighters were given a list of 10 buildings that they were to protect at all cost. Historic buildings in S Site (TA-16) burned during the fire, including Building 1. He added that all of S Site is contaminated . . . [Name redacted] commented that a report on the [Cerro Grande] fire stated that the contamination levels were within acceptable levels, but he questioned the location of the air samplers. He stated that he was aware of the air samplers at Station 4 to the west of the fire, but recalled that the wind was blowing toward the east. Dr. Macievic asked if the firefighters had given bioassay samples after the fire. Several of the attendees responded that they had not.* (pp. 4–5 of 14)

*. . . [Name redacted] stated that firefighters worked 18–20 hours per day during the Cerro Grande fire in 2000. . .*

*[Name redacted] stated that the firefighters' schedule changed to 48 hours on, then 24 hours off because more manpower was needed. He recalled that people were sleeping in their vehicles in the parking lot because the stations were crowded because so many firefighters had been called in to help fight the fire.*

*Attendees described a fire at Ancho Canyon (TA-39) in June 2008. The fire resulted when a fire from an experimental shot could not be contained and spread into a larger wildlands fire. The firefighters and other response personnel were monitored for contamination, but were not informed of any possible contaminants. Dr. Macievic commented that it seemed to be common practice for the Lab not to disclose that information to response personnel.* (pg. 7 of 14)

*[Name redacted] recalled that the 1977 La Mesa fire destroyed parts of K Site and S Site, the facilities where chemical explosives were developed and tested. More than 800 firefighters came from surrounding states to fight the fire. [Name redacted] added that the signs that read "Stay on Paved Roads" don't apply to the firefighters, who must leave the road to contain fires in many of the "hot" areas.* (pg. 5 of 14)

[General concerns regarding rad protection and communications:]

*[Name redacted] . . . stated that the firefighters cannot wear SCBAs when responding to wildland fires such as the Cerro Grand fire because the equipment is too restrictive for the intense working conditions.*

*[Name redacted] stated that some of the attendees had careers spanning more than 20 years. He stated that the safety issues from the past are ongoing because the Lab has not made corrections to the processes. The Lab calls on the Fire Department and they respond to the incidents, often without an RCT present.* (pp. 2–3 of 14)

*[Name redacted] stated that the fire department keeps "run reports" that describe their responses to events in the LANL areas. The fire department often responds to wildland fires in the canyon areas that are littered with things from LANL's past. Firefighters often use "destructive force" to disturb the soil and overturn rocks to contain fires. Since most of those areas have been remediated, LANL may not send out RCTs for surveys during wildlands fires. He asked Dr. Macievic if NIOSH takes into account the contamination in the soil that may become airborne during their activities.* (pp. 3–4 of 14)

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

NIOSH response from outreach meeting (ORAUT 2008d):

*Dr. Macievic stated that he has seen quarterly reports that indicate that such events were common and occurred over a period of time. He asked [Name redacted] if the radiological control technicians (RCTs or rad techs) are always present during the shots at PHERMEX. [Name redacted] responded that RCTs were not present during the early morning hours of the late shift.*

*Dr. Macievic stated that the LANL records are inconsistent. The quarterly reports he has seen indicate that there was a chronic problem occurring over time. The purpose of the meeting is to speak with the firefighters so NIOSH can validate whether flaws in the safety practices were limited to specific incidents or if the problems were a result of the standard safety practices.*

*Dr. Macievic responded that specific information can help NIOSH link the activities to contamination survey reports by the health physics groups. NIOSH will use the airborne contamination data in the survey reports to model the “missed dose” for dose reconstructions of unmonitored workers in those particular areas instead of using generic information.* (pp. 2–3 of 14)

*Dr. Macievic responded that NIOSH can use the data in environmental reports to develop a model that accounts for the resuspension of the residual material in the soil. Survey reports of the area during the operational period may also contain actual data taken by a technician that can be used to develop a usable model for the resuspension of contaminated residue. The models are necessary to help dose reconstructors come up with accurate radiation doses for firefighters and other workers who are not normally considered radiological workers but who come into contact with contaminated materials while carrying out their job duties.* (pp. 3–4 of 14)

*Dr. Macievic concurred [with commenter’s speculation that hospital probably would not check for radioactive materials after PHERMEX incident]. NIOSH can look for the source data from the survey and incident reports for the 1995 incident and use that raw data do determine the firefighters’ internal dose.* (pg. 9 of 14)

[Refer to Comment 46 for NIOSH Consideration/Response regarding the Cerro Grande fire.]

[Refer to Comment 57 for NIOSH Response/Consideration of general concerns regarding radiological exposures and dose reconstruction for support service workers.]

**SC&A Observation/Comment:**

As noted for Comment 46, NIOSH has considered potential unmonitored intakes resulting from the Cerro Grande fire. NIOSH concluded that personnel exposures would be minimal and would be bounded by existing dose reconstruction practices for occupational environmental dose. NIOSH is continuing to investigate this incident as part of its ongoing review of the post-1995 period.

Except for the Cerro Grande fire, SC&A did not identify consideration of the specific incidents or the general radiation protection concerns of firefighters in NIOSH technical documents. Comment 20 indicates that NIOSH uses site-wide maximum values to bound environmental occupational dose for claimants who are not eligible for compensation from the SEC classes.

As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

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**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Special Exposures/Incidents		
<b>Comment Number:</b> 54	<b>Source of Comment:</b> Claimant Provided Exposure Data Claim [redacted], December 28, 2009	<b>Commenter:</b> Claimant
<b>Comment:</b>		
<p>While working in the [redacted] building in LANL, ([redacted]) I received high TLD badge readings in the spring of [redacted] that were above allowable limits. . .</p> <p>While working on a [redacted], I received two batches of material for processing. Little history was provided on the material given other than the exact amount of plutonium it contained. There was an established process for handling the material; maintaining strict controls, criticality limits, moving material through the lines, counting for verification of material content to avoid criticality violations and liquid volume limits.</p> <p>[Claimant describes steps of process, including containment, shielding, and controls, from verification of shipment ID through grinding, dissolution, filtering, and sampling of filtered solution for analysis.]</p> <p>. . . It was found that although the count of plutonium was correct, the two runs I was working on contained 104 g of americium. The established process that was provided for me along with the material was not sufficient for handling the high radiation exposure of 104 g of americium.</p> <p>In my opinion, the processing of 104 g of americium at LANL should have been done using manipulators had it been known that it was part of this material and extra precautions should have taken place. . .</p> <p style="text-align: right;">(pp. 6–7 of 60)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>NIOSH 2012a. <i>SEC Petition Evaluation Report, Petition SEC-00109</i>, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pg. 23 of 98.</p> <p><i>As mentioned in Section 5.2.1.1, Am-241 is a component that is always present in aged weapons-grade plutonium. There is also evidence that operations involving purified Am-241 took place at LANL during the time period under evaluation (post-1975). For example, a 1982 memorandum that discusses the criteria for routine Am-241 urine sampling states: “However, in the plutonium recovery process Am-241 concentrates in the residues (which contain little plutonium) such that the weight percent of Am-241 is much larger than initial values. These high Am-241 content residues may be recycled for more efficient plutonium recovery, further processed to recover the Am-241 specifically, or prepared for recoverable storage. Personnel involved in these operations would be americium workers.” (Criteria, 1982).</i></p> <p>ORAUT 2013a. <i>Los Alamos National Laboratory – Occupational External Dose</i>, ORAUT-TKBS-0010-6, Rev. 03, Oak Ridge Associated Universities Team, March 21, 2013, pg. 39 of 79.</p> <p>Plutonium operations at TA-55 (from Table 6-14):</p> <p><i>Radiochemical operations: Plutonium processed at LANL had largely been separated from fission products. Radiochemical operations were largely for recovery of fissionable material.</i></p> <p><i>Plutonium component production: Pu is machined into components using glovebox assembly process with mostly close anterior exposures. Radiation fields involve significant lower energy photons and neutron radiation.</i></p> <p><i>Plutonium storage: Radiation characteristics in this area generally involve dispersed lower energy neutron radiation and scattered photons, including 60-keV Am-241 gamma ray.</i></p>		

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<p><b>SC&amp;A Observation/Comment:</b></p> <p>Americium is a recognized component of plutonium operations at LANL, considered in NIOSH assessment of internal and external exposures. The commenter describes details of the process and procedural controls; the main concern is that external dose limits were exceeded due to poor communication of the quantity of americium in the samples. These concerns do not appear to interfere with NIOSH dose reconstruction.</p>
<p><b>NIOSH Evaluation Comment:</b></p> <p>NIOSH concurs with the SC&amp;A Observation/Comment.</p>
<p><b>SC&amp;A Conclusion:</b></p> <p>Disposition:      Issues were investigated and incorporated into technical documents.</p> <p>NIOSH was responsive to the substance of the comment.</p>

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 55	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 23, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>I am a former Los Alamos National Laboratory employee. I was hired by the [redacted] in [redacted] and worked at this facility until [redacted]. My job classification was that of a [redacted].</i></p> <p><i>My daily activities consisted of entering into designated “hot areas”, working on [redacted] where chemicals, metals and radioactive sources were present. Because I was [redacted], I was constantly exposed to the airborne contaminants that were released through the ventilation systems, as well as exposure to the contaminated buildings themselves.</i></p> <p><i>[redacted] until the late 1980’s (when the Tiger Team came in to conduct their assessment of the facility) I had no personal protective equipment, training on the hazards that I was routinely exposed to or even knowledge of the potential exposures in these areas. I was routinely exposed to . . . contaminated water, fumes and old materials from when the buildings were first constructed. There was no way possible that I could have known what was processed in these buildings over the course of when LANL first started. There were areas where I had to go into that required that we waterproof the containers (which were almost like big vats) so that whatever was placed in these containers would not leak into the surrounding areas.</i></p> <p><i>In the [redacted] years that I was employed at the LANL, I worked in every single Tech Area, building, storage area and contaminated area throughout the entire LANL property. In the early years, the areas where we worked were not monitored for contamination; therefore we were never advised to use protective clothing. It wasn’t until after the Tiger Team assessment that we started to be monitored in areas where potential exposure was present.</i></p> <p><i>My records will show little to no exposure because I was not monitored for half of my career. (pg. 45 of 50)</i></p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
[Refer to Comment 64 for NIOSH Response/Consideration of exposure potential and dose reconstruction for construction trades workers.]		
<b>SC&amp;A Observation/Comment:</b>		
<p>The commenter describes concerns regarding inadequate knowledge, PPE and monitoring for potential exposures at facilities all over the site. In evaluation reports for SEC-170 and SEC-109, NIOSH determined it was not feasible to definitively place workers in specific work locations, so SEC classes for 1943–1975 and 1976–1995 include all LANL workers.</p> <p>As noted for Comment 64, NIOSH has considered potential unmonitored exposures for support service workers at LANL, although this consideration is not generally communicated in LANL technical documents. OTIB-0052 provides general guidance regarding bounding assumptions for unmonitored construction trades workers at all covered facilities. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.</p>		
<b>NIOSH Evaluation Comment:</b>		
NIOSH concurs with the SC&A Observation/Comment.		

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**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.  
NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 56	<b>Source of Comment:</b> Form OCAS-1, <i>Statement by the Claimant Closing the Record on a NIOSH Dose Reconstruction under the Energy Employees Occupational Illness Compensation Program Act</i> (Claimant [redacted], 2006) December 15, 2006	<b>Commenter:</b> Claimant
<b>Comment:</b> [Draft DR report indicates claimant was an [redacted], was not monitored for external radiation dose at LANL, and was assigned on-site ambient dose that likely overestimates “any incidental external doses” that may have been received. Claimant added the following comments in the margins of the draft DR report.]  <i>External Dose: No mention is made to the period of my employment in [redacted] where I was a [redacted] working with contaminated vehicles and in contaminated dump sites.</i>  <i>Radiation Type: I was monitoring contaminated dump sites and vehicles, I consider that these were not incidental exposures.</i>  <i>Ambient Dosages: Incidental external dosages are mentioned which in my estimation were consistent and constant exposures when monitoring contaminations.</i>  <p style="text-align: right;">(pp. 2–4 of 12)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  NIOSH 2010. <i>SEC Petition Evaluation Report, Petition SEC-00170</i> , Rev. 0, National Institute for Occupational Safety and Health, April 26, 2010, pp. 3–4 of 20.  <i>NIOSH previously determined in its evaluation of petition SEC-00051 that some LANL workers could have received intakes of radioactive materials that went unmonitored during the period from March 15, 1943 through December 31, 1975, and that limitations in the available data did not allow NIOSH to estimate such radiation doses with sufficient accuracy. In 2007, the Department of Health and Human Services (DHHS) designated the following class for inclusion in the SEC:</i>  <i>Employees of the Department of Energy (DOE), its predecessor agencies, or DOE contractors or subcontractors <b>who were monitored or should have been monitored for radiological exposures while working in operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory (LANL)</b> . . .</i>  <i>Through the course of ongoing dose reconstruction and research, NIOSH has determined that, due to undocumented worker movements across the site and limited claimant-specific information pertaining to work locations, it is unable to eliminate any specific worker from potential exposure scenarios based on assigned work location. NIOSH has found that a determination cannot always be made as to whether or not an employee worked in Technical Areas with a history of radioactive material use, or whether an employee should have been monitored for radiological exposures. Accordingly, NIOSH has determined that it is necessary to remove the area-specific and monitoring criteria from the class description and to expand the SEC class definition to include all areas of LANL, and all employees of the DOE, its predecessor agencies, and their contractors and subcontractors who worked at LANL during the specified time period, regardless of monitoring.</i>		

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**SC&A Observation/Comment:**

NIOSH has considered the issue of undocumented worker movements at LANL and has determined it is not feasible to definitively rule out individual workers from potential exposure scenarios on the basis of assigned work location. For this reason, LANL SEC classes for 1943–1975 and for 1976–1995 include all areas and all workers at LANL.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      General issues regarding completeness of personnel monitoring records were investigated and incorporated into technical documents.

NIOSH was responsive to the general substance of the comment. Specific responses to the claimant were not assessed within the scope of this review.

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 57	<b>Source of Comment:</b> <i>Special Exposure Cohort Petition – Form B,</i> with attachments [SEC-109] ([redacted]) Signed March 26, 2008	<b>Commenter:</b> [redacted]
<p><b>Comment:</b></p> <p>42 CFR 82.2 requires:</p> <p style="padding-left: 40px;"><i>If individual monitoring data are not available or adequate, dose reconstructions may use monitoring results for groups of workers with comparable activities and relationships to the radiation environment.</i></p> <p><i>However, the task and assignments for support service workers are not comparable to regular laboratory workers. Support Service workers routinely worked in different locations at LANL sometimes a different TA every day or a series of TAs in a day. Regular laboratory workers were assigned to the same locations year in and year out. The changing assignments had to affect the neutron doses assigned using the older TLDs. And then, the other monitoring data cannot equal the exposures support services workers received. Support Services workers often worked overtime in excess of the standard year. And, the personal protective equipment, if provided, was usually different from regular laboratory workers. All together, there is no other group of LANL workers with comparable activities and relationships to the radiation environment. . .</i></p> <p style="text-align: right;">(pg. 71 of 112)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>ORAUT 2008b. <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL), Meeting with New Mexico Building and Construction Trades Council (BCTC), Española, New Mexico, September 17, 2008 [OTS-18], pg. 3 of 11.</i></p> <p><i>. . . NIOSH has only sparse dosimetry and bioassay data for the class of workers named in the petition – guards, firefighters, construction and trades workers. NIOSH is searching the DOE Records Centers to try to locate records that contain data for the radiation and contamination levels so they can use that, along with what they know about [work activities] in certain areas, to model radiation doses that reflect what those workers would have received for the type of work and the amount of time they spent in those areas. The purpose of the SEC evaluation is to determine whether this information is available so NIOSH can assign radiation doses for the class of workers named in the petition. . .</i></p> <p>NIOSH 2012a. <i>SEC Petition Evaluation Report, Petition SEC-00109, Rev. 1, National Institute for Occupational Safety and Health, August 13, 2012, pp. 11–12 of 98.</i></p> <p><i>Based on its preliminary research, NIOSH accepted the petitioner-proposed class. Therefore, NIOSH defined the following class for further evaluation: Service Support Workers (which includes, but is not limited to, security guards, firefighters, laborers, custodians, carpenters, plumbers, electricians, pipefitters, sheet metal workers, ironworkers, welders, maintenance workers, truck drivers, delivery persons, rad technicians, and area work coordinators) who worked in any operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory from January 1, 1976 through December 31, 2005.</i></p> <p><i>. . . The NIOSH-proposed class to be added to the SEC includes all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Los Alamos National Laboratory in Los Alamos, New Mexico from January 1, 1976 through December 31, 1995 . . .</i></p> <p>ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.</i></p>		

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*The following sections describe several types of employees for which potential unmonitored internal doses must be considered when reconstructing internal doses. In each case, a review must be performed for potential unmonitored internal doses using case information. Programmatic problems identified in the Tiger Team assessment (DOE 1991) indicate that the potential exists for unmonitored intakes. Unmonitored intakes may be estimated using ORAUT-OTIB-0062, Internal Dosimetry Coworker Data for Los Alamos National Laboratory (ORAUT 2009b). However, doses from potential intakes of other radionuclides may only be based on dose monitoring information in claim files. Because of the potential for internal dose that is not reflected in internal dose monitoring information, classes of LANL employees have been added to the SEC that include all workers in the period before January 1, 1996.*

[Groups specifically identified in this section of the TBD are workers before 1949, short-term workers, Zia Company and other contract service workers, RaLa project operations (1944–1963), and responders to the Cerro Grande wildlands fire of 2000.]

(pp. 18–20 of 117)

ORAUT 2011. *Parameters to Consider When Processing Claims for Construction Trade Workers*, ORAUT-OTIB-0052, Rev. 01, Oak Ridge Associated Universities Team, February 17, 2011, pp. 7–8 of 40.

*This document presents information that compares doses received by monitored CTWs to doses received by all other monitored workers. For the purposes of this document CTWs include, but are not limited to, laborers, mechanics, masons, carpenters, electricians, painters, pipefitters, insulators, boilermakers, sheet-metal workers, operating engineers, and iron workers. . .*

*. . . Although there are limitations and conditions on the data sets used in this TIB, it is possible to separate and compare the external and internal doses received by CTWs and AMWs [all monitored workers] at a site. . . . From these comparisons, which are presented for sites that had differing missions, operations, facilities, and radioactive source terms, the relationship between doses received by CTWs and AMWs becomes evident. Specifically, the comparisons demonstrate that, with some important exceptions and conditions, the doses received by the monitored CTWs were typically bounded by the doses received by AMWs on the same site. . .*

[Refer to Comment 14 regarding neutron dose reconstruction.]

**SC&A Observation/Comment:**

SC&A has observed in several comments that NIOSH’s consideration of potential unmonitored exposures for support service workers, while expressed in outreach and Work Group meetings, is not communicated directly in the ER or TBDs. NIOSH’s recommendation of an SEC class for 1976–1995 is based on limited bioassay and effluent monitoring for some exotic radionuclides, combined with the inability to rule out potential exposure for individual claimants. These concerns are not limited to support service workers but apply to all LANL workers, which may help explain why support service groups are not specifically called out in the site profile documents.

The new Internal Dose TBD lists several groups of workers whose claims should be closely reviewed for indicators of potential unmonitored exposure. Except for early workers (up to 1949) and responders to the Cerro Grande fire, the group descriptions appear to emphasize work in operational areas, such as short-term operations workers, RaLa operations, RCTs, and contract service workers (the description emphasizes maintenance activities). NIOSH is currently investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

Of the groups of support service workers identified by the petitioner, construction trades workers are the only group with a specific OTIB regarding dose reconstruction. In ORAUT-OTIB-0052, NIOSH acknowledges that

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monitoring and records may be inadequate for CTWs, but the agency determined that CTWs' internal and external exposures can be bounded using AMW data (with correction factors in some cases). Although it is not directly stated in the ER or TBDs, it appears that these considerations for CTWs may be similarly applicable to other groups of support service workers on a case-by-case basis.

As noted for Comment 14, NIOSH uses neutron correction factors (based on workplace neutron energy measurements), to adjust the dose of record from Model 7776 dosimeters. NIOSH uses the maximum NCF from facilities the worker may have entered to bound the neutron doses for an individual claimant.

**NIOSH Evaluation Comment:**

NIOSH has recognized that personnel exposure data may be incomplete prior to 1996 and that unmonitored workers may have received significant internal dose. Partially due to this situation, an SEC class has been designated for all workers at LANL through 1995. NIOSH is continuing to work with LANL to ensure that complete internal dosimetry records are provided for claimants, particularly for the post-1995 period. NIOSH is also working with LANL to evaluate how to determine internal doses to unmonitored workers during the post-1995 period. These efforts are ongoing.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 58	<b>Source of Comment:</b> OTS-16, 9:00 a.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008c)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>When the S Site was active in the 1980s, guards routinely checked roped-off bunker areas used for hazardous chemical storage. Another guard added that depleted uranium (DU) was used in destructive testing in D-33, D-36, and D-39. [Name redacted] said that her father had worked at S Site in the early 1960s when there was a fatal explosion in Building 260 that had contaminated the area. [Name redacted] stated that guards were cautioned to stay on established roads. (Some discussion followed about locating retired guards who might recall policy prior in the mid-1970s to determine whether they were required to patrol off-road in contaminated areas.)</i></p> <p><i>[Name redacted] asked the union members if they had worked in all of the Technical Areas before PTLA (Protection Technology Los Alamos) introduced the “zone concept,” and how often they worked in the areas. They replied that prior to the zoning in 1993, in a one month period their patrols could take them through the entire Lab. They were assigned to 8- to 10-person work groups and rotated through the zones on a quarterly basis until they had worked through all the zones over the course of a year. They all worked a great deal of overtime and their overtime assignments did not generally keep them in the same areas where they worked during their regular shifts. [Name redacted] stated that they often worked as many as 16 hours every other day because there were fewer guards and the turnover was high during that period.</i> (pg. 3 of 11)</p> <p><i>[Name redacted] stated that when he sat in the Assessment Room where the guards watched the monitors around the perimeter of Kiva 3 where the Godiva testing was done, the blasts from the experiments were so severe that they caused some of the monitoring equipment to shut off or become distorted. He was concerned that the security guards who were stationed about 100 yards from the outside of the kiva were exposed to contamination that resulted from those blasts. The kiva was shielded internally but the guards were not issued PPE. The road to the area was closed off to traffic during the experiments. The guards stationed at the perimeter of the area during the testing were shielded only by their vehicles (one by the road, one on the hilltop, one by Kiva 2, and one by Building 211). [Name redacted] said that all of the monitors inside the guards’ station would go off at the burst. When [name redacted] asked if the area was monitored during the experiments, [name redacted] replied that area dosimeters were posted approximately every 50 feet on the fences along the road and at the kiva. He did not recall whether there were air monitors in the area. Testing in four reactors in TA-18 was ongoing through approximately 2004, when the equipment and material were moved out of the area. Some of the equipment was sent to the Nevada Test Site and the material was sent to TA-55.</i></p> <p><i>Mr. Lewis asked what type of shielding was used at the kivas. [Name redacted] recalled that lead bricks were used for shielding in the earlier years. He said that the primary duties of the guard force now are perimeter patrol and traffic control.</i> (pp. 4–5 of 11)</p> <p><i>[Name redacted] asked the attendees to describe working conditions in the reactor area in the canyons prior to the reactors being shut down. [Name redacted] replied that one of the guard posts at TA-2 was about 30 yards from the reactor. The reactor did not run all the time, but when it was up, a mist of water droplets would fall on their heads and other exposed skin. He recalled breathing in the mist as well. When Mr. Lewis asked about the timeframe, [Name redacted] replied that he had started in 1986 and the reactor was used periodically through 1992.</i></p> <p><i>[Name redacted] recalled that when he began working in 1982, the guard post at TA-2 was an 11-hour patrol and the reactor was always running. [Name redacted] said that it was an access control post and the patrolling was generally during non-work hours.</i> (pg. 6 of 11)</p>		

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*[Name redacted] asked the attendees if they had ever worked at the Beam Line, at the LANSCE (Los Alamos Neutron Science Center), or at the Lagoon. [Name redacted] stated that security guards only accessed the administrative area in Building 6 at LANSCE. [Name redacted] added that security guards are posted outside the doors during occasional experiments at LANSCE and the area is roped off. . . [Name redacted] stated that the LANSCE facility still houses some isotope testing activity, but has more recently been used for weapons physics.*

*Ms. Valerio asked whether the RaLa (radioactive lanthanum) testing areas were still in operation at the Bayo Canyon site (in TA-10). [Name redacted] replied that the Lab has been cleaning up that area recently and disposing of the waste at TA-54. He added that an area in TA-35 that was used for RaLa testing in the 1950s and 1960s is still there. . . [Name redacted] stated that the LAMPRE (Los Alamos Molten Plutonium Reactor Experiment) ended in the 1960s and the equipment was removed from the building (either Building 2 or Building 27). The area is now marked as a material disposal area (MDA). . .*

*[Name redacted] stated that the CMR facility at TA-3 has been downgraded and access is restricted. Guards responding to an alarm are required to don booties and smocks and must monitor themselves. If the alarm goes off because they become contaminated, they must call an RCT to be checked. They are subject to disciplinary action if they do not follow procedure. A new CMR facility is being built at TA-55.*

*[Name redacted] stated that Buildings 410 and 411 at S Site in TA-16 were fenced in because they were highly contaminated areas. In the 1980s, extra security guards were stationed there because the doors had to be checked every half hour. [Name redacted] said that the building had been the assembly/disassembly area.*

*Several guards recalled having to patrol the exterior of Building 30 at K Site in TA-11 every four hours. The site is posted for depleted uranium shrapnel and guards must stay in designated patrol areas so they will not become contaminated. Mr. Lewis asked if the Cerro Grande fire had affected the area. Several attendees responded that it had, but they did not answer when Mr. Lewis asked if anyone left the roadway to fight the fire. . .*

*[Name redacted] asked if any of the attendees had ever patrolled at PHERMEX (Pulsed High-Energy Radiographic Machine Emitting X-Rays) or DARHT (Dual Axis Radiographic Hydrodynamics Test) facilities. [Name redacted] responded that the patrols around DARHT involved a lot of walking because the guards have check the facility on the hour, around the clock. [Name redacted] asked if there was extra security during the shots. [Name redacted] said that the area around the facility is shut down. [Name redacted] added that shots at TA-39 are a daily event and evacuation alarms are common. [Name redacted] stated that TA-36 is patrolled daily, but he was not certain whether daily shots are done there.*

*[Name redacted] asked those present to describe their duties at TA-8. [Name redacted] stated that they are inside the building during E shift while the radiography shots are being done. In the course of the discussion, it was established that there are approximately three security guards and five radiographers inside the building during the shots, as well as five guards on patrol about 50 yards from the outside the building. The guard closest to the outside of the building might be asked to move farther away during the shot. The inside guards are stationed inside the door to the building and the material is in the next room. The guards use a V-100 armored personnel carrier to transport the material and escort it into the building. They are always told that it is “safe.” All personnel, including the guards, are given an additional dosimeter to measure neutron radiation but they are never given information about the dosimeter readings. [Name redacted] explained that the security guards at TA-8 rotate inside and outside positions for this patrol. Ms. Valerio asked him if the guards are issued the same PPE as well. He responded that the guard going inside the control room may have worn a smock but the technicians did not always wear PPE either. A metal door separated the shooting room and the inside guards.*

*[Guards] are not sent to TA-50 for regular building checks, but occasionally are sent out for visual checks. [Name redacted] asked if there is a badge reader on the gate to restrict access to TA-50 and was told that the area is open.*

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**NIOSH Response/Consideration of Comment:**

[Refer to Comment 27 for NIOSH Response/Consideration of guards' potential exposure from high-energy x-ray facilities and critical assemblies.]

[Refer to Comment 64 for additional NIOSH Response/Consideration of support service workers routine activities and associated potential for exposure.]

ABRWH 2011. *Work Group on Los Alamos National Laboratory*, Cincinnati Airport Marriott Hotel, Hebron, Kentucky, May 2, 2011.

*[MR. EVASKOVICH: I think just [the badge reader issue is about] determining access to -- or as a means of placing people in the areas.]*

*DR. MACIEVIC: Oh, yes, again, that would not be -- like we were talking about with the guards and firemen and people going in and out of areas to try to place people over a 20 to 30 year period, say where they were at different times . . .* (pg. 272 of 332)

*DR. NETON: See, we have abandoned that. Remember that the original SEC that we had it was based on the -- that we thought we knew where people worked in different areas, and it became very clear to us that we couldn't partition that in any reasonable way, so we made that all workers at Los Alamos for the early class because of that. And so I don't think there's any way that we are going to be able to segregate workers at different areas of the site. . .* (pg. 274 of 332)

*[CHAIRMAN GRIFFON: Well this could be quickly answered if we could just say NIOSH is not going to apply a policy of using the badge access . . . -- for dose reconstruction determination.]*

*DR. MACIEVIC: No, we won't use badge access . . .* (pp. 276–277 of 332)

**SC&A Observation/Comment:**

There are several technical areas and locations discussed in this comment, but they all pertain to patrolling assignments of the guards at LANL. Were the guards asked to patrol contaminated areas? Did they receive potentially unmonitored external exposures while stationed in or near neutron and high-energy x-ray facilities? NIOSH's technical documents do not respond to these issues specifically for the guards and other support service workers, but issues are broadly addressed in TBDs and SEC evaluation reports for all LANL workers.

In the Work Group meeting of May 2011, and in ERs for SEC-170 and SEC-109, NIOSH determined they could not definitively place workers in work locations. SEC classes for 1943–1975 and for 1976–1995 include all LANL workers.

As noted for Comment 64, NIOSH has considered exposure potentials and sparse internal monitoring data for support service workers at LANL. Exposure conditions for support service workers were discussed during the LANL Work Group's review of the SEC-109 ER. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

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**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 59	<b>Source of Comment:</b> OTS-16, 1:00 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008e)</i> September 16, 2008	<b>Commenter:</b> Not identified
<b>Comment:</b>  <i>[Name redacted] stated that he was one of the LANL guards who were sent to the Nevada Test Site (NTS) for two work rotations. They were not issued NTS dosimetry badges during either of two month-and-a-half rotations. They were assigned to patrol duties inside the Device Assembly Facility (DAF) and other areas outside the DAF. They were not briefed regarding the work being performed or if they were assigned to “hot” areas.</i> <span style="float: right;">(pg. 6 of 9)</span>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  NIOSH response from the outreach meeting (ORAUT 2008e, pg. 6 of 9):  <i>Dr. Macievic added that there have been many cases where the employee may be eligible as a member of SEC classes at two or more facilities – the 250-day employment requirement can be satisfied from time served at multiple SEC sites. Dr. Macievic suggested again that they should consult Ms. Breyer.</i>		
<b>SC&amp;A Observation/Comment:</b>  SC&A did not locate discussion of work assignments at NTS or other DOE sites in LANL technical documents, although it is understood that dose records would be maintained at those sites and be accessed as part of the dose reconstruction process. As noted for Comment 44, the Site Description TBD indicates LANL was intermittently involved in nuclear weapons testing.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Issues regarding individual dose reconstruction and/or adequacy of NTS monitoring practices are not applicable to NIOSH technical documents for LANL.  Disposition: Not investigated for LANL TBDs or SEC evaluations  NIOSH response is appropriate for the substance of the issue.		

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 60	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008a)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>Dr. Macievic stated that NIOSH is particularly interested in learning when activities or incidents occurred so they can search the records from LANL’s dosimetry group to find out when they actually started monitoring for that information. He [Dr. Macievic] asked if the guards are aware of the materials and processes in an area before they go into the area for an assignment or in response to an incident – do they have knowledge beforehand that plutonium is in the building or if there is an accelerator or a reactor at the location? [Name redacted] explained that when he started working for Mason-Hanger in the early 1980s, they were informed only if they had a “need to know.” They were given orders to respond and did what had to be done. If that resulted in a contamination incident, the company dealt with it.</i></p> <p><i>Dr. Macievic stated that NIOSH is interested in learning more about the exotic radionuclides and where those were located so they can understand how much exposure a worker may have had to those materials over a period of time. [Name redacted] responded that guards were not given that information [about exotic radionuclides] with their orders. . .</i></p> <p><i>. . . Dr. Macievic asked when the health physics organizations consolidated into one group. He also asked if there had been differences between the health physics operations in the different areas before that time. Were some groups more responsive than others? [Name redacted] responded that before the groups consolidated around 1998, the RCT came to tell the guards what they needed to know and the guards passed the information along to their supervisor to handle. . . [Name redacted] commented that this had been one of the findings in the Tiger Team report: The groups had control over what was or was not reported.</i></p> <p style="text-align: right;">(pp. 3–4 of 11)</p> <p><i>Dr. Macievic stated that the site profile describes the radioactive materials that are in the various buildings and technical areas. He asked whether those materials are confined to specific areas or if the materials are moved between the different technical areas from time to time. [Name redacted] stated that storage of specific materials is usually confined to specific areas. He recalled that waste material from the plutonium facility had been removed from Building 155 at the TA-55 waste facility because it had not been stored properly. [Name redacted] stated that there had been no shielding in Building 164 in TA-3 (next to Building 202 in the CMR). [Name redacted] remarked that the guards do not always know what is stored in their patrol areas; for example, he is aware that there are cobalt sources in TA-3 but not specifically where they are stored. He stated that barrels of material were moved out of CMR before the Tiger Team investigation. He added that there are “all kinds of actinides” in CMR. Dr. Macievic commented that NIOSH is aware that many of the exotic radionuclides are used in CMR, but it is difficult to find out the quantities because much of the work is classified.</i></p> <p><i>[Name redacted] stated that the guards receive and scan the shipments of materials from other DOE sites at TA-55. The monitors go off all the time.</i></p> <p style="text-align: right;">(pg. 6 of 11)</p> <p><i>Mr. Lewis asked if the attendees could recall if there were smelters for melting down scrap metals. [Name redacted] stated that there are furnaces in PF4 and at DP site, but there are none in the open. [Name redacted] stated that there are furnaces in Building 102 near the breakroom in the back of the building. [Name redacted] stated that the guards had to check the bunker doors hourly in Building 42 at TA-9 when the ovens were operating. [Name redacted] added that the check was to make sure the bunker doors were locked. He could hear the alarms going off as he patrolled the building. [Name redacted] recalled that there was an explosion in one of the</i></p>		

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*laboratories in the main building at TA-9 about two years ago, but he did not think that radiological materials were involved. He added that the guards often do not know what radiological sources are present. . .*

*[Name redacted] stated that there are signs posted at the 280 Series Bunkers warning that there are radiological materials in the area and that safety glasses are required, but the type of material and the counts are not indicated. He stated that in certain areas at TA-55, the counts are indicated on signs posted near the laboratories or where there is drum storage in the basement. [Name redacted] stated that a sign on the door to the X ray machine warns of “Grave Bodily Danger.”*

*[Name redacted] stated that he had found an orange lock on the door to Building 304, or possibly 302, in TA-16 after patrolling that area routinely. He asked why the door was locked suddenly and was told that he should look into it. After several days, he was able to locate someone with an explanation. The door had been locked to keep craftsmen out of the basement where there was a 6 MeV Betatron X ray unit. There were no safety signs or other indicators that showed when the Betatron was operating. Since the lockout-tagout locks were supposed to be red, not orange, he submitted a safety concern that resulted in warning devices being installed on the front of the building to keep the guards from patrolling there when the Betatron is in use. (This occurred in 2007.)*

*Dr. Macievic asked when LANL started posting safety warnings denoting the radiation levels in the areas. [Name redacted] responded that the postings did not begin until after the Lab started Rad 2 training. [Name redacted] stated that the guards started Rad 2 training in 1993. [Name redacted] added that the lack of safety postings had been an issue in the Tiger Team report. Prior to the Tiger Team investigation, the guards had been trained only for Rad 1.*

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*[Name redacted] stated that the guards patrolled Building 27 in TA-35, where many research projects took place. The guards patrolled the basement of that building, where a great variety of research materials were stored. He recalled that the basement had been flooded once during the 1990s.*

*[Name redacted] described a contamination event that happened when a tool contaminated with americium inside a glovebox was removed and used to package materials that were being shipped outside of LANL.*

(pg. 9 of 11)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from outreach meeting (ORAUT 2008a):

*Dr. Macievic confirmed that when Radiation Work Permits (RWPs) were set up, the guards were not involved in the permit and were excluded from the time limits.*

*Dr. Macievic stated that the actual field survey data from the groups from various periods are important because the quarterly reports that NIOSH has located are not necessarily a reflection of field activity. Quarterly reports contain only a summary of events that may have carried more weight with one group than another.*

(pp. 3–4 of 11)

*Dr. Macievic explained that information about sources in specific areas or facilities may be easier to locate if NIOSH has an idea of the guards’ activities in those areas during specific time periods.*

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[Refer to Comment 57 for general NIOSH Response/Consideration regarding exposures and dose reconstruction of support service workers.]

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**SC&A Observation/Comment:**

NIOSH solicited information from the participants on a number of topics—actively seeking information from the workers that would help identify records regarding source terms, facilities, work activities, and monitoring records relevant to dose reconstruction and the SEC petition evaluation for support service workers. Their comments reflect awareness of historical concerns regarding hazard communication and radiation controls affecting the guards. Much of this information is at a level of detail that would not necessarily be included in Site Profile TBDs.

As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

SC&A did not identify discussion of a betatron at TA-16 in the documents reviewed.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment. The Site Profile (ORAUT-TKBS-0010-2, Rev. 00) does not specifically identify a betatron at TA-16; however, “X-rays” is a listed “Radiation source” at TA-16. X-rays would be the radiological hazard associated with a 6 MeV betatron, and resulting personnel doses would be measured with the standard external dosimetry.

**SC&A Conclusion:**

Disposition:      General issues were investigated and addressed in technical documents

NIOSH was responsive to the substance of the issues and the SC&A Observation/Comment.

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<b>Comment Number:</b> 61	<b>Source of Comment:</b> OTS-16, 6:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008f)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<p><b>Comment:</b></p> <p><i>[Name redacted] stated that he has worked all over the Lab in the 26 years he has worked there. Dr. Macievic asked him if the areas were posted as contamination or radiation areas at the beginning of his employment in the early 1980s. [Name redacted] confirmed that the areas were always posted, but the guards were not informed of the extent of the contamination or radiation.</i></p> <p><i>[Name redacted] stated that the guards did not have Rad 2 training until 1993. Other attendees who worked in the early 1980s added that they were not educated about the contamination and radiation hazards when they started working at LANL.</i></p> <p><i>[Name redacted] asked the attendees if they had worked during any of the experiments at TA-41. [Name redacted] responded that the experiments were classified, so the guards were not given any information. They were instructed to control the area and given a list of personnel who were authorized to enter the area.</i></p> <p style="text-align: right;">(pg. 2 of 6)</p>		
<p><b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b></p> <p>[Refer to Comment 57 for NIOSH Response/Consideration of exposure potential and dose reconstruction for support service workers.]</p>		
<p><b>SC&amp;A Observation/Comment:</b></p> <p>The commenter describes concerns regarding inadequate knowledge of potential radiological exposures at facilities all over the site. The specific issues reflected in these statements primarily address the guards' lack of information and training regarding radiological hazards they encountered. These concerns would not directly impact NIOSH's ability to reconstruct dose, since NIOSH can access information that may not have been communicated to the workers.</p> <p>As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH's recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.</p>		
<p><b>NIOSH Evaluation Comment:</b></p> <p>NIOSH concurs with the SC&amp;A Observation/Comment.</p>		
<p><b>SC&amp;A Conclusion:</b></p> <p>Disposition:      General issues were investigated. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation.</p> <p>NIOSH was responsive to the substance of the comments.</p>		

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 62	<b>Source of Comment:</b> OTS-17: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008d) September 17, 2008	<b>Commenter:</b> Not identified
<p><b>Comment:</b></p> <p><i>A discussion ensued regarding the work schedules of firefighters. . . The current work schedule at the LAFD is 48 hours on duty followed by 96 hours off, or 240 hours per month. [Name redacted] stated that firefighters worked 144 hours per two-week pay period (24 hours on, 24 hours off) when they worked for DOE in the 1970s and 1980s. When Los Alamos County took over in September 1989, the schedule changed to 112 hours per pay period.</i> (pg. 7 of 14)</p> <p><i>[Name redacted] recalled several day-to-day activities during his career:</i></p> <ul style="list-style-type: none"> <li>• <i>While the fire department was still under the jurisdiction of DOE, the firefighters regularly assessed the fire safety conditions in the buildings. For example, the firefighters went inside the beam area in the meson facility (LAMPF) daily to inspect and to familiarize themselves with the buildings.</i></li> <li>• <i>When he was with Pro Force, four to six guards were assigned to Building 1 in TA-21 (DP Site). The lead shielding was a half-inch thick. The building has been decommissioned and removed from the LANL property. Security officers were stationed outside the building while it was being demolished.</i></li> <li>• <i>As a security guard, he regularly patrolled around the SM-102 machine shop. The only barrier to keep people from entering the area was a ribbon stating “Do Not Cross.”</i></li> </ul> <p><i>[Name redacted] stated that firefighters still go into buildings for pre-fire plans and to inspect the buildings monthly to check for updates. He recalled that he had to leave his pants when an alarm went off after a tour of the CMR (Chemistry and Metallurgical Research) facility. He was dressed out in a smock and booties for the tour. He was advised of the chemical hazards in the building but not the radiological hazards. [Name redacted] commented that when he was with Pro Force, he had the same assignment. The smocks and booties had to be worn in some areas and removed in others.</i></p> <p><i>[Name redacted] stated that these daily activities are not recorded in their logbooks because they are daily activities. The firefighters at the stations serving the Laboratory routinely visit every building on site to update pre-fire plans. The assignments vary by station: Station 5 by S Site serves TA-8, TA-9, TA-11, and TA-16; Station 1 responds to CMR, TA-3, TA-55, and Pajarito Canyon; and Station 6 serves TA-21 and part of TA-3. [Name redacted] recalled building inspections during his career as well.</i></p> <p><i>[Name redacted] recalled that when he worked as a security guard with Pro Force, two security guards patrolled TA-18. During the Mason-Hanger era, 10 armed guards patrolled the area with heavy armored vehicles. There had been an incident in Building 2 when two sources had been stored too close together. The security guards also patrolled inside the building, which was highly contaminated. The building was eventually taken down and removed from the LANL site.</i></p> <p><i>. . . all of the fire stations have areas that they inspect; for example Station 3 inspects TA-18, TA-33, TA-39, and TA-53. However, all stations are responsible to respond during incidents.</i> (pp. 10–11 of 14)</p>		

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**NIOSH Response/Consideration of Comment:**

Response from the outreach meeting (ORAUT 2008d):

*Dr. Macievic commented that work hours are a factor for response personnel whose schedules change according to demand instead of 8-hour shifts.*

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*Dr. Macievic indicated that it is also important to know about the firefighters' daily activities in particular facilities. The routine activities in radiation facilities over a period of time give the workers a chronic low dose, which also figures into dose reconstructions. Changes in the daily practices are also important, such as the safe boundaries being moved after a period of several years because the RCTs determined that the "safe" area was farther away from the building.*

(pg. 10 of 14)

[Refer to Comment 64 for additional NIOSH Response/Consideration of support service workers' routine activities and associated potential for exposure.]

**SC&A Observation/Comment:**

This comment describes several technical areas and locations, but the primary issues are the extended work hours of firefighters and the radiological exposure potentials to firefighters and security guards.

As noted for Comment 64, NIOSH has considered exposure potentials and sparse internal monitoring data for support service workers at LANL. Exposure conditions for support service workers were discussed during the LANL Work Group's review of the SEC-109 ER. NIOSH's technical documents do not respond to these issues specifically for the firefighters, guards and other support service workers, but issues are broadly addressed in TBDs and SEC evaluation reports for all LANL workers. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      General issues were investigated. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation.

NIOSH was responsive to the substance of the comments.

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<b>Comment Number:</b> 63	<b>Source of Comment:</b> OTS-17: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008d) September 17, 2008	<b>Commenter:</b> Not identified

**Comment:**

*[Name redacted] responded that when the subject of legacy waste is brought up in the claims process, they are asked to list the areas where they have worked at LANL. Due to the nature of their work, the list is all inclusive. (pg. 5 of 14)*

*[Name redacted] commented that it is difficult for response personnel to identify the radiation sources in the technical areas because they rarely know what materials are present. Dr. Macievic responded that it is NIOSH's responsibility to find survey data that can establish the materials that were associated with the buildings and technical areas over time. As part of the petition evaluation, NIOSH reaches out to workers for information that may help in locating the survey data.*

*[Name redacted] stated that LAFD kept a logbook describing the daily activities, including, for example, the date, the time, the facility, the time a shot was fired, and the time the all clear was given so they could put out the fire. [Name redacted] noted that Los Alamos County took over the fire department in 1989, so any records prior to that would belong to DOE. [Name redacted] asked [Name redacted] and [Name redacted] how incidents were documented prior to the late 1990s when LAFD began using the Firehouse Reporting System (FRS) computer program that is maintained by the State of New Mexico. [Name redacted] responded that the incidents were noted in the logbook and written up in narrative reports in a computer file kept by the captain. [Name redacted] stated that the FRS can be queried for reports going back to the time the system was implemented, but hard copies of reports prior to that may be kept in records archives at Station 4. [Name redacted] commented that the reports were handwritten when he began working in the 1970s. [Name redacted] added that most of the reports will not include information about the materials involved because the industrial hygienist does not usually tell them.*

*[Name redacted] explained that Station 5 has daily shot activity from 2:00 to 3:00 p.m. [Name redacted] stated that the shots are classified experiments, so the computer log does not contain much information other than dates, times, locations, and activity. (pg. 6 of 14)*

*[Name redacted] commented that it is difficult for workers to prove their exposure to the legacy waste materials from 60 years of operations at LANL. [Name redacted] explained that addressing the legacy waste issue is the purpose of petition.*

*[Name redacted] stated that in the past, LANL had hired retirees as consultants to identify legacy waste areas from the early years of operations. He commented that those consultants may not have done a thorough job of identifying all of the areas. (pp. 9–10 of 14)*

*[Name redacted] thanked [Name redacted] for filing the petition, stating that he does not feel that the Lab disseminates information correctly to the firefighters. (pg. 11 of 14)*

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from outreach meeting (ORAUT 2008d):

*Dr. Macievic noted that a number of Quarterly Reports are missing, presumably because they contain classified information. NIOSH has security-cleared personnel who can review the classified documents, but written descriptions of activities must be generic to exclude the classified information. Mr. Lewis added that a secure interview can be arranged if a worker has classified information for NIOSH.*

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*[Name redacted] asked if NIOSH has access to LANL Industrial Hygiene reports. Dr. Macievic responded that NIOSH is searching LANL records and DOE Federal Records Centers for monitoring records and radiation survey reports as part of the petition evaluation process. He explained that such searches can often turn up large amounts of data that can help NIOSH associate real dose values with specific activities at a site. Dr. Macievic assured the attendees that NIOSH accounts for human error by looking for trends in the survey methods and creating a bounding dose that can be assigned for unmonitored workers who received an indirect ambient dose. (pp. 6–7 of 14)*

*Dr. Macievic agreed that it is difficult to compensate a claim in which the worker doesn't know what materials he was exposed to in the workplace. But the SEC petition gives NIOSH reasons to evaluate whether sufficient data can be found to do dose reconstructions accurately for the class named in the petition. If NIOSH cannot find sufficient data to show what materials were present and in what quantities over time, then the class may be added to the SEC. However, if NIOSH does find sufficient amounts of new information for accurate dose constructions, then previously denied cases will be reviewed and recalculated using the new data.*

*Dr. Macievic responded that NIOSH is going back to see what information can be found in the original records because a consultant after the fact may not have all the information necessary to identify all of the legacy sites. The SEC class for all workers from 1943 to 1975 was added because there were too many gaps in the data for many of the exotic radioactive materials that were used in the wide variety of experiments at LANL over a long period of time. (pp. 9–10 of 14)*

*Dr. Macievic explained that NIOSH is considering whether radiation doses can be determined sufficiently and accurately for the period between 1976 and 2005 – not only for the firefighters and guards, but also for all workers at LANL. He explained how the radiation doses for monitored workers in heavily contaminated areas can be used to assign a dose to unmonitored workers for the time they spent in those areas.*

*[Name redacted] commented that there are many factors that complicate the doses that firefighters receive on their jobs. Dr. Macievic responded that the topic will be discussed at the Advisory Board meeting when he presents the LANL Petition Evaluation Report. For example, if the report says that the dose is based on 15% of the dose for monitored workers, the Board will want to know how he arrived at that figure. He explained that the more data NIOSH can find, the better the picture will be for the whole group. The unmonitored worker would not get more dose than a worker who was exposed to the source every day. The difficult part of the calculation will be in determining how much dose to assign for the resuspension of the legacy waste. The final recommendation for exactly who will be included in the class, and for what period, is a complicated process requiring careful consideration by all who are involved. (pg. 11 of 14)*

[Refer to Comment 22 for NIOSH Response/Consideration of resuspended legacy contamination.]

[Refer to Comment 57 for general NIOSH Response/Consideration regarding exposures and dose reconstruction of support service workers.]

**SC&A Observation/Comment:**

NIOSH solicited information from the participants on a number of topics—actively seeking information from the workers that would help identify records regarding source terms, facilities, work activities, and monitoring records relevant to dose reconstruction and the SEC petition evaluation for support service workers. NIOSH's responses reflect awareness of historical concerns regarding hazard communication and radiation controls affecting the firefighters. The participants also described records of incident response maintained by the firefighters. Much of this information is at a level of detail that would not necessarily be included in Site Profile TBDs. NIOSH responses during the outreach meeting reflect consideration of worker concerns and provide information to participants regarding the SEC evaluation and Advisory Board review processes. Assignment of dose from

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resuspended legacy waste is mentioned as a key issue of interest to firefighters. This has been addressed in the Environmental Dose TBD (Comment 22) and the Internal Dose TBD (primarily in regard to the Cerro Grande fire – Comment 46).

As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:     Issues were investigated and partially incorporated in technical documents.  
                          Ongoing investigation.

NIOSH was responsive to the substance of the comments.

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<b>Category:</b> Unknown/Undocumented Exposure		
<b>Comment Number:</b> 64	<b>Source of Comment:</b> OTS-18: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008b) September 17, 2008	<b>Commenter:</b> Not identified [Building Trades]
<b>Comment:</b>		
<p><i>[Name redacted] asked why NIOSH did not start with the “hottest” site, TA-53. [Name redacted] added that the Old DP Site, TA-55, TA-50, TA-53, the Beam Line, and CMR were all high radiation areas.</i></p> <p><i>Dr. Macievic asked the attendees if they worked all over LANL or if their work was concentrated on particular facilities or technical areas. The consensus answer was that construction trades workers went everywhere.</i> (pp. 3–4 of 11)</p> <p><i>They worked all over the site during their careers. Most of the pipefitters had worked at TA-55 and the old DP site.</i> (pg. 6 of 11)</p> <p><i>[Name redacted] commented that workers often got a “double whammy” when the chemicals contained radioactive waste. He noted that Area L in TA-54 (the “hot” dump) was where the “pigs,” or plutonium isolation ground storage tanks, contained the high-level radioactive waste. He added that the LANL site profile refers to these “pigs” as shafts but does not give any further information on them. Dr. Macievic asked if [name redacted] worked around the “pigs” as a routine activity. [Name redacted] responded that he had helped take the covers off the tanks when trucks delivered canisters containing high-level waste.</i> (pg. 9 of 11)</p>		
<b>NIOSH Response/Consideration of Comment:</b>		
<p>[Response from outreach meeting (ORAUT 2008b):]</p> <p><i>Dr. Macievic stated that when a worker’s dose information is lacking, he is put into a general job category, such as a laborer or a chemical operator. Like the guards and firefighters, construction and trades workers at LANL work around equipment and piping that has carried a wide variety of radioactive materials and that varies from facility to facility. . .</i></p> <p><i>. . . NIOSH has only sparse dosimetry and bioassay data for the class of workers named in the petition – guards, firefighters, construction and trades workers. NIOSH is searching the DOE Records Centers to try to locate records that contain data for the radiation and contamination levels so they can use that, along with what they know about what trades workers did in certain areas, to model radiation doses that reflect what those workers would have received for the type of work and the amount of time they spent in those areas. The purpose of the SEC evaluation is to determine whether this information is available so NIOSH can assign radiation doses for the class of workers named in the petition. . .</i></p> <p><i>. . . If NIOSH cannot find the information to calculate the “missed dose” for the whole group of unmonitored workers, then the class may be added to the SEC. Mr. Cameron added that Dr. Macievic’s job is to figure out if NIOSH can assign the dose. If not, then the class may become part of the SEC. If the “missed dose” can be determined, the additional information will be used in dose reconstructions.</i> (pp. 2–4 of 11)</p> <p>ORAUT 2011. <i>Parameters to Consider When Processing Claims for Construction Trade Workers</i>, ORAUT-OTIB-0052, Rev. 01, Oak Ridge Associated Universities Team, February 17, 2011, pp. 7–8 of 40.</p> <p><i>This document presents information that compares doses received by monitored CTWs to doses received by all other monitored workers. For the purposes of this document CTWs include, but are not limited to, laborers, mechanics, masons, carpenters, electricians, painters, pipefitters, insulators, boilermakers, sheet-metal workers, operating engineers, and iron workers. . .</i></p>		

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... Although there are limitations and conditions on the data sets used in this TIB, it is possible to separate and compare the external and internal doses received by CTWs and AMWs [all monitored workers] at a site. . . From these comparisons, which are presented for sites that had differing missions, operations, facilities, and radioactive source terms, the relationship between doses received by CTWs and AMWs becomes evident. Specifically, the comparisons demonstrate that, with some important exceptions and conditions, the doses received by the monitored CTWs were typically bounded by the doses received by AMWs on the same site. . .

ORAUT 2013b. *Los Alamos National Laboratory – Occupational Internal Dose*, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013, pg. 113 of 117.

*ATTACHMENT E: SCALING OF COWORKER DOSE INTAKES CONSISTENT WITH TYPE AND DURATION OF EXPOSURES*

The major presumptive exposures at LANL were made up of the primary radionuclides plutonium, uranium, tritium and, in early days, polonium. Other radionuclides may have resulted in intakes to personnel, but due to the small amounts of material, the limited operations, and the use of engineering controls such as dry boxes, potential exposures are relatively unlikely. NIOSH has determined that it is not feasible to reconstruct doses for these radionuclides before the year 1996. Work locations are another important consideration when evaluating for a potential unmonitored intake. In this attachment, a method is presented to scale assigned intakes based on job category and likely duration of exposure to limit the margin of overestimation.

For the purpose of dose reconstruction, the amount of exposure should be considered when assigning coworker dose intakes. For personnel with full contact with the material, the 95<sup>th</sup> percentile of the calculated coworker intakes should be assigned. For others, the 50<sup>th</sup> percentile is more appropriate, as listed in the table below.

*Table E-1. Levels of contact for certain job categories.*

Contact Level	Description	Example job titles	Percentile of CW intake
Primary contact	Contact with material in unencapsulated and uncontained form. Normal contact with the material is under less-controlled environments such as in fume hoods and inside chemical apparatus.	Chemists, researchers	95 <sup>th</sup>
Secondary contact	Normal contact with the material is in containment or process equipment, occasional contact with airborne material during excursions.	Operators, janitors, decommissioning and decontamination workers, health physics personnel routinely assigned	50 <sup>th</sup>
Incidental contact	Contact with contamination and airborne radioactive material only during an excursion or as part of an exposure during a maintenance, repair, waste disposal, decontamination, or decommissioning activity.	Janitors, decommissioning and decontamination, maintenance, health physics personnel who are not routinely assigned; construction activities associated with waste disposal or demolition of legacy structures	50 <sup>th</sup>
Contact unlikely, but presumed	Nonradiological job categories, construction activities not associated with waste or decontamination and decommissioning, but evidence supports a potential incidental exposure.	Construction activities	50 <sup>th</sup>
Contact unlikely, not presumed	Nonradiological job categories, and no evidence to suggest a presumptive exposure.		50 <sup>th</sup>

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**SC&A Observation/Comment:**

This comment describes exposures of construction trade workers at various high radiation areas of LANL. Multiple facilities are mentioned, and the participants noted that CTWs moved all over the site. NIOSH indicated consideration by soliciting and responding to information shared by the workers.

Exposure conditions and monitoring for support service workers was considered at the outreach meeting and through the LANL Work Group’s review of the SEC-109 ER. NIOSH conducted multiple outreach meetings and data capture activities in evaluating the SEC petition and responding to Work Group concerns.

- OTIB-0052 provides general guidance regarding bounding assumptions for unmonitored construction trades workers at all covered facilities.
- Attachment E of the Internal Dose TBD describes scaling of coworker doses based on type and duration of exposures for particular jobs. Maintenance, repair, and construction activities appear in the “incidental” or “unlikely” contact levels, which are scaled at the 50<sup>th</sup> percentile when assigning coworker dose.

The issue of potential synergistic effects (“double whammy” of chemical and radiological exposures) is beyond the scope of this review.

While similar issues are broadly addressed in TBDs and SEC evaluation reports for all LANL workers, NIOSH’s technical documents for LANL generally do not communicate how these concerns are considered in dose reconstruction for support service workers. NIOSH is investigating the adequacy of internal monitoring for support service workers in its ongoing review of the post-1995 period. A recent data request (NIOSH 2012b) includes queries addressing historic and current assessment of internal dose for support service personnel.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Issues were investigated and partially incorporated in technical documents.  
Ongoing investigation.

NIOSH was responsive to the substance of the comments.

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<b>Category:</b> Unknown/Unmonitored Exposures		
<b>Comment Number:</b> 65	<b>Source of Comment:</b> Claimant Provided Exposure Data Claim [redacted], January 15, 2011 CATI Claim [redacted], January 9, 2008	<b>Commenter:</b> Claimant [redacted] Claimant [redacted]

**Comment:**

*The Army Weapons Carrier we drove and rode in frequently in [redacted], [redacted] and [redacted] was discovered to be radioactive and was tagged with a Symbol indicating it was "HOT" (radioactive) and was taken out of service.*

*A number of the Buildings in LANL had a Badge exchange procedure. The employee would hand the Security Officer his area badge, and the Security Officer would locate the individuals Building Badge, and compare both photos of the employee attempting to enter. The employee would then receive the Building Badge, and proceed to his work location. The Security Officer would then place the Area Badge in the badge rack.*

*When the employee wished to leave, the procedure would be reversed.*

*When handling badges the Security Officer did not wear protective clothing nor gloves. Any contamination present on the Building Badge would be in contact with the Security Officer's hands. This contamination had radioactive, chemical, and/or toxic residues. For the [redacted] years that I was a [redacted] at Los Alamos the procedure remained unchanged. [[redacted]]*

*D Building was the location where Plutonium was first separated, and was highly contaminated with radiation, chemical residues, and toxic substances. (pg. 3 of 64)*

*[The following information is taken from CATI of claimant [redacted], which claimant [redacted] included in the Claimant Provided Exposure Data. The interview date was 1/9/2008. Both claimants worked in [redacted] in the [redacted] and [redacted].]*

*Tech A-3 (including all of the Old and New Tech Area – during off hours they patrolled all buildings to make sure the buildings and file cabinets were locked) . . .*

*[Claimant] noted the site was extremely secretive. He said their idea or basic principal of security was to have numerous people that only had small amounts of information. Their other idea was to keep these people from talking and putting the whole story together. He said with this type of logic at the site, they really did not get instruction about health or how to handle things.*

*[Claimant] said they really did not know what was going on in the buildings, they just [redacted], and they would make the appropriate phone call as needed [redacted].*

*[Claimant] said in most of the areas he worked in he was not given a briefing. He said the only briefing he received was when he joined the [redacted]. As a result, [claimant] said he educated himself about rays that were alpha, beta, and gamma. He said he read about different breathing problems that could occur as well as information about not eating food that had had alpha and/or beta rays on it.*

*. . . most of the time he worked six days a week. . . for a number of years he worked 48 hours per week.*

*. . . potential exposure varied depending on the locations. . . they had regular assignments that lasted three months; during these assignments they would either work swing, day, or the graveyard shift. [Claimant] said . . . in a location like DP where the plutonium was processed [workers were] potentially exposed at all times while working. . . in an area like the Old Tech Area, [[redacted]] [redacted] so potential exposure was limited.*

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

NIOSH 2010. *SEC Petition Evaluation Report, Petition SEC-00170*, Rev. 0, National Institute for Occupational Safety and Health, April 26, 2010, pp. 3–4 of 16,.

*NIOSH previously determined in its evaluation of petition SEC-00051 that some LANL workers could have received intakes of radioactive materials that went unmonitored during the period from March 15, 1943 through December 31, 1975, and that limitations in the available data did not allow NIOSH to estimate such radiation doses with sufficient accuracy. . .*

*. . . NIOSH has found that a determination cannot always be made as to whether or not an employee worked in Technical Areas with a history of radioactive material use, or whether an employee should have been monitored for radiological exposures. Accordingly, NIOSH has determined that it is necessary to . . . expand the SEC class definition to include all areas of LANL, and all employees. . . who worked at LANL during the specified time period. . .*

*Although NIOSH found that it is not possible to completely reconstruct radiation doses for the period from March 15, 1943 through December 31, 1975, NIOSH intends to use any external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at LANL during the period from March 15, 1943 through December 31, 1975, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.*

[Refer to Comment 58 for NIOSH Response/Consideration regarding similar concerns for security personnel in later periods.]

[Refer to Comment 64 for NIOSH Response/Consideration regarding support service workers' exposure potential and monitoring.]

[Refer to Comment 44 for NIOSH Response/Consideration regarding unmonitored exposures and small-scale incidents.]

**SC&A Observation/Comment:**

The commenter describes a specific example of potential exposure from driving and riding in a contaminated vehicle. As noted for Comment 44, the SEC-051 ER indicates that missed dose and coworker dose are likely to account for workers' exposures in routine work and minor incidents.

The commenter describes concerns regarding inadequate knowledge of potential radiological exposures due to LANL's approach to national security. The specific issues address the [redacted]' lack of information and training regarding radiological hazards encountered in routine patrols and work activities. These concerns would not directly impact NIOSH's ability to reconstruct dose, since NIOSH can access information that may not have been communicated to the workers.

Several statements in this comment describe work activities, locations, and exposure potentials for [redacted] during the [redacted] and [redacted]. NIOSH has determined that data from this time period are inadequate to support dose reconstruction, but available personal monitoring data are used to partially reconstruct doses for claimants ineligible for the SEC. Other referenced comments indicate NIOSH's consideration of special exposure conditions and limited monitoring data for support service workers.

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<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.
<b>SC&amp;A Conclusion:</b>  Disposition: Issues were investigated and partially incorporated in technical documents.  NIOSH was responsive to the substance of the comments.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 66	<b>Source of Comment:</b> OTS-77: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005a) June 18, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b> <i>I'd get on the dozer to bury the gloveboxes and all that dust would fly into my face. And I would just be wearing a dust mask. They didn't change the masks or even inspect them periodically. They were all cracked and weather-beaten.</i> (pg. 13 of 30)		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  [Responses from outreach meeting (ORAUT 2005a, pg. 13 of 30):]  <i>Bill Murray: NIOSH assumes that no respirators were worn. . . It doesn't matter if you wore them. When they reconstruct your dose, they assume you didn't. I'm not sure if that is across all the sites.</i>  <i>Sam Glover: It's pretty broad. NIOSH doesn't put much faith in the respirator practices.</i>  OCAS 2002. <i>Internal Dose Reconstruction Implementation Guideline</i> , OCAS-IG-002, Rev. 0, Office of Compensation Analysis and Support, August 2002, pg. 21 of 50.  <i>An additional factor that must be considered is respiratory protection. Measured and documented fit factors should not be used since they are not typically indicative of the protection afforded in the work environment. Prior to giving credit for respiratory protection, the respirator program should be evaluated to determine its protection effectiveness. This is not an audit of the program but rather an evaluation to determine if quantitative fit testing was performed and whether it is likely a respirator was worn during the times that credit is given for the protection. This evaluation may rely on any source of information, including a comparison of airborne results to bioassay, interviews, or written documentation. It should not rely solely on a written administrative requirement unless there is some evidence of the enforcement or normal compliance with that requirement.</i>  ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i> , ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013.  <i>. . . Respiratory protection equipment (e.g., assault gas masks or respirators) was used as early as 1944 (Oppenheimer 1944).</i>  <i>. . . Measures to control personnel exposures included multiple changes of clothing, showers before leaving the building, use of surgical gloves and respirators, and use of closed systems whenever possible. These measures were primitive by current standards. Most workers cooperated with safety rules to the best of their ability, but the potential for contamination and intakes was present. . .</i>  <i>. . . Early Health Group reports indicate contamination inside many respirators, which indicates improper storage and handling and poor fit during use (LASL 1944b).</i> (pp. 14–15 of 117)  <i>Particulate filtering respirators were available and were used from the beginning of the program. Therefore, ambient air concentrations might not reflect the actual breathing air concentration of the workers. . .</i>  <i>. . . Rather than preventing intakes completely, the focus of the respiratory protection program, especially in the early years of operation, was to not exceed allowable concentration limits.</i> (pg. 111–112 of 117)		

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**SC&A Observation/Comment:**

The commenter appears to be describing ground burial of a contaminated glovebox, reflecting some type of D&D activity. The work location, source term, and source location of the glovebox are not identified.

NIOSH’s response to the commenter during the outreach meeting indicates that NIOSH does not assume the presence or effectiveness of respiratory protection in assigning dose. Although the Internal Dose Implementation Guideline (IG) recommends caution in crediting the program for respirator use (a general written policy is not sufficient evidence), and the LANL Internal Dose TBD describes some concerns and limitations of LANL’s respiratory protection program, SC&A did not identify a specific statement indicating that respiratory protection should be disregarded in dose reconstruction.

**NIOSH Evaluation Comment:**

NIOSH practice is to not assume respiratory protection due to the cautions listed in the referenced IG. The language is reproduced below.

*Prior to giving credit for respiratory protection, the respirator program should be evaluated to determine its protection effectiveness. This is not an audit of the program, but rather an evaluation to determine if quantitative fit testing was performed and whether it was likely a respirator is worn during the times that credit is given for the protection.*

For the dose reconstructor, such an evaluation would necessarily be a part of the technical basis document. Since this evaluation is not present, it is not possible to take credit for respiratory protection in individual dose reconstructions, unless case-specific data are sufficient to justify the use of such credit. (The author cannot recall a single incident of a dose reconstruction that took credit for respiratory protection in his experience with hundreds of claims for this program.)

It is also worthwhile to point out that data available to dose reconstructors is typically very general in nature (bioassay results are typically the most specific data with respect to dates and potential exposures), and it would normally be very difficult to make the claim that a respirator was worn during a specific incident or at all times for a specified period of time. Therefore, neglecting the protection offered by respiratory protection programs is inherent in the dose reconstruction process.

Finally, it is not impossible that respiratory protection would be used to mitigate a potential exposure; some claims have had sufficient information in them to meet the standard of proof provided by OCAS (above). One site sometimes performs quantitative fit tests prior to each entry to certain work areas. However, as stated above, the option to claim respiratory protection has not been used to the author’s recollection.

**SC&A Conclusion:**

Disposition: Issues were investigated and addressed in technical documents

NIOSH was responsive to the substance of the issues and the SC&A Observation/Comment.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 67	<b>Source of Comment:</b> OTS-83: Rollout Meeting for Los Alamos National Laboratory Site Profile (ORAUT 2005b) August 16, 2005	<b>Commenter:</b> Not identified
<b>Comment:</b>		
<p>[Response to NIOSH query regarding evolution of safety equipment and practices:]</p> <p><i>The safety equipment that was afforded to us is completely different than what was afforded to the Lab. They have a lot of mechanical detection systems in place that we don't have available to us. Most of the time, all we have is our TLD. They have many different types of dosimetry devices to monitor how long they can be in certain areas. We are exempt – we stay as long as they make us stay. We were in the same areas. They were being monitored and we were not.</i></p> <p><i>Mark Lewis: Have there been times when they were issued protective clothing or equipment and you were there in street clothes?</i></p> <p><i>Response: That is common practice.</i></p> <p><i>Response: TA-18 is a good example of that. We were guarding "Lady Godiva" (fast plutonium reactor). Other employees were there in their gloves, masks and overalls. We were sitting less than 15 feet away wearing just smocks and booties. Everything was wide open.</i></p> <p><i>Response: Areas that we routinely checked are now closed off. Protective equipment is required to get in there. We feel the readings we get back are false because we always get negative readings. The Lab individuals are only allowed to be in there for a limited time, and we are in there all the time.</i></p> <p><i>Mark Lewis: This situation is common among guards. We have heard the same kind of story at other facilities.</i></p> <p><i>Another prime example is at TA-21. We were going in there for checks and the material was running off the tables. They painted over it with lead paint. It must be that thick on those floors. (Speaker gestures a length of several inches).</i></p> <p><i>Response: They [Lab employees] had two different types of badges. They usually had temporary badges when they were doing special assignments.</i></p> <p><i>Response: Maybe other groups get reports from their dosimetry, but we are never given any group information.</i></p> <p><i>Response: None at all. We do get individual reports.</i></p> <p><i>Response: They don't give us any information that we don't inquire about.</i></p> <p>[Sam Glover: . . . Are the guards currently on at least a limited plutonium bioassay program?]</p> <p><i>Response: No. The guard force is not. People at the Lab are testing, TA-55 for example. The company is in the process of figuring out why we were taken out of the program.</i></p> <p><i>Response: We don't even have the initial entry test right now. Well, we do for in vivo, but for the past couple years they have not been doing the initial screening. There currently is no screening in TA-55 for personnel that are inside.</i></p> <p><i>Response: . . . That issue came up recently. None of us has had bioassay on a regular basis. (pp. 14–16 of 16)</i></p>		

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[Response from outreach meeting (ORAUT 2005b, pp. 14–16 of 16):]

*Mark Lewis: We encourage veteran employees such as yourselves to share your memories with us – to help make the LANL Site Profile as complete as possible. We need your help so you can help others. Do you know anyone who was here before 1965?*

*[Response: (Name withheld) has been here 46 years.]*

*Mark Lewis: I am sure he has valuable information if he could talk to us. There are very few who have been around that long.*

*Sam Glover: Do you get collective dose reports on TA-18? This would be for guards who would be down there. We can compare dosimetry history to try to figure out why there are discrepancies. I do not know if you had different badges than what the Lab personnel had, but it sounds like they may have had temporary dosimetry which you may not have been afforded.*

[Regarding the lack of group dosimetry reports:]

*Mark Lewis: Sam, if they take the personal identifiers off the dose reports, can't labor organizations request them?*

*Sam Glover: Usually in a radcon program, there is an ALARA (As Low As Reasonably Achievable) program. As part of that, there is an ALARA program officer who oversees exposures to a group of personnel. Their doses are monitored to see if there are any changes. If doses exceed the set limit, there is an evaluation. TA-18 seems to be an area that comes up quite often.*

*Sam Glover: I know that in 2002 they were doing some low-level plutonium bioassay screening. Evidently, it has changed. It was my understanding that the guards were being evaluated then, but I could be wrong.*

[Refer to Comment 38 for NIOSH Response/Consideration of support service workers' participation in bioassay program.]

**SC&A Observation/Comment:**

NIOSH personnel requested information about worker protection and monitoring, and their responses reflect consideration of the workers' input against other information they had received. The outreach contractor requested names of other workers with long employment history at LANL and expressed interest in talking with such workers. Documentation of further follow-up was not identified. As noted for Comment 9, SC&A may not have access to a complete record of NIOSH's site expert interviews and communications.

As noted for Comment 38, limited consideration of support service workers' internal monitoring and data is provided in the SEC-109 ER and the Internal Dose TBD. Additional consideration of internal data adequacy and completeness is provided in these documents for the general population of LANL workers. NIOSH is investigating internal monitoring practices for support service workers as part of its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

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**SC&A Conclusion:**

Disposition: General issues were investigated and partially incorporated in technical documents.  
Ongoing investigation.

NIOSH response to the substance of the comment is inconclusive. Documentation of further follow-up was not identified. Documentation of NIOSH interviews and site expert communications may be incomplete.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 68	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 6, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b> <i>I recall an incident where [coworker] and I were assigned [redacted]. The [redacted]. When exiting Mason the RAD alarms were set off at exit gates.</i>  <i>... the RCT's and management direct [coworker] and myself to [redacted]. (pg. 15 of 50)</i>  <i>That I recall an incident where [coworker] and I were assigned [redacted] and that we were required [redacted]</i>  <i>That when [coworker] and I entered the experimental area, the docimeters [sic] maxed out and</i>  <i>That [coworker] and I exited directly to the RCT station where the RCT's zeroed out the docimeters [sic]. (pg. 16 of 50)</i>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  [Refer to Comment 5 for NIOSH's general response/consideration regarding adequacy of external monitoring data.]		
<b>SC&amp;A Observation/Comment:</b>  The commenter's examples apparently reflect lack of confidence in radiological controls. Both scenarios appear to indicate external exposure potential—from activated shielding material and from entering an experimental area. The example with [redacted]. Assuming that the worker was monitored, exposure from this event would be captured in dose reconstruction.  The second example is that RCTs zeroed out pencil dosimeters that had maxed out. Similar concerns regarding adequacy of external monitoring data are discussed for Comment 5. As noted for Comment 5, NIOSH has found external monitoring data generally adequate for dose reconstruction, particularly after 1975. Available data, even for early periods, are used for partial dose reconstructions for claimants who are ineligible for compensation under the SEC. Missed dose is assigned for recorded or assumed zero dosimeter results, based on the individual's typical exposure or coworker data.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition: General adequacy of external monitoring was investigated and incorporated in technical documents. Specific issues relevant for individual DR are beyond the scope of this review.  NIOSH was responsive to the substance of the comment in a general sense.		

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 69	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 21, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p>In [redacted] I began working at LANL as a [redacted]. During the first five to six years of my employment at LANL there was little if no monitoring of contamination.</p> <p>In [redacted] I was involved in [redacted]. My job was to [redacted]. I'm certain that there was a considerable amount of radioactive contamination that again, was not monitored in the least.</p> <p>After this I was assigned to [redacted] another facility that deals with high levels of contamination. My job description was [redacted] for the area. This included [redacted], an area that also deals with uranium and plutonium. On several occasions my crew and I were asked to work on glove boxes and other radioactive handling equipment. In fact, there were many times when we were required to exit certain areas of the building because of radioactive spills. Over [redacted] there were twenty times or better that we had to be evacuated hurriedly. There were times when we had to move through the entire basement expeditiously because of the intensity of the spill. At [redacted] we had a situation in which we were not informed of some very serious contamination that was found under a coat of paint. (pg. 44 of 50)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
[Refer to Comment 64 for NIOSH Response/Consideration of exposure potential and dose reconstruction for construction trades workers.]		
<b>SC&amp;A Observation/Comment:</b>		
<p>Although the affidavit was submitted in support of the SEC-051 petition, most of the events described take place after 1975. The worker describes examples of [redacted], [redacted], and [redacted] work on contaminated equipment, as well as many spills that prompted evacuation of work areas.</p> <p>As noted for Comment 64, NIOSH has considered potential unmonitored exposures for support service workers at LANL, although this consideration is not generally communicated in LANL technical documents. OTIB-0052 provides general guidance regarding bounding assumptions for unmonitored construction trades workers at all covered facilities. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.</p>		
<b>NIOSH Evaluation Comment:</b>		
NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>		
<p>Disposition: General issues were investigated and partially incorporated in technical documents. Ongoing investigation.</p> <p>NIOSH was responsive to the general substance of the comments.</p>		

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 70	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 22, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b>		
<p><i>I started working at the Los Alamos National Lab in [redacted]. I was stationed at [redacted], [redacted]. This area is also known as [redacted]. They would drop us off in the morning and the site supervisor would lock the gates behind us. We stayed in the area all day with no shelter whatsoever. Our food was exposed to all of the dust from the pits that held all of the radioactive material in them. . . In the afternoon our supervisor would take us out of the fenced area. Another supervisor from Zia Co. would take us to our vehicles. At that time we never showered.</i></p> <p><i>We would [redacted] on a daily basis. I would go to SM 39, TA 29 or TA 50 to shower. In the afternoons we would stop what we were doing and [redacted], whatever came in during the day. Eventually I was transferred over full time to just work [redacted].</i></p> <p><i>One time that I was “hot” they had me [redacted]. They [redacted]; the monitor would monitor me . . . Finally [redacted]. . .</i></p> <p><i>After that the Lab bought me government issued shoes which were to be left at the site. They also began furnishing me with clothing. Basically during my normal work day I never wore any kind of protective equipment besides coveralls and a film badge. My film badge was worn inside my coveralls. I often worked without a radiation monitoring badge for months at a time because of the type of work that I did they would fall off of my clothing. Even after major exposures I was never put on a monitoring program. I never had to give urine samples to measure exposure to radiation.</i></p> <p><i>We often disposed of animals . . . Monkeys, elk, rats, pigs and other animals were brought from the “rat lab” and Los Alamos and I had to dispose of them. Elk that were in radioactive areas were killed and then dissected. Those animals would then need to be disposed of, that was my job. The disposal shafts are 55’ deep. The animal would be placed on a rope and we’d cut the rope to send it down. Gloves from TA-55, isotopes, graphite and beryllium barrels were also disposed of in the shafts. It was my job to [redacted].</i></p> <p><i>They used TA 54 as a training site for monitors. Summer students were there, people from other facilities; however, we never knew who that monitor of the day was. There were times when trucks leaving the area would set off monitors and they’d have to turn back and bring a monitor from another area of the Lab to check the vehicle. If the vehicle was extremely contaminated they would dispose of the vehicle.</i></p> <p><i>One time I was told to [redacted].</i></p> <p><i>One time [redacted]. Plutonium 238 was stored in these barrels and radiation was leaking and had leaked all over. By that time we were already exposed to the plutonium. [redacted].</i></p> <p><i>. . . We had many incidents at [redacted] that were probably never recorded. . . There were many times when I would not get my urine kit for three or four months. There was one time when I was at [redacted] that our urine samples stayed sitting in the restroom for about three months.</i></p>		

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

[Refer to Comment 1 for NIOSH retrieval of records regarding material disposal at [redacted].]

[Refer to Comment 44 for NIOSH Response/Consideration regarding unmonitored exposures and small-scale incidents.]

[Refer to Comment 7 for NIOSH Response/Consideration regarding delays in processing urine bioassay samples.]

**SC&A Observation/Comment:**

Although the affidavit was submitted in support of the SEC-051 petition, the activities and events described take place after 1975. The commenter describes routine duties, occurrences, and monitoring practices for [redacted]. The commenter’s statements include some discrepancies regarding personal participation in bioassay. One statement indicates the commenter never had to give urine samples to monitor for exposure to radiation, but other statements indicate the worker “would not get my urine kit for three or four months,” and “our urine samples stayed sitting in the restroom for about three months.”

NIOSH has acquired logbooks and disposal records for [redacted] that were described by workers in Comment 1. As noted for Comment 44, missed dose and coworker dose are likely to account for workers’ exposures in routine work and minor incidents (for claimants ineligible for the SEC classes). As noted for Comment 7, significant delays in processing urine bioassay samples were considered in Revision 1 of the LANL Internal Dose TBD.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: General issues were investigated and incorporated into technical documents. Follow-up on the commenter’s participation in bioassay programs is not evident.

NIOSH was responsive to the general substance of the comment.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 71	<b>Source of Comment:</b> Letter to Larry Elliott (OCAS) and attachments (Affidavits) in support of Special Exposure Cohort Petition SEC-051 ([redacted]) Affidavit dated June 22, 2006	<b>Commenter:</b> [redacted]
<b>Comment:</b> <i>I have worked for Los Alamos National Laboratory for the past [redacted] years as a custodian. Within these [redacted] years I received a security clearance and was assigned to work inside designated “hot” areas where there is radiation activity going on. These work sites included [redacted], [redacted], [redacted] and [redacted]. When working in these areas there was no medical monitoring done and I was not asked to participate in any bioassay monitoring either.</i>  <i>Upon entering a building, I used coveralls, gloves and booties, but never had any type of respiratory [sic] protection. When leaving the building, I often set off radiation alarms but was never properly checked for contamination. An example of this was while working in the [redacted], I would leave the building to [redacted]. The following day the area I passed through would be taped off due to contamination of the area.</i> <p style="text-align: right;">(pg. 48 of 50)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>  [Refer to Comment 44 for NIOSH Response/Consideration regarding unmonitored exposures and small-scale incidents.]  [Refer to Comment 57 for general NIOSH Response/Consideration regarding exposures and dose reconstruction of support service workers.]		
<b>SC&amp;A Observation/Comment:</b>  Although the affidavit was submitted in support of the SEC-051 petition, the activities and events described take place after 1975. The commenter describes a [redacted]’s work activities, PPE, and contamination incidents in the 1990s to mid-2000s. As noted for Comment 44, missed dose and coworker dose are likely to account for workers’ exposures in routine work and minor incidents such as personal contamination events described by the commenter.  Custodians were included in the petitioner-proposed class for SEC-109. As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.		
<b>NIOSH Evaluation Comment:</b>  NIOSH concurs with the SC&A Observation/Comment.		
<b>SC&amp;A Conclusion:</b>  Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers’ concerns in technical documents. Ongoing investigation of post-1995 period.  NIOSH was responsive to the substance of the comment in a general sense.		

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INDIVIDUAL COMMENT REVIEWS  
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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 72	<b>Source of Comment:</b> Claimant Provided Exposure Data Claim [redacted], January 15, 2011 CATI Claim [redacted], January 9, 2008	<b>Commenter:</b> Claimant [redacted]
<b>Comment:</b>		
<p>[The following information is taken from CATI of claimant [redacted], which claimant [redacted] included in his Claimant Provided Exposure Data. The interview date was 1/9/2008. Both claimants worked in [redacted] in the late [redacted] and [redacted].]</p> <p><i>Duties:</i> [Claimant] said if he worked in [redacted] he was [redacted] and [redacted] ([redacted]), as well as [redacted] (i.e., [redacted]). He said when the workers would come out, as a [redacted], it was his job to take a [redacted]. He said the work clothing the worker had on while in the restricted area went into a hamper. [redacted] if a reading came up, the worker would have to go back and shower again. He said normally the workers were clean; however, the idea was the site did not want the workers to take the plutonium home with them and contaminate their homes. . . [Claimant] said this was the most controlled place he worked in.</p> <p>[Claimant] said there was a point in time when the site found out they did not have an emergency response team. [redacted]. He said they received about 30 minutes of instruction from an educated person that came from the University of California and then they were sent out into the field. [redacted].</p> <p>[Claimant] noted that he normally did not wear protective clothing; workers tried to avoid wearing them. He said if he went into an area that required him to dress out he would put on the needed dress. [Claimant] said when he entered a contaminated area it was normally after hours and he put on a complete hood that fit close down, heavy coveralls, and canvas booties over his shoes; he was completely covered. [Claimant] again noted that this was not his normal attire at the site. (pp. 54–56 of 64)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>ORAUT 2013b. <i>Los Alamos National Laboratory – Occupational Internal Dose</i>, ORAUT-TKBS-0010-5, Rev. 02, Oak Ridge Associated Universities Team, April 18, 2013, pp. 14–15 of 117.</p> <p>[In 1944] <i>Measures to control personnel exposures included multiple changes of clothing, showers before leaving the building, use of surgical gloves and respirators, and use of closed systems whenever possible. These measures were primitive by current standards. Most workers cooperated with safety rules to the best of their ability, but the potential for contamination and intakes was present. . .</i></p> <p>. . . <i>Early safety efforts were based on working in safe contamination levels (LASL 1944a). In 1952, the Health-Safety Rules for Building 52 included restriction of access only through locker rooms and release of clothing with levels less than 100,000 cpm (LASL 1952a). . . In 1954, contamination measurements were based on contact with a shield-open Geiger-Müller (GM) tube for beta/gamma and a Pee Wee probe of a 55-cm<sup>2</sup> area for alpha. . .</i></p> <p>. . . <i>Tolerance limits were established as the level below which the risk of health effects was considered acceptable (safe) to continue work or to not take immediate action to correct the condition (LASL 1945). . . Corrective actions appropriate to the situation (e.g., decontamination of an area, release of personnel with skin contamination) were initiated if tolerance limits were exceeded.</i></p>		

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**SC&A Observation/Comment:**

The early safety practices described in the LANL Internal Dose TBD are consistent with the commenter's description of practices at DP Site (TA-21). The commenter describes issuance of external dosimetry based on work location, protective clothing, showering, and monitoring for personnel contamination. The worker's [redacted]. This information is more detailed than is presented in the External Dose TBD; it is consistent with NIOSH's general characterization of the LANL radiation safety program.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      General safety practices are addressed in technical documents.  
                            Ongoing investigation.

NIOSH was responsive to the general substance of the comment.

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INDIVIDUAL COMMENT REVIEWS  
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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 73	<b>Source of Comment:</b> OTS-16, 9:00 a.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008c)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple] Loretta Valerio
<b>Comment:</b>		
<p><i>[Name redacted] stated that he had worked at LANL since 1982 and shared some of his personal experiences:</i></p> <ul style="list-style-type: none"> <li>• <i>While working as a security guard in the very highly contaminated DP Area, he was stationed outside the door to a work area in which production workers wore full personal protective equipment (PPE), but he was not issued any protective gear. He stated that guards were often asked why they were not stationed farther away from the contamination. The guards were under orders to man their post outside the door.</i></li> <li>• <i>In SM-39 (South Mesa Building 39) Machine Shop, the machinists wore masks while machining metals such as beryllium but the guards assigned to protect the material were not issued PPE.</i></li> <li>• <i>Mr. Cameron asked if [name redacted] recalled giving bioassay samples. He replied that a radiological control technician (RCT) took swipes from the walls. [Name redacted] said that there was a list of all the contamination incidents that had occurred at LANL over the years but he had never seen it.</i></li> </ul> <p><i>... guards have sometimes responded to incidents before they have been equipped properly or prior to the evacuation of the area. Since they are first responders, the guards are responsible for clearing the area. . .</i></p> <p><i>... guards' main duty was traffic control during critical incidents. They were trained to read signs posted in areas with hazardous materials and used pocket HAZMAT guides to maintain patrol perimeters at the proper distance.</i> (pg. 2 of 11)</p> <p><i>Several guards recalled that security patrols had unrestricted access to controlled areas in the 1980s and 1990s prior to the installation of the personnel badge readers that limit access to restricted areas. They did not know if an area was restricted unless it was roped off. One attendee stated that since the CMR (Chemistry and Metallurgy Research) Building was downgraded, only guards have access to the building between 6:00 p.m. and 6:30 a.m.</i></p> <p><i>[Name redacted] stated that the availability of RCTs has improved over time. Now they are around during most jobs, which limits who can be in the area. . .</i></p> <p><i>[Name redacted] recalled working at a security post in DP Site in TA-21 during the same time period. He stated that the RCTs would come around periodically and pull out the table and chair where the guards sat so they could read the area dosimeter on the wall behind them. When the reading was high, they would send a painting crew out to coat the wall with lead paint and then come back to take an acceptable reading. He also remembered having an assignment at a security post in the SM-102 machine shop in TA-3 with an assault rifle to guard material wearing a smock and booties while the material was being machined. The machinists wore dust masks and other PPE as they machined the material and as the material smoked and chips fell to the floor, he often wondered why the guards were not offered the same protection as the machinists. When he asked, he was told that he was "safe".</i> <i>[Name redacted] added that the guards patrol only the exterior of the building now.</i> (pg. 3 of 11)</p> <p><i>[Name redacted] stated that they are mostly concerned with the period through the 1990s because the conditions at LANL have improved in more recent years. Guards who worked prior to that time were exposed to many more contaminants than they are now. . . He then asked [name redacted] if he was working in TA-18 during the "movements" that ended in approximately 2005. [Name redacted] recalled that there had been many Stop Work Orders issued in TA-18 and particularly in Building 127, where there was a lot of testing. He recalled an occasion,</i></p>		

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*possibly in 2005, when guards were training in a building there that housed a reactor in the basement. They had completed about a half month of training before the RCTs came in to check the building and found that it was “hot.” They were not permitted to use the facility for training after that. The guards who had been training – approximately half of the security force – were offered testing if they felt ill but he was unsure if anyone had chosen to do so.* (pg. 4 of 11)

*. . . Employees are now required to complete safety training before the badge readers will allow them access to restricted areas. . .* (pg. 5 of 11)

*[Name redacted] . . . cited an incident at TA-55 in 2003 or 2004 when materials that were stored too close together started to react. He and several other guards were stationed at the entry of Building PF-4 as workers entered the area with full-face respirators and other protective gear. When he asked why guards did not have PPE, he was told to be quiet and do his job. This continued for approximately one month. Now, the guards must keep anyone who is not properly dressed-out from entering the area, but the Lab will not approve the guards’ request to wear smocks while stationed there.*

*Recently, the Lab has prohibited eating and drinking at the post. [Name redacted] asked whether drinking, eating, and smoking had ever been allowed inside the plant. [Name redacted] replied that there had been designated smoking areas on the mezzanines and the hallways. Workers were allowed to have beverages inside the work area. [Name redacted] stated that the fire personnel in the building had an area where they could prepare food.*

*[Name redacted] recalled eating at Post 315 in DP West, which was about 20 feet from a highly contaminated area; [name redacted] added that Post 316 in the back was the same. Security guards had to patrol the area every half hour to make sure the doors were locked, often walking among pipes that leaked on the floor. Areas were often roped off due to spills. The guards were not informed what had spilled or leaked. He said that if they did not turn off the area monitors, they would go off all night. [Name redacted] said that guards only patrol the exterior of the building now.*

*[Name redacted] stated that production workers who go into contaminated areas have locker rooms where they can change into work clothes before their shifts and shower after their shifts so they can wear their street clothes home. The security guards who man the posts in those areas do not have shower facilities and wear the same clothes home that they wore during their shifts.*

*. . . [Name redacted] recalled that the guards could eat at the post [reactor post at TA-2]. [Name redacted] stated that there was a break room in the building. [Name redacted] said that he often wondered if the droplets were radioactive, but didn’t question it. He said that training in the 1980s was limited but had improved since the Rad 2 Training started about 10 years ago.* (pg. 6 of 11)

*. . . an open field near Building 27 was fenced off at some time during the past two years and posted as a radioactive contamination area. He recalled stopping to have his lunch and walking in the area prior to the posting. [Name redacted] recalled that security guards used to patrol four levels of that building and that there was a vault on the bottom level that they checked every two hours. [Name redacted] did not recall any special monitoring in the building. . .*

*[Name redacted] stated that Wing 9 of the Chemistry and Metallurgy Research (CMR) facility (Building 29) in TA-3 is so “hot” that guards who patrol it are required to wear booties and a smock. He recalled a tandem truck that was used to transport material from CMR back to a vault. The truck became so “hot” that it had to be buried at the TA-54 Waste Disposal Site. He replied “No” when Mr. Lewis asked if they were required to wear respiratory protection in Wing 9. [Name redacted] stated that guards were stationed outside the doors during the experiments, but the workers inside wore full PPE.* (pg. 7 of 11)

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*[Name redacted] revisited a topic that [name redacted] had addressed before his arrival. He recalled that the monthly tactical training had been scheduled in Building 127 in TA-18 after the area was shut down so the guards could practice clearing the vaults. The guards had completed several days of training when the RCTs came in to do a survey and found that the building was highly contaminated. The class was cancelled and the building was shut down. Several of the guards went to the medical facility for testing because they felt ill. [Name redacted] stated that the union documented the incident.*

*A short discussion followed during which the attendees discussed other training areas of concern: TA-41, both inside and outside the buildings; and TA-3 Building 16, where the Van DeGraaf generator is housed. Building 16 was also used for tritium storage at one time. . .)*

*[Name redacted] asked if the others recalled response drills in TA-55. The guards went into the area to practice defensive positions behind discarded bathospheres and other equipment. The practice was stopped when the equipment was found to be contaminated. He stated that there was an area on the west side of TA-55 where boxes from inside the plant were refurbished. [Name redacted] remembered that contaminated dirt was brought into the area from around the plant. [Name redacted] stated that the response plans changed because of the contaminated material in the area. [Name redacted] added that the area where they trained is roped off now. Ms. Valerio said that contaminated dirt from the fire area was brought into TA-55 in dump trucks.*

*[Name redacted] described a more recent contamination event in TA-55. The guards used to raise and lower the American flag daily. The flag set off the pedestrian radiation monitors several times when they brought it into Building 111 at night. The alarms also went off when they checked the flag with a handheld monitor. He reported it as a safety incident and was told later that radon in the flag had set off the meter. He was not satisfied with the answer since the flag is flown at 30 feet in a windy area and radon tends to stay in low lying areas because it is a heavy gas. He found out later that the company did not file the report in its records. Now the flag is flown round the clock and replaced when it becomes tattered.* (pp. 8–9 of 11)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from outreach meeting (ORAUT 2008c, pg. 5 of 11):

*Mr. Lewis asked if any of the attendees knew any other guards who could talk about their work experiences from 1976 through the late 1970s. He commented that he was pleased with the quality of the information the union members had shared during the session and hoped that others would share their stories with Mr. Macievic during the afternoon sessions. [Name redacted] replied that the guards with the most seniority work day shift and would likely attend the 6:30 p.m. session. [Name redacted] added that those guards are more knowledgeable about the areas and more likely to report safety issues.*

[Refer to Comment 57 for general NIOSH Response/Consideration regarding exposures and dose reconstruction of support service workers.]

**SC&A Observation/Comment:**

There are several technical areas and locations discussed in this comment, but two primary issues are a lack of information about radiological hazards in work areas and a discrepancy in the level of worker protections (such as PPE and RCT coverage) for security guards compared to the research and production workers in the same area. Much of this information is at a level of detail that would not necessarily be included in Site Profile TBDs.

As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

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**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 74	<b>Source of Comment:</b> OTS-16, 1:00 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008e)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>[Name redacted] stated that security guards were assigned to protect the pits and sometimes heavy metals in the machine shops in Building 102 and SM-39 (South Mesa Building 39) when he first started working at LANL in the 1980s. The guards sat next to the material as it was machined. The machinists wore masks and smocks but the guards assigned to protect the material were only given booties. When they voiced their concerns about being so close to the activity and not having adequate protection, the guards were told that they were safe.</i></p> <p><i>[Name redacted] replied that all workers in the area used hand monitors as they left the area since radiological control technicians (RCTs) were not assigned to the area during the 1980s. Currently, RCTs stay in radiological work areas. . . He stated that the machinists had sometimes asked why the guards were in the machine shop without protection. The guards were later moved into an area away from the machining where they could still see the material.</i> (pp. 2–3 of 9)</p> <p><i>Dr. Macievic asked when LANL started using Radiation Work Permits (RWPs). [Name redacted] responded that RWPs were first used in the 1990s. [Name redacted] stated that RWPs were issued mainly to the trades. LANL does not advise the guards of the nature of the work and they are not required to sign off on RWPs. He has not seen an RWP in the ten years that he has worked at LANL, even though he sometimes escorts material during radiation work.</i> (pg. 4 of 9)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
<p>Response from outreach meeting (ORAUT 2008e):</p> <p><i>Dr. Macievic stated that if radiation monitoring data for the workers in that area during that period and air monitoring information were available, NIOSH could determine the guards’ potential radiation exposures.</i></p> <p><i>Dr. Macievic recalled that the Tiger Team report mentions the scenario. [Name redacted] confirmed that it does. [Name redacted] offered to give Dr. Macievic contact information for one of the machinists that had worked in the area during the 1980s.</i> (pp. 2–3 of 9)</p> <p><i>Dr. Macievic said that he is hopeful that RWPs were issued prior to the early 1990s because they provide NIOSH with a lot of useful information. RWPs show what type of work was performed and where, radiological materials in the area, the types of instruments used for monitoring, and work time limits in the area.</i> (pg. 4 of 9)</p> <p>[Refer to Comment 57 for general NIOSH Response/Consideration regarding exposures and dose reconstruction of support service workers.]</p>		
<b>SC&amp;A Observation/Comment:</b>		
<p>The commenters describe scenarios in which the guards were in close proximity to work activities, such as machining, without having PPE comparable to the operations workers. NIOSH expressed interest in obtaining RWPs, air monitoring data, and coworker monitoring data to estimate exposures. SC&amp;A is not able to evaluate NIOSH’s follow-up in response to the workers’ input, since much of this information would not typically be included in Site Profile TBDs.</p>		

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<p>As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.</p>
<p><b>NIOSH Evaluation Comment:</b></p> <p>NIOSH concurs with the SC&amp;A Observation/Comment.</p>
<p><b>SC&amp;A Conclusion:</b></p> <p>Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers’ concerns in technical documents. Ongoing investigation of post-1995 period.</p> <p>NIOSH was responsive to the substance of the comment in a general sense.</p>

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 75	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008a)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple] Loretta Valerio

**Comment:**

*[Name redacted] stated that during E shift duties in the 1980s, guards manned posts at multiple sets of doors in Building 127 as barrels of material were brought into the building. Other personnel were issued masks, but the guards had no protection.*

*[Name redacted] stated that the same situation occurred at SM-102 during the 1980s. Machinists and RCTs in the area wore PPE, but the guards who sat close by were issued only booties. (pg. 2 of 11)*

*[Name redacted] stated that guards were not furnished respiratory protection until after the Cerro Grande fire in 2000. [Name redacted] commented that after the fire, the guards were issued the same type of breathing apparatus as the British Army for use during tactical training or in the event of a tactical situation. Before that, they had industrial-type respiratory protection, which was not adequate because it interfered with their ability to use their weapons in tactical training.*

*[Name redacted] described another exposure scenario in the Orange Room at DP in the 1980s. The guards were assigned to escort workers wearing masks and suits as they scraped paint off the walls. The guards were not issued any PPE at all. The building has since been torn down. [Name redacted] stated that a lot of contaminated equipment had been taken out of that area. [Name redacted] added that the guards ate their lunches next to that room. The guards were always told the area was clean.*

*[Name redacted] stated that the guards patrolled inside PF-4 at TA-55 during fire guard without masks during the Mason-Hanger era (the 1980s and early 1990s). [Name redacted] stated that there was not a limit on the time they were allowed to work in PF4 (the plutonium production facility) during the Mason-Hanger era. Guards often worked their entire 8-hour shift in the area and up to 16 hours if they worked overtime. The current time limit posted for the area is two hours. Mr. Lewis asked if workers were allowed to eat in the work area. [Name redacted] responded that he did not eat in the area while he was on duty during the graveyard shift, but he recalled that workers were permitted to smoke in the corridors. He also recalled drinking coffee while he patrolled the area. (pg. 4 of 11)*

*[Name redacted] asked if any of the attendees had worked in TA-41 at S Site. [Name redacted] recalled that the guards on duty sat inside the work area in the Tritium Building (205). [Name redacted] stated that the guards sat at their post inside the room with no protection while the other workers were dressed out in full PPE. He recalled thinking that there was “something wrong with this picture. Why is everybody dressed out and we are not?” He added that it was a recurring situation in this location. The guards took the word of the RCT that they were “safe.”*

*Ms. Valerio stated that she had not heard anyone mention TA-48. She asked if any of the attendees had worked in that area. [Name redacted] responded that he had patrolled in Building 1, the radiochemistry facility where the radioactive sources are kept. He recalled that he used to cut through a hallway to check the back door. [Name redacted] asked if he had also patrolled the vault areas in the basement. [Name redacted] stated that the monitors “used to go off like crazy” in the rooms as he walked through the basement hallway.*

*[Name redacted] stated that they had to check the vaults and the roof at the Operations Center in TA-53 when they were in “SOs.” They could hear the alarms go off even outside the building. The guards could also hear the alarms going off inside Building 27 in TA-35 when they patrolled there. Ms. Valerio asked about the vaults at the CMR facility, at TA-55, and at the Old DP site. [Name redacted] responded that the guards served as escorts at CMR.*

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*[Name redacted] explained that the guards had been given a special assignment to escort material to the WETF (Weapons Engineering Tritium Facility) at TA-16 for a special experiment and had to remain there on shifts around the clock. During the experiment, guards were posted in the building and outside on perimeter patrol to keep personnel out of the area. The guards in the building were in close proximity to the material. . . . [Name redacted] stated that he did not wear protective clothing during this assignment but the other Lab employees were dressed in smocks.*

*[Name redacted] recalled that his work hours were extensive during the experiment. In 2003 or 2004, he had filed a safety concern with his supervisor because he had been called back to work shortly after arriving home from a long shift. [Name redacted] confirmed that the complaint had resulted in a stipulation in the guards' 2004 contract for overtime relief that provides for the reimbursement of hotel room charges for employees who routinely work double shifts. . . . [Name redacted] commented that everyone worked overtime during that experiment and they often worked in another area before reporting for their second shift at WETF. [Name redacted] responded that the guards routinely worked either 16-hour shifts every other day (16-8-16-8-16) or 12-hour shifts every day for as many as seven days. Starting off the week by working a double shift and then working 12-hour days for the balance was also common (16-12-12-12-12). [Name redacted] recalled working three 16-hour shifts in a row when he started working for Mason-Hanger in 1980. He commented that the excess overtime caused both physical and mental fatigue and noted that he had once been written up when he forgot to check in at one of the Detex clocks during a period when he had worked multiple 16-hr days.*

*[Name redacted] stated that he patrolled by himself when he was checking facilities in the radiation buffer zones. There were RCTs present when he was assigned to radiation jobs. He recalled that he used to patrol in Building 102, but later the RCTs starting roping off the areas where the material was stored and posting "Do Not Enter" signs that kept the guards from checking the doors. (pp. 5–6 of 11)*

*Ms. Valerio commented that when she worked at CMR in the late 1990s, the guards escorted HVAC workers to the filter towers when they changed out the HEPA filters on the roof. The guards were stationed at the door to the filter room while the HVAC workers changed out the filters. [Name redacted] recalled having this duty one time in the 1980s. During the procedure, the HVAC workers were in full PPE with respirators but the guards were stationed at the door to the filter room without any protective gear. [Name redacted] stated that a guard had once entered the exhaust stack and had to be decontaminated; so the doors are locked during the filter change now. [Name redacted] stated that guards still escort personnel in this area during air sampling. (pg. 6 of 11)*

*The guard post at TA-2 was located so close to the reactor that condensate of the steam from the reactor fell on the guards at the post. [Name redacted] commented that the LANL site profile notes a leak in the discharge line from the reactor building out to the canyon. The air monitoring data in the site profile indicated that the reactor produced mixed activation products. . . . (pp. 7–8 of 11)*

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from outreach meeting (ORAUT 2008a):

*Dr. Macievic noted that the [respiratory protection] equipment was provided near the end of the time frame in the petition. . .*

*Dr. Macievic commented that the lack of protective equipment seemed like standard practice for the guards. (pg. 4 of 11)*

*Dr. Macievic commented that the guards' routine overtime should be taken into consideration since dose reconstruction normally is based on 8-hour days. . .*

*Dr. Macievic commented that he needed to establish ways to link their comments to health survey data. He asked whether the guards patrolled mostly in areas where other workers were being monitored during rad operations or mostly by themselves. (pp. 5–6 of 11)*

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*Dr. Macievic noted that the security levels at LANL are higher than at many of the other DOE facilities. He asked if the attendees knew whether guards escorted materials or other workers into the production areas in the mid- to late 1970s and 1980s. He asked if the attendees could help him identify any security personnel from that period. . . .*  
(pg. 6 of 11)

*Dr. Macievic commented that the LANL Site Profile will be revised to address their concerns and to include any new information found during the LANL data search. He stated that their comments have given him a better idea of the working conditions for the workers who were classified as “unmonitored” in the site profile and the radiation doses that they received.*  
(pg. 7 of 11)

[Refer to Comment 57 for NIOSH Response/Consideration of internal dose assessment for support service workers.]

**SC&A Observation/Comment:**

The commenters describe scenarios in which the guards were in close proximity to work activities, such as machining or scraping contaminated surfaces, without having PPE comparable to other workers involved in the operations. The workers also indicate significant changes in practices over time, such as time limits for work in PF4. NIOSH expressed interest in details of guards’ working conditions and in obtaining additional information through data capture to support estimates of exposures to unmonitored workers.

As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH’s recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

One commenter identified S Site as TA-41. S Site, which does include a tritium facility as described by the worker, is identified as TA-16 in the Site Profile. Another commenter at the outreach meeting also indicated the Weapons Engineering Tritium Facility is located at TA-16 (consistent with the Site Profile). It appears that the commenter misspoke.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: Adequacy of internal monitoring was investigated for all LANL workers. Limited incorporation of support service workers’ concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 76	<b>Source of Comment:</b> OTS-16, 4:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL)</i> (ORAUT 2008a) September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>[Name redacted] stated that when the guards were assigned to escort the materials that were screened in the radiography facility in Building 23 in TA-8, the technicians wore lead aprons but the guards did not. . . [Name redacted] added that the guards took turns doing that assignment and stayed with the materials until the screenings were finished. [Name redacted] asked about the dosimetry during that assignment. [Name redacted] responded that they were not given special dosimeters at the time; that practice started years later . . .</i></p> <p><i>[Name redacted] asked if the radiographers had special dosimeters. [Name redacted] responded that the radiographers wore neutron dosimeters in addition to their TLDs and another dosimeter. He stated that he stood side-by-side with the radiographers. If they left the area for any reason, he went with them. [Name redacted] added that the guards were in direct contact with the packages because they were responsible for ensuring that the materials were put back into the correct packages after the screening. . . [Name redacted] responded that the same practices were used throughout the 1980s as well.</i></p> <p><i>[Name redacted] stated that the building was old and did not have area monitors, but RCTs were assigned to the area.</i> (pp. 2–3 of 11)</p> <p><i>[Name redacted] asked [name redacted] if he had been involved in the packaging in TA-18. [Name redacted] responded that he did one tour in TA-18, but he was involved in the packaging at TA-8 and CMR (Chemical and Metallurgical Research facility). [Name redacted] stated that at TA-8, the RCT carried a dosimeter to check the radiation level and only stayed in the area for 15 minutes at a time, but the guards had to stay in the area for their entire 8- or 12-hour shift to protect the material. [Name redacted] confirmed [name redacted] statement. Dr. Macievic asked [name redacted] if the guards had a special dosimeter for the assignment. [Name redacted] replied that the guards were not given the additional neutron dosimeter that the other workers were given. The RCTs came in, took the data, and left the area.</i> (pg. 4 of 11)</p> <p><i>[Name redacted] responded that the guards always wore TLDs and that was usually all they had. He recalled that at TA-8 the guards had been given special TLDs. The special TLDs were collected at the end of the shift. . .</i></p> <p><i>[Name redacted] responded that the special TLDs were issued near the end of operations at TA-8 (from 1999 to 2005) in addition to their regular TLD badges. The special TLDs were collected at the end of the shift. [Name redacted] asked if the guards recalled when the patrol perimeter was moved farther away from Building 23 after the Lab started reading the environmental TLDs after the bursts. He added that the special TLDs were not issued due to a policy change, but were used during the bursts.</i> (pg. 5 of 11)</p>		
<b>NIOSH Response/Consideration of Comment [NOTE SOURCES]:</b>		
Response from outreach meeting (ORAUT 2008a):		
<p><i>Dr. Macievic stated that this information [work practices, side-by-side with radiographers, remaining with material] would be a good example to include in his report and asked if the same practice was in place during the 1990s.</i></p> <p><i>Dr. Macievic asked if there were area monitors in place for gamma ray exposures such as TLDs on the walls. . . Mr. Lewis asked if he recalled the names of any of the RCTs. Dr. Macievic explained that the RCTs' names can be used to find survey reports that may contain data to calculate radiation doses when there is an absence of internal and external dosimetry.</i> (pg. 2 of 11)</p>		

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*Dr. Macievic commented that LANL often changed the types of dosimetry badges and other monitoring methods from the beginning of operations up to the present time. He asked if the attendees could identify the time period when they were given the special TLDs.* (pg. 5 of 11)

**SC&A Observation/Comment:**

The commenters describe scenarios in which the guards had less protection (e.g., lead aprons), remained in proximity to materials and radiography equipment for longer periods, and did not have comparable external dosimetry as RCTs and operational workers. NIOSH expressed interest in details of guards' working conditions and in obtaining additional information (e.g., area dosimeters and coworker results) to support estimates of exposures to unmonitored workers. SC&A did not identify specific follow-up or conclusions regarding these concerns.

NIOSH has indicated that reconstruction of external dose is feasible after 1975.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Documentation of consideration/investigation of the SEC petition for support service workers is dominated by issues affecting feasibility of internal dose reconstruction. Feasibility of external dose reconstruction has been evaluated primarily for the entire LANL population (not specific to support service workers's). The NIOSH Evaluation Comment did not respond to the SC&A Observation regarding NIOSH investigation of these concerns.

Disposition: Inconclusive. Issues specifically pertaining to external dose reconstruction for security guards may not have been fully addressed or investigated; they have not been incorporated into technical documents.

NIOSH responsiveness to the substance of the comment is uncertain.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 77	<b>Source of Comment:</b> OTS-16, 6:30 p.m.: <i>SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008f)</i> September 16, 2008	<b>Commenter:</b> Not identified [multiple]
<b>Comment:</b>		
<p><i>[Name redacted] stated that in the early 1980s many of the guards patrolled inside the facilities at DP site without personal protective equipment (PPE). The guards went into the glovebox areas where high radiation signs were posted without the booties and smocks that were worn by production workers. The guards had to check in hourly at Detex clocks at certain doors and storage vaults throughout the facility.</i></p> <p><i>Dr. Macievic asked if [name redacted] could recall any specific locations or years. [Name redacted] stated the [sic] he recalled that Posts 310, 315, and 316 were located in the area. [Name redacted] recalled that the material was stored in Buildings 1 and 2 in TA-21.</i></p> <p><i>Another attendee recalled that guards checked in at Detex clocks in PF4 and patrolled in that area for the entire night shift. [Name redacted] stated that the guards wore lab coats and booties in that facility. (pg. 1 of 6)</i></p> <p><i>[Name redacted] commented that safety has improved 100% since those times, including the increased presence of RCTs who monitor the time limits for employees in the radiation areas. Dr. Macievic asked if the number of RCTs has remained about the same over time. [Name redacted] responded that one RCT may have covered a large area in the earlier years but now there is an RCT for nearly every job at the Lab – including a “mini-army” in TA-55.</i></p> <p><i>[Name redacted] addressed a topic that had recurred throughout the day: guards who were assigned to protect material in the machine shop in Building 102 did not have the same PPE as the machinists. The guards wore only booties, while the machinists who machined beryllium, uranium, and other materials wore lab coats, booties, and masks. [Name redacted] confirmed [Name redacted] statement.</i></p> <p><i>[Name redacted] stated that the Lab recently determined that the guards do not need to wear lab coats at the plutonium facility (PF4) even though everyone else in the facility is required to wear appropriate PPE. The Lab told the guards that their job classification does not require PPE other than booties in the PF4 facility. The recent finding is based on a study of the guards’ assignments in other areas. Dr. Macievic asked if the guards had worn PPE in that facility during the early 1980s. [Name redacted] responded that they had worn PPE then, but were going into different areas of the facility to check the Detex clocks. The guards’ present assignments in that area confine them mostly to “clean” areas. [Name redacted] said that the Lab’s report also notes that the smocks may interfere with tactical equipment the guards might wear during an event. Dr. Macievic commented that he is interested in seeing the report since it may provide recent information regarding how “clean” the areas are now as compared with historical data.</i></p> <p><i>[Name redacted] responded that the union had received a letter from the Lab summarizing the study less than a month ago. [Name redacted] noted that the postings in the area say that all personnel must wear PPE and do not make an exception for the guards. [Name redacted] stated that he was told that the postings will be changed.</i></p> <p><i>Dr. Macievic asked if postings in the early 1980s had numbers reflecting the radiation levels. [Name redacted] said that the postings only gave the level of radiation (for example, High Radiation Area). (pp. 2–3 of 6)</i></p>		

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**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from outreach meeting (ORAUT 2008f, pg. 3 of 6):

*Dr. Macievic commented that he now has a better picture of the LANL guards' activities; because LANL has more high-security materials, their duties take them into high radiation areas more than guards at some other DOE facilities.*

[Refer to Comment 57 for NIOSH Response/Consideration of internal dose assessment for support service workers.]

**SC&A Observation/Comment:**

The commenters describe changes in areas patrolled, PPE, contamination control, and RCT coverage from the early 1980s to 2008. NIOSH expressed interest in details of guards' working conditions and in obtaining additional information, such as a recent report evaluating the need for PPE in areas of PF4 patrolled by the guards. SC&A did not identify specific follow-up or conclusions regarding these concerns.

SC&A queried the SRDB for "guards," "PF4," and "2008." The "recent report" mentioned by the commenter was not identified. Similar information from an earlier period was identified; NIOSH retrieved a 1978 procedure for security guards patrolling the TA-55 plutonium facility after hours (SRDB 54501). This procedure describes required training, dosimeter badge, urinalysis, PPE, and self-survey practices for security guards assigned to the plutonium facility.

As noted for Comment 57, potential unmonitored exposures for support service workers were acknowledged in outreach meetings and the Work Group review process. NIOSH's recommendations of LANL SEC classes are based on the inability to differentiate exposure potential between workers in various jobs and assigned locations. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition: General issues were investigated for all LANL workers. Follow-up specific to the commenter's information was not identified. Limited incorporation of support service workers' concerns in technical documents. Ongoing investigation of post-1995 period.

NIOSH was responsive to the substance of the comment in a general sense.

NIOSH representatives at the Outreach Meeting expressed an interest in further investigation of this issue, but no follow-up Action Item was recorded in WISPR.

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<b>Category:</b> Worker Protections and Monitoring		
<b>Comment Number:</b> 78	<b>Source of Comment:</b> OTS-18: SEC Worker Outreach Meeting for the Los Alamos National Laboratory (LANL) (ORAUT 2008b) September 17, 2008	<b>Commenter:</b> Not identified Loretta Valerio
<p><b>Comment:</b></p> <p><i>[Name redacted] stated that before the Tiger Team investigation, construction trades workers were often sent into “hot” areas unmonitored and without protective clothing. After the investigation, they were not always monitored but were required to wear booties and smocks in many of the same areas where they previously had worked without protective equipment. [Name redacted] added that a rope or line was often the only thing that distinguished a “hot” area from a clean one. (pg. 2 of 11)</i></p> <p><i>Dr. Macievic asked if RWPs were posted for all of their jobs. The attendees responded that there were RWPs most of the time. [Name redacted] stated that when the pipefitters cut into pipe they suited up and wore respirators for jobs that had limits ranging from five minutes to five hours. (pg. 4 of 11)</i></p> <p><i>Some of the attendees described their experiences:</i></p> <ul style="list-style-type: none"> <li>• <i>[Name redacted] recalled being scrubbed several times after a contamination event but still having a “hot spot” on his hand. The RCT told him to wear a glove home so he could “sweat the rest of it out.”</i></li> <li>• <i>[Name redacted] stated that he went home with a “hot” boot in 1994 or 1995. LANL sent RCTs to his home to take 100 swipes. They also checked his truck for contamination as well as every place he had been that day. He told Dr. Macievic that he had been removing equipment and piping in TA-50 and there was a spill. The RCT who was with him said that it was not a “hot” job, but the count on the floor swipe was over one million dpm (disintegrations per minute). He was not wearing booties. The count on the sink trap was a half million dpm. He was working less than a foot away from the sink trap and was not wearing a respirator. He had not been wearing booties or protective clothing. Dr. Macievic asked if he had left a bioassay sample. [Name redacted] responded that he had a whole body count but did not know the results.</i></li> <li>• <i>[Name redacted] also recalled working in the pump rooms at TA-55 for three or four hours at a time without a TLD so there was no way of knowing how “hot” it was. He recalled stripping down to his underwear when he exited but was told that he was not “hot.” [Name redacted] stated that he was wearing four sets of coveralls that were taped up with a rain suit over them.</i></li> <li>• <i>[Name redacted] commented that when he was assigned to TA-55, he worked next to the glovebox workers who wore lead shielding (aprons).</i></li> </ul> <p style="text-align: right;"><i>(pp. 6–7 of 11)</i></p> <p><i>Ms. Valerio stated that it took her almost a year to convince NMT that workers needed special respirators in the Evaporator Room. [Name redacted] stated that work assignments in that room required a full face respirator with an air supply.</i></p> <p><i>Dr. Macievic asked the attendees if they wore breathing zone samplers when they worked in high contamination areas. He also asked if the RCTs specified the need for special equipment based on the surveys for the RWPs. [Name redacted] responded that the RCTs issued the special equipment – for example, “the RCTs had a kind of heat exchanger that they put on us” when they worked in Room 401 with the glovebox and in the equipment room.</i></p> <p><i>Dr. Macievic asked when the dosimetry policy changed to the RCTs giving them dosimeters. [Name redacted] responded that the policy had changed slowly.</i></p>		

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*Dr. Macievic . . . asked if the nasal swipes were ever recorded. [Name redacted] responded that it depended on the job they were doing. He said that if he came out of the equipment room with 4 sets of coveralls and a rain suit and full face air supply, by the time he had stripped down to his underwear, there was never any contamination on his body even when the suit was contaminated.*

*[Name redacted] initiated a discussion about the RWP process. Dr. Macievic asked the attendees if it was common practice to have an RWP for every job. [Name redacted] responded that RWPs came later. He recalled that there were many jobs that they did not even have safety meetings or RWPs, up until approximately 2000. He stated that he worked in the construction zones where they did not do much maintenance work, but they did encounter “hot spots” where they were told to stay behind a tape or a line.*

*[Name redacted] . . . began working at LANL in May 1975. His first overtime weekend job was a few weeks later and a RCT was on the job site with them for spot checks. They were using a cutting torch so there was airborne material. Dr. Macievic noted that RWPs were not a common practice at the time. [Name redacted] stated that RWPs were not posted prior to the Tiger Team investigation.*

(pg. 8 of 11)

**NIOSH Response/Consideration of Comment [NOTE SOURCES]:**

Response from outreach meeting (ORAUT 2008b, pg. 8 of 11):

*Dr. Macievic confirmed that the contamination was just to the measuring instrument. He commented that tritium and some other radionuclides are able to penetrate protective equipment and cause contamination. He also noted that a gradual introduction of radiation protection measures probably indicates that the various groups and RCTs were able to make independent decisions about those measures.*

[Refer to Comment 64 for NIOSH Response/Consideration of exposure potential and dose reconstruction for construction trades workers.]

**SC&A Observation/Comment:**

The commenters describe work conditions, protective equipment, contamination control/response, and monitoring for CTWs at LANL. NIOSH representatives asked questions to clarify information. Evidence of specific follow-up was not identified, although the work descriptions and contamination incidents are at a level of detail that may not generally be reflected in technical documents.

As noted for Comment 64, NIOSH has considered potential unmonitored exposures for support service workers at LANL, although this consideration is not generally communicated in LANL technical documents. OTIB-0052 provides general guidance regarding bounding assumptions for unmonitored construction trades workers at all covered facilities. NIOSH is investigating internal monitoring concerns of support service workers in its ongoing review of the post-1995 period.

**NIOSH Evaluation Comment:**

NIOSH concurs with the SC&A Observation/Comment.

**SC&A Conclusion:**

Disposition:      General issues were investigated and partially incorporated in technical documents.  
                            Ongoing investigation.

NIOSH was responsive to the substance of the comments in a general sense.

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## REFERENCES FOR LANL WORKER OUTREACH COMMENT REVIEWS

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ABRWH 2011. *Work Group on Los Alamos National Laboratory*, Cincinnati Airport Marriott Hotel, Hebron, Kentucky, May 2, 2011.

ABRWH 2012a. *Work Group on Los Alamos National Laboratory*, Cincinnati Airport Marriott Hotel, Hebron, Kentucky, May 14, 2012.

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## **ADDENDUM: SUMMARY RESULTS FOR NIOSH CONSIDERATION OF TECHNICAL INFORMATION**

*SC&A presented the results of the LANL outreach review during a teleconference meeting of the Worker Outreach Work Group on June 5, 2014. The following tables are responsive to a participant's request for a breakdown of the aggregate results. Section numbers and headers are included to assist the reader in linking this tabulated information to the main report.*

### **4.1 INCORPORATION OF INFORMATION INTO TECHNICAL WORK DOCUMENTS**

Table A-1 presents SC&A's conclusions regarding NIOSH's incorporation of substantive issues into technical work documents.

**Table A-1. Summary Results for Incorporation of Information in Technical Documents**

<b>Incorporation into Technical Documents</b>	<b>Number of Comments</b>	<b>Percentages</b>
Yes	22 of 78	28%
General	16 of 78	21%
Partial	29 of 78	37%
No	11 of 78	14%
Uncertain	0 of 78	0%

### **4.2 INVESTIGATION OF TECHNICAL INFORMATION**

Table A-2 presents SC&A's conclusions regarding NIOSH's investigation of technical issues raised by commenters, within the limits of data available to SC&A for review.

**Table A-2. Summary Results for Investigation of Technical Information**

<b>Investigation of Technical Information</b>	<b>Number of Comments</b>	<b>Percentages</b>
Yes	35 of 78	45%
General	29 of 78	37%
Partial	5 of 78	6%
No	3 of 78	4%
Uncertain	6 of 78	8%

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### 4.3 NIOSH EVALUATION COMMENTS

As noted in Section 4.3, NIOSH concurred with the SC&A Observation for 50 of the 78 comments reviewed. The results in Table A-3 represent SC&A’s assessment of the remaining 28 NIOSH Evaluation Comments.

**Table A-3. Summary Results for NIOSH Evaluation Comments**

Responsiveness of NIOSH Evaluation Comments	Number of Comments	Percentages
Yes	18 of 28	64%
General	0 of 28	0%
Partial	6 of 28	21%
No	4 of 28	14%
Uncertain	0 of 28	0%

### 4.4 OVERALL NIOSH RESPONSIVENESS TO TECHNICAL INPUT

The results in Table A-4 represent SC&A’s assessment of these NIOSH’s overall responsiveness for the 78 comments evaluated.

**Table A-4. Summary Results for Overall NIOSH Responsiveness**

Overall NIOSH Responsiveness to Technical Issues	Number of Comments	Percentages
Yes	39 of 78	50%
General	27 of 78	35%
Partial	4 of 78	5%
No	2 of 78	3%
Uncertain	6 of 78	8%

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