

SEC Petition Evaluation Report Petition SEC-00170

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Site Expert(s):	N/A

Petitioner Administrative Summary

Petition Under Evaluation

Petition #	Petition Type	Petition A Receipt Date	DOE/AWE Facility Name
SEC-00170	83.14	April 23, 2010	Los Alamos National Laboratory

NIOSH-Proposed Class Definition

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 March 15, 1943 through December 31, 1975, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort.

Related Petition Summary Information

SEC Petition Tracking #(s)	Petition Type	DOE/AWE Facility Name	Petition Status
SEC-00051	83.13	Los Alamos National Laboratory	Class included in the SEC for 1943-1975

Related Evaluation Report Information

Report Title	DOE/AWE Facility Name
SEC Petition Evaluation Report for Petition SEC-00051	Los Alamos National Laboratory

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Evaluation Report Summary: SEC-00170, Los Alamos National Laboratory

This evaluation report by the National Institute for Occupational Safety and Health (NIOSH) addresses a class of employees proposed for addition to the Special Exposure Cohort (SEC) per the *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, 42 U.S.C. § 7384 *et seq.* (EEOICPA) and 42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*.

NIOSH-Proposed Class Definition

All employees of 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 March 15, 1943 through December 31, 1975, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

Feasibility of Dose Reconstruction Findings

NIOSH 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. NIOSH finds that it is likely feasible to reconstruct occupational medical dose for Los Alamos National Laboratory (LANL) workers with sufficient accuracy.

The NIOSH dose reconstruction feasibility findings are based on the following:

- Principal sources of internal and external radiation for members of the proposed class included exposures to plutonium, uranium, tritium, fission and activation products, transuranic radionuclides, nuclear reactors, linear accelerators, radiography equipment, and a wide variety of other radioactive materials.
- 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:

*Employees of the Department of Energy (DOE), its predecessor agencies, or DOE contractors or subcontractors **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) for a number of work days aggregating at least 250 work days from March 15, 1943 through December 31, 1975, or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort (DHHS, 2007).***

- 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.
- Pursuant to 42 C.F.R. § 83.13(c)(1), NIOSH determined that there is insufficient information to either: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the radiation doses of members of the class more precisely than a maximum dose estimate.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, 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.

Health Endangerment Determination

The NIOSH evaluation did not identify any evidence supplied by the petitioners or from other resources that would establish that the class was exposed to radiation during a discrete incident likely to have involved exceptionally high-level exposures, such as nuclear criticality incidents or other events involving similarly high levels of exposures. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of inadequately monitored radionuclides and from direct exposure to radioactive materials. Therefore, 42 C.F.R. § 83.13(c)(3)(ii) requires NIOSH to specify that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

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SEC Petition Evaluation Report for SEC-00170

ATTRIBUTION AND ANNOTATION: This is a single-author document. All conclusions drawn from the data presented in this evaluation were made by the ORAU Team Lead Technical Evaluator: Chris Miles, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.

1.0 Purpose and Scope

This report evaluates the feasibility of reconstructing doses for employees who worked at a specific facility during a specified time. It provides information and analysis germane to considering a petition for adding a class of employees to the Congressionally-created SEC.

This report does not make any determinations concerning the feasibility of dose reconstruction that necessarily apply to any individual energy employee who might require a dose reconstruction from NIOSH, with the exception of the employee whose dose reconstruction could not be completed, and whose claim consequently led to this petition evaluation. The finding in this report is not the final determination as to whether or not the proposed class will be added to the SEC. This report will be considered by the Advisory Board on Radiation and Worker Health (the Board) and by the Secretary of Health and Human Services (HHS). The Secretary of HHS will make final decisions concerning whether or not to add one or more classes to the SEC in response to the petition addressed by this report.

This evaluation, in which NIOSH provides its findings both on the feasibility of estimating radiation doses of members of this class with sufficient accuracy and on health endangerment, was conducted in accordance with the requirements of EEOICPA and 42 C.F.R. § 83.14.

2.0 Introduction

Both EEOICPA and 42 C.F.R. pt. 83 require NIOSH to evaluate qualified petitions requesting that the Department of Health and Human Services add a class of employees to the SEC. The evaluation is intended to provide a fair, science-based determination of whether it is feasible to estimate, with sufficient accuracy, the radiation doses of the proposed class of employees through NIOSH dose reconstructions.¹

NIOSH is required to document its evaluation in a report, and to do so, relies upon both its own dose reconstruction expertise as well as technical support from its contractor, Oak Ridge Associated Universities (ORAU). Once completed, NIOSH provides the report to both the petitioners and the Advisory Board on Radiation and Worker Health. The Board will consider the NIOSH evaluation report, together with the petition, comments of the petitioner(s) and such other information as the Board considers appropriate, to make recommendations to the Secretary of HHS on whether or not to add one or more classes of employees to the SEC. Once NIOSH has received and considered the advice of the Board, the Director of NIOSH will propose a decision on behalf of HHS. The Secretary

¹ NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 C.F.R. pt. 82 and the detailed implementation guidelines available at <http://www.cdc.gov/niosh/ocas>.

of HHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Board, and the proposed decision issued by NIOSH. As part of this final decision process, the petitioner(s) may seek a review of certain types of final decisions issued by the Secretary of HHS.²

3.0 NIOSH-Proposed Class Definition and Petition Basis

The NIOSH-proposed class 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 March 15, 1943 through December 31, 1975, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort. During this period, employees at this facility were involved with research and development, testing of the nuclear weapons lifecycle, strategic defense research, development of arms control and treaty verification technology, energy research, atmospheric sciences, and nuclear waste research.

The evaluation responds to Petition SEC-00170, which was submitted by an EEOICPA claimant whose dose reconstruction could not be completed by NIOSH due to a lack of sufficient dosimetry-related information. NIOSH's determination that it is unable to complete a dose reconstruction for an EEOICPA claimant is a qualified basis for submitting an SEC petition pursuant to 42 C.F.R. § 83.9(b).

There is currently a class of LANL workers associated with the previous NIOSH evaluation of SEC petition SEC-00051, for which the Secretary of DHHS has designated inclusion in the Special Exposure Cohort:

*Class added to the SEC effective July 22, 2007 (DHHS, 2007): Employees of the Department of Energy (DOE), its predecessor agencies, or DOE contractors or subcontractors **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) for a number of work days aggregating at least 250 work days from March 15, 1943 through December 31, 1975, or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort.*

Detailed information associated with the worker class added to the SEC in 2007 can be found in the NIOSH evaluation report, *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)*, as well as Addendum-1 and Addendum-2 of this same report (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c). This SEC class, previously proposed by NIOSH (NIOSH, 2007c), was based on inadequate monitoring for internal exposures to various radionuclides of concern during the proposed time period. The associated SEC class designated by the DHHS was based on the NIOSH determination at that time, based on the information at hand, that employee work locations would be sufficiently well known, such that an assessment could be made regarding whether or not an employee received exposures "... while working in operational Technical Areas with a history of radioactive material use ..." (NIOSH, 2007c).

² See 42 C.F.R. pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available at <http://www.cdc.gov/niosh/ocas>.

In the course of its on-going dose reconstruction and continued data capture efforts, NIOSH has determined that 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. 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 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.

4.0 Radiological Operations Relevant to the Proposed Class

The following subsections summarize the radiological operations at LANL from March 15, 1943 through December 31, 1975, and the information available to NIOSH to characterize particular processes and radioactive source materials. Using available sources, NIOSH has attempted to gather process and source descriptions, information regarding the identity and quantities of radionuclides of concern, and information describing processes through which the radiation exposures of concern may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is meant only to be a summary of the available information.

Unless otherwise indicated, information for Section 4.0 and its subsections was obtained from *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)* and *Addendum-1* and *Addendum-2* of this same report (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c).

4.1 Operations Description

This section summarizes the operations performed at LANL that are relevant to the proposed SEC time period. Detailed information associated with the operations at LANL can be found in the NIOSH evaluation report, *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)* and *Addendum-1* and *Addendum-2* of this same report (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c). Additional information can also be found in the six LANL technical basis documents, collectively referred to as ORAUT-TKBS-0010.

The LANL laboratory initially had a single mission, which was the design and manufacture of the first nuclear weapons. This mission involved a great deal of both experimental and theoretical research, particularly with regard to fission of uranium-235 and plutonium-239 by neutrons and the production of fission products. Related work was also performed on the chemistry, metallurgy, preparation, and assembly of the weapons' nuclear components. LANL was charged with fabricating the fissile components of the weapons, which included machining metallic plutonium and uranium to exacting tolerances. Neutronics studies required construction of two small test reactors and a number of critical facilities. In addition, a great deal of non-radiological work was carried out involving high explosives and other ancillary weapons components. In 1946, responsibility for the lab was transferred from the military to the newly-created civilian Atomic Energy Commission (AEC).

By mid-1947, there was a resurgence of activity at the then-renamed Los Alamos Scientific Laboratory (LASL). Aided by a large construction budget the following year, a much more broadly-defined mission included the development of fast neutron reactors and thermonuclear weapons research. These projects brought with them new radiological concerns, specifically doses from neutrons and tritium. Los Alamos remained the lead facility for the fabrication of nuclear components for weapons until 1949, when the Plutonium Finishing Plant at the Hanford site began making the central cores for nuclear devices. However, LASL remained a back-up production facility. In addition, the Los Alamos laboratory designed, developed, and fabricated nuclear components for test devices, a function that has continued throughout its lifetime. Furthermore, LASL's work broadened to include a wide spectrum of radiologically-related research and operational activities. Weapons development and testing remained central; however, the broadened mission also included fission product studies, isotope applications, reactors, and advanced accelerators, such as the Los Alamos Meson Physics Facility (LAMPF), Project Sherwood, and the Kiwi reactor program assigned to the laboratory in 1957.

The large scope and wide breadth of site activities involving radiation and radioactive materials also include early biomedical studies of tritium and plutonium, experimental application of mesons to medical therapy, fission product studies, dynamic testing of uranium, neutron cross-section measurements, source development, criticality studies, reactor developments, and controlled fusion. These are but a few of the more significant radiologically-related activities carried out over the years.

To accomplish its mission, LANL was divided into a number of physically separate Technical Areas that spread in time over a relatively large area. At least 75 numbered Technical Areas have been identified at LANL, although some of them had no history of radioactive material use.

4.2 Radiation Exposure Potential from Operations

The potential for external radiation dose existed in all Technical Areas where radioactive materials or radiation-generating devices were present. Based on the site operations outlined in Section 4.1, sources of exposure included beta, gamma, and neutron radiation emitted from a wide variety of radioactive materials and radiation generating devices.

The primary sources of internal radiation exposure at the site were airborne and surface contamination generated during operations involving radioactive material usage. Many of the radioactive source materials handled at LANL were alpha particle emitters. The primary alpha-emitting radionuclides of concern included weapons-grade plutonium (i.e., plutonium-239, plutonium-240); polonium-210; and uranium in varying isotopic abundances of uranium-234, uranium-235, and uranium-238. Lesser quantities of plutonium-238, americium-241, thorium-232, radium-226, uranium-233, curium-244, and various other alpha emitters were used in various projects.

The potential for exposure to tritium and mixed fission and activation products also existed from operations performed at LANL. Large quantities of tritium were used in the development of thermonuclear weapons. Potential for fission product exposures existed with accelerator and reactor operations, handling and analyses of weapon-testing shot samples, biomedical research, research and development activities, safeguards and security programs, miscellaneous laboratory analyses, and from waste management research operations.

Additional information regarding the radioisotopes, work areas, and operations associated with radiation exposures at LANL can be found in the NIOSH evaluation report, *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)*, as well as *Addendum-1* and *Addendum-2* of this same report (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c).

4.3 Time Period Associated with Radiological Operations

Per the DOE Office of Health, Safety and Security, the time period associated with DOE operations at LANL is from 1942 through present. As presented in Section 3.0 of this report, in 2007, DHHS designated that a class of LANL workers during the period from March 15, 1943 through December 31, 1975, be included in the SEC. The start date of March 15, 1943 was selected for the 2007 designated class because it is the date that the LANL Laboratory Director, J. Robert Oppenheimer, and a few of his staff first arrived at the site. Work with radioactive materials or other radiation sources would not have begun prior to that date. The end date for the class, December 31, 1975, is the date after which the LANL internal dosimetry program was fully developed, with *in vivo* monitoring capabilities for mixed fission and activation products (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c). The period of radiological operations associated with this evaluation remains the same as that associated with the previously designated class for SEC-00051. Accordingly, the time period for this evaluation report on LANL exposures remains March 15, 1943 through December 31, 1975.

4.4 Site Locations Associated with Radiological Operations

A component of the basis for the SEC class designated in 2007, was that employee work locations would be sufficiently well known, such that an assessment could be made regarding whether or not an employee received exposures "... *while working in operational Technical Areas with a history of radioactive material use ...*" NIOSH has since found that, due to undocumented worker movements across the site and limited claimant-specific information pertaining to work locations, a determination cannot always be made as to whether or not an employee worked in Technical Areas with a history of radioactive material use. NIOSH is therefore unable to define individual worker exposure scenarios based on specific work locations within the LANL site during the period under evaluation.

4.5 Job Descriptions Affected by Radiological Operations

NIOSH has determined that the site-specific and claimant-specific data available for LANL for the time period under evaluation are insufficient to allow NIOSH to determine that any specific work group was not potentially exposed to radioactive material releases or possible subsequent contamination. NIOSH has insufficient information associating job titles and/or job assignments with specific radiological operations or conditions. Without such information, NIOSH is unable to define potential radiation exposure conditions based on worker job descriptions.

5.0 Summary of Available Monitoring Data for the Proposed Class

The primary data used for determining internal exposures are derived from personal monitoring data, such as urinalyses, fecal samples, and whole-body counting results. If these are unavailable, the air monitoring data from breathing zone and general area monitoring are used to estimate the potential internal exposure. If personal monitoring and breathing zone area monitoring are unavailable, internal

exposures can sometimes be estimated using more general area monitoring, process information, and information characterizing and quantifying the source term.

This same hierarchy is used for determining the external exposures to the cancer site. Personal monitoring data from film badges or thermoluminescent dosimeters (TLDs) are the primary data used to determine such external exposures. If there are no personal monitoring data, exposure rate surveys, process knowledge, and source term modeling can sometimes be used to reconstruct the potential exposure.

A more detailed discussion of the information required for dose reconstruction can be found in OCAS-IG-001, *External Dose Reconstruction Implementation Guideline*, and OCAS-IG-002, *Internal Dose Reconstruction Implementation Guideline*. These documents are available at: <http://www.cdc.gov/niosh/ocas/ocasdose.html>.

5.1 Data Capture Efforts and Sources Reviewed

As a standard practice, NIOSH completed an extensive database and Internet search for information regarding LANL. The database search included the DOE Legacy Management Considered Sites database, the DOE Office of Scientific and Technical Information (OSTI) database, the Energy Citations database, the Atomic Energy Technical Report database, and the Hanford Declassified Document Retrieval System. In addition to general Internet searches, the NIOSH Internet search included OSTI OpenNet Advanced searches, OSTI Information Bridge Fielded searches, Nuclear Regulatory Commission (NRC) Agency-wide Documents Access and Management (ADAMS) web searches, the DOE Office of Human Radiation Experiments website, and the DOE-National Nuclear Security Administration-Nevada Site Office-search.

Detailed information regarding NIOSH's data capture efforts for the LANL site can be found in the related NIOSH evaluation report and addenda for SEC-00051 (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c). NIOSH's SRDB currently contains over 6,000 documents and subdocuments associated with the LANL site. The following subsections summarize the data sources identified and reviewed by NIOSH.

5.2 Worker Interviews

To obtain additional information in support of its 2007 evaluation of Petition SEC-00051, NIOSH interviewed several current and former LANL employees. Details regarding these interviews may be found in the LANL evaluation report for SEC-00051 (NIOSH, 2007a). Additional interviews for the specific purpose of supporting this evaluation were not deemed necessary, and were therefore not conducted.

5.3 Internal Personnel Monitoring Data

To support dose reconstruction and its evaluation of SEC-00051, NIOSH and its contractor worked together with LANL staff to create a comprehensive bioassay database. This database contains over 100,000 *in vivo* bioassay counting records and over 500,000 *in vitro* bioassay records. These data are presented in an ORAU Team document titled, *Los Alamos National Laboratory Bioassay Repository Database* (ORAUT-OTIB-0063).

In its evaluation of SEC-00051, NIOSH found that these available internal monitoring data were not of sufficient number, or sufficient detail to quantify potential exposures to all radionuclides with sufficient accuracy. Specifically, the SEC-00051 petition evaluation report and addenda concluded that, prior to 1976, internal dose reconstruction to fission and activation products and various other radionuclides of concern was not possible.

Additional information regarding the quantity and condition of the LANL internal personnel monitoring data available to NIOSH, and the NIOSH evaluation of such data, can be found in the NIOSH evaluation report and addenda for SEC-00051 (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c), and the LANL site profile, *Los Alamos National Laboratory – Occupational Internal Dose* (ORAUT-TKBS-0010-5).

5.4 External Personnel Monitoring Data

To support dose reconstruction, NIOSH identified personnel external monitoring data going back to 1943, as well as documentation describing LANL monitoring programs. In its evaluation of SEC-00051, NIOSH concluded that external monitoring data are of sufficient quantity and quality to support external dose reconstructions of gamma and neutron radiation after 1945. It also concluded that data are sufficient to allow reconstruction of external beta dose for all years after 1948.

Additional information regarding the quantity and condition of the LANL external personnel monitoring data available to NIOSH, and the NIOSH evaluation of such data, can be found in the related LANL evaluation report and addenda for SEC-00051 (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c), and the LANL site profile, *Los Alamos National Laboratory – Occupational External Dose* (ORAUT-TKBS-0010-6).

5.5 Workplace Monitoring Data

To support dose reconstruction and its evaluation of SEC-00051, NIOSH obtained air monitoring data for a limited number of specific buildings/areas for the time period from 1945 through 1971. NIOSH has determined that these data are insufficient to adequately bound potential intakes to all personnel in the absence of personnel monitoring data.

Additional information regarding the quantity and condition of the LANL workplace monitoring data available to NIOSH, as well as the NIOSH evaluation of such data, can be found in the related LANL evaluation report and addenda for SEC-00051 (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c).

5.6 Radiological Source Term Data

Sources of radiation doses to members of the evaluated class included, but were not limited to, plutonium, uranium, tritium, fission and activation products, transuranic radionuclides, nuclear reactors, linear accelerators, and radiography equipment. The source term and activity data available to NIOSH are inadequate for the performance of sufficiently accurate dose reconstructions in the absence of personnel or workplace monitoring data.

Additional information regarding the LANL source term data available to NIOSH can be found in the related LANL evaluation report and addenda for SEC-00051 (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c), and the LANL site profile documents.

6.0 Feasibility of Dose Reconstruction for the Proposed Class

42 C.F.R. § 83.14(b) states that HHS will consider a NIOSH determination that there was insufficient information to complete a dose reconstruction, as indicated in this present case, to be sufficient, without further consideration, to conclude that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy.

In the case of a petition submitted to NIOSH under 42 C.F.R. § 83.9(b), NIOSH has already determined that a dose reconstruction cannot be completed for an employee at the DOE or AWE facility. This determination by NIOSH provides the basis for the petition by the affected claimant. Per § 83.14(a), the NIOSH-proposed class defines those employees who, based on completed research, are similarly affected and for whom, as a class, dose reconstruction is similarly not feasible.

In accordance with § 83.14(a), NIOSH may establish a second class of co-workers at the facility for whom NIOSH believes that dose reconstruction is similarly infeasible, but for whom additional research and analysis is required. If so identified, NIOSH would address this second class in a separate SEC evaluation rather than delay consideration of the claim currently under evaluation (see Section 10). This would allow NIOSH, the Board, and HHS to complete, without delay, their consideration of the class that includes a claimant for whom NIOSH has already determined a dose reconstruction cannot be completed, and whose only possible remedy under EEOICPA is the addition of a class of employees to the SEC.

This section of the report summarizes research findings by which NIOSH determined that it lacked sufficient information to complete the relevant dose reconstruction and on which basis it has defined the class of employees for which dose reconstruction is not feasible. NIOSH's determination relies on the same statutory and regulatory criteria that govern consideration of all SEC petitions.

6.1 Feasibility of Estimating Internal Exposures

NIOSH has evaluated the available personnel and workplace monitoring data and source term information and has determined that there are insufficient data for estimating internal exposures, as described below.

As presented in Section 3.0 of this report, there is currently a class of LANL workers associated with the previous NIOSH evaluation of SEC petition SEC-00051, for which the Secretary of DHHS has designated inclusion in the SEC (DHHS, 2007). This existing SEC class was based on inadequate monitoring for internal exposures to various radionuclides of concern during the period from March 15, 1943 through December 31, 1975, and included only those employees "... *who were monitored, or should have been monitored, for radiological exposures while working in operational Technical Areas with a history of radioactive material use ...*" (NIOSH, 2007c). This class description was based on the NIOSH determination at that time, based on the information at hand, that employee work locations would be sufficiently well known, such that an assessment could be made regarding whether or a not

an employee received exposures “... *while working in operational Technical Areas with a history of radioactive material use ...*”

In the course of its on-going dose reconstruction and continued data capture efforts, NIOSH has determined that 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 an 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 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.

Consistent with its findings associated with petition SEC-00051, NIOSH has determined that it does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential internal exposures to fission and activation products, and various other radionuclides of concern potentially received at LANL during the period from March 15, 1943 through December 31, 1975. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures to fission and activation products and resulting doses for the class of employees covered by this evaluation.

Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from March 15, 1943 through December 31, 1975, 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 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.

6.2 Feasibility of Estimating External Exposures

This evaluation responds to a petition based on NIOSH determining that internal radiation exposures to fission and activation products and various other radionuclides of concern could not be reconstructed for a dose reconstruction referred to NIOSH by the Department of Labor (DOL). As noted above, HHS will consider this determination to be sufficient without further consideration to determine that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy. Consequently, it is not necessary for NIOSH to fully evaluate the feasibility of reconstructing external radiation exposures for the class of workers covered by this report.

In its previous evaluation of petition SEC-00051, NIOSH concluded that for periods after 1975, it has access to sufficient information to either: (1) estimate the maximum external radiation dose for every type of cancer for which radiation doses are reconstructed that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the external radiation doses to members of the class more precisely than a maximum dose estimate. This current evaluation has found no evidence to the contrary.

Adequate reconstruction of medical dose is likely to be feasible by using claimant-favorable assumptions in the technical information bulletin, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006), and LANL technical basis documents, collectively referred to as ORAUT-TKBS-0010.

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.

6.3 Class Parameters Associated with Infeasibility

DHHS has designated an SEC class for LANL workers for the period from March 15, 1943 through December 31, 1975 (DHHS, 2007). The time period covered by this current report is the same as that previously designated by DHHS in 2007. NIOSH therefore recommends that the class include the period from March 15, 1943 through December 31, 1975.

As discussed in Section 4.4, 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.

NIOSH has insufficient information associating job titles and/or job assignments with specific radiological operations or conditions. Without such information, NIOSH is unable to define potential radiation exposure conditions based on worker job descriptions. NIOSH therefore recommends that the class include all workers during the specified time period.

7.0 Summary of Feasibility Findings for Petition SEC-00170

This report evaluates the feasibility for completing dose reconstructions for employees at LANL from March 15, 1943 through December 31, 1975. NIOSH determined that members of this class may have received radiation exposures from fission and activation products. NIOSH lacks sufficient information, which includes fission product bioassay, source term data, and workplace monitoring data, which would allow it to estimate the potential fission and activation products exposures to which the proposed class may have been exposed.

NIOSH has documented herein that it cannot complete the dose reconstructions related to this petition. The basis of this finding demonstrates that NIOSH does not have access to sufficient information to estimate either the maximum radiation dose incurred by any member of the class or to estimate such radiation doses more precisely than a maximum dose estimate.

Consistent with its findings associated with SEC-00051 (NIOSH, 2007a; NIOSH, 2007b; NIOSH, 2007c), NIOSH finds that it is not feasible to estimate, with sufficient accuracy, the total radiation dose received by members of the proposed class of employees. Adequate reconstruction of medical

dose is likely to be feasible by using claimant-favorable assumptions in ORAUT-OTIB-0006, as well as LANL technical basis documents, collectively referred to as ORAUT-TKBS-0010.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, 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.

8.0 Evaluation of Health Endangerment for Petition SEC-00170

The health endangerment determination for the class of employees covered by this evaluation report is governed by EEOICPA and 42 C.F.R. § 83.14(b) and § 83.13(c)(3). Pursuant to these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. The regulations require NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has not been established, then NIOSH is required to specify that health was endangered for those workers who were employed for a number of work days aggregating at least 250 work days within the parameters established for the class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

NIOSH has determined that members of the class were not exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of a fission and activation products, and various other radionuclides of concern. Consequently, NIOSH is specifying that health was endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

9.0 NIOSH-Proposed Class for Petition SEC-00170

The evaluation defines a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. This class 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 March 15, 1943 through December 31, 1975, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort.

10.0 Evaluation of Second Similar Class

In accordance with § 83.14(a), NIOSH may establish a second class of co-workers at the facility, similar to the class defined in Section 9.0, for whom NIOSH believes that dose reconstruction may not be feasible, and for whom additional research and analyses is required. If a second class is identified, it would require additional research and analyses. Such a class would be addressed in a separate SEC evaluation rather than delay consideration of the current claim. At this time, NIOSH has not identified a second similar class of employees at LANL for whom dose reconstruction may not be feasible.

11.0 References

42 C.F.R. pt. 81, *Guidelines for Determining the Probability of Causation Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule, Federal Register/Vol. 67, No. 85/Thursday, p 22,296; May 2, 2002; SRDB Ref ID: 19391

42 C.F.R. pt. 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 2, 2002; SRDB Ref ID: 19392

42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 28, 2004; SRDB Ref ID: 22001

42 U.S.C. §§ 7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*; as amended; DCAS website

DHHS, 2007, *HHS Designation of Additional Members of the Special Exposure Cohort Designating a Class of Employees from Los Alamos National Laboratory (LANL) Los Alamos, New Mexico*; Department of Health and Human Services (DHHS); June 22, 2007; SRDB Ref ID: 48179

NIOSH, 2007a, *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)*; National Institute for Occupational Safety and Health (NIOSH); February 1, 2007; SRDB Ref ID: 41108, pp. 16-132

NIOSH, 2007b, *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)-Addendum 1*; National Institute for Occupational Safety and Health (NIOSH); May 3, 2007; SRDB Ref ID: 41108, pp. 12-15

NIOSH, 2007c, *SEC Petition Evaluation Report for Petition SEC-00051, Los Alamos National Laboratory (LANL)-Addendum 2*; National Institute for Occupational Safety and Health (NIOSH); June 4, 2007; SRDB Ref ID: 41108, pp. 2-11

ORAUT-OTIB-0006, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures*, Rev. 03 PC-1; ORAU Team Dose Reconstruction Project for NIOSH; December 21, 2005; SRDB Ref ID: 20220

ORAUT-OTIB-0063, *Los Alamos National Laboratory Bioassay Repository Database*, Rev. 00; ORAU Team Dose Reconstruction Project for NIOSH; August 24, 2009; SRDB Ref ID: 73101

ORAUT-TKBS-0010-1, *Technical Basis Document for Los Alamos National Laboratory-Introduction*, Rev. 00; ORAU Team Dose Reconstruction Project for NIOSH; January 25, 2005; SRDB Ref ID: 19560

ORAUT-TKBS-0010-2, *Technical Basis Document for Los Alamos National Laboratory-Site Description*, Rev. 00; ORAU Team NIOSH Dose Reconstruction Project; May 7, 2004; SRDB Ref ID: 19561

ORAUT-TKBS-0010-3 *Technical Basis Document for Los Alamos National Laboratory-Occupational Medical Dose*, Rev. 00; ORAU Team Dose Reconstruction Project for NIOSH; December 29, 2004; SRDB Ref ID: 19562

ORAUT-TKBS-0010-4 *Technical Basis Document for Los Alamos National Laboratory-Occupational Environmental Dose*, Rev. 00; ORAU Team Dose Reconstruction Project for NIOSH; October 8, 2004; SRDB Ref ID: 19564

ORAUT-TKBS-0010-5 *Technical Basis Document for Los Alamos National Laboratory-Occupational Internal Dose*, Rev. 01; ORAU Team Dose Reconstruction Project for NIOSH; October 15, 2009; SRDB Ref ID: 74987

ORAUT-TKBS-0010-6 *Technical Basis Document for Los Alamos National Laboratory-Occupational External Dose*, Rev. 02; ORAU Team Dose Reconstruction Project for NIOSH; November 23, 2009; SRDB Ref ID: 77688