NEVADA TEST SITE SPECIAL EXPOSURE COHORT PETITION

SUBMITTED:
February 5, 2007

PETITIONERS:

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1 Nevada Test Site Building Trades Medical Screening Program: Summary Of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

2 NIOSH Responses to S. Cohen & Associates Comments: Draft Review of the NIOSH Site Profiel for the Nevada Test Site, SCA–TR-TASK1-0006, dated 12/31/05

3 Job Titles and Job Duties: Documents provided but the National Nuclear Security Administration

4 Affidavit of

5 Affidavit of

6 Affidavit of

7 Affidavit of

8 Email correspondence from regarding SC&As findings on the NTS Site Profile, dated February 23, 2006.

9 Anspaugh, Lynn. The Resuspension Pathway for Nevada Test Site Workers. Sanford Cohen & Associates. October 8, 2006 (Revision 3)

10 Affidavit of

11 Affidavit of

12 Affidavit of

13 Affidavit of

14 Statement of

15 Statement of

16 *Test Site Workers' Records Dumped* Las Vegas Review-Journal (Nevada), September 25, 2006 Monday, B; Pg. 1B, 1303 words, Keith Rogers

17 Anspaugh, Lynn R., et. al. "Movement of Radionuclides in terrestrial Ecosystems by Physical Processes." Health Physics. Vol. 82, No. 5., May 2002. 669-79.

18 Anspaugh, Lynn R. Technical Basis for Dose Reconstruction. Virginia: Lawrence Livermore National Laboratory, UCRL-JC-123714. 31 Jan. 1996.

19 Anspaugh, Lynn R. Introduction to Section II and Overview of Dose Reconstruction: Lessons Learned from Studies in the U.S. California: Lawrence Livermore National Laboratory. UCRL-JC-126357. Jan. 1997.

20 Boice, John D., et. al. "A Comprehensive Dose Reconstruction Methodology for Former Rocketdyne/Atomics International Radiation Workers." Health Physics. Vol. 90, No.5, May 2006. 409-430.

21 Layton, David, et. al. Risk Assessment of Soil-Based Exposures to Plutonium at Experimental Sites Located on the Nevada Test Site and Adjoining Areas. California: Lawrence Livermore National Laboratory. UCRL-ID-113605. June 1993.

22 Martell, E.A. "Iodine-131 Fallout from Underground Tests." Science. New Series, Vol. 143, No. 3602, 10 Jan. 1964. 126-129.

23 McArthur, R.D. Radionuclides in the Surface Soil at the Nevada Test Site. Desert Research Institute, DOE/NV/10845-02. Nevada Office: 1991.

24 Rodgers, John, et. al. Performance Evaluation of LANL Environmental Radiological Air Monitoring Inlets at High Wind Velocities Associated with Resuspension. Los Alamos National Laboratory, LA-UR-00-3091.

PETITIONER INFORMATION

Petitioner 1/ Lead Petitioner:

B.1
B.2 SSN:
B.3 Address:

B.4 Home Phone:
Cell Phone:
B.5 Email:
B.6 Relationship to Employee:

Petitioner 2:

C.1
C.2 N/A
C.3 SSN:
C.4 Address:

C.5 Home Phone:
C.6 N/A
C.7 Employment Information Relevant to Petition:
- C.7a Employee Number:
- C.7b Dates of Employment:
- C.7c Employer Name: REECo
- C.7d Work Site Location:
- C.7e Supervisors Name:

Petitioner 3:

C.1
C.2 N/A
C.3 SSN:
C.4 Address:

C.5 Home Phone:
C.6 Email:
C.7 Employment Information Relevant to Petition:
- C.7a Employee Number:
- C.7b Dates of Employment:
- C.7c Employer Name: REECo
- C.7d Work Site Location:

C.7e Supervisors Name:

F.3 ☐ I/We have attached a report from a health physicist or other individual with expertise in radiation dose reconstruction documenting the limitations of existing DOE or AWE records on radiation exposures at the facility, as relevant to the petition. The report specifies the basis for believing these documented limitations might prevent the completion of dose reconstructions for members of the class under 42 CFR Part 82 and related NIOSH technical implementation guidelines.

(Attach report to the back of the petition form.)

F.4 ☐ I/We have attached a scientific or technical report, issued by a government agency of the Executive Branch of Government or the General Accounting Office, the Nuclear Regulatory Commission, or the Defense Nuclear Facilities Safety Board, or published in a peer-reviewed journal, that identifies dosimetry and related information that are unavailable (due to either a lack of monitoring or the destruction or loss of records) for estimating the radiation doses of employees covered by the petition.

(Attach report to the back of the petition form.)

Go to Part G.

G Signature of Person(s) Submitting this Petition — Complete Section G.

All Petitioners should sign and date the petition. A maximum of three persons may sign the petition.

_____ 2/5/07
Date

_____ 2/05/07
Date

_____ 2/05/7
Signature Date

Notice: Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided under EEOICPA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both. I affirm that the information provided on this form is accurate and true.

Send this form to:
SEC Petition
Office of Compensation Analysis and Support
NIOSH
4676 Columbia Parkway, MS-C-47
Cincinnati, OH 45226

If there are additional petitioners, they must complete the Appendix Forms for additional petitioners. The Appendix forms are located at the end of this document.

Name or Social Security Number of First Petitioner: _____

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

_____
Street Apt # P.O. Box

_____ _____ _____
City State Zip Code

B.4 **Telephone Number of Survivor:**

B.5 **Email Address of Survivor:**

B.6 **Relationship to Employee:**

Go to Part C.

C Employee Information — Complete Section C UNLESS you are a labor organization.

C.1 **Name of Employee:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** _____

C.4 **Address of Employee** (if living):

_____
Street Apt # P.O. Box

_____ _____ _____
City State Zip Code

C.5 **Telephone Number of Employee:** (_____) _____

C.6 **Email Address of Employee:** _____

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start _____ End _____

C.7c Employer Name: _____

C.7d Work Site Location: _____

_____

C.7e Supervisor's Name: _____

Go to Part E.

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 2**

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** (___) _____

B.5 **Email Address of Survivor:** _____

B.6 **Relationship to Employee:** ❑ Spouse ❑ Son/Daughter ❑ Parent ❑ Grandparent ❑ Grandchild

Go to Part C.

C Employee Information — Complete Section C.

C.1 **Name of Employee:**

Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** _____

C.4 **Address of Employee** (if living):

Apt # P.O. Box

City State Zip Code

C.5 **Telephone Number of Employee:** _____

C.6 **Email Address of Employee:** _____

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start _____ End _____

C.7c Employer Name: Reynolds Elec

C.7d Work Site Location _____

C.7e Supervisor's Name: _____

Sign Part G of the original petition.

Name or Social Security Number of First Petitioner: _____

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 3**

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** (___) ___-_____

B.5 **Email Address of Survivor:** _____

B.6 **Relationship to Employee:** ☐ Spouse ☐ Son/Daughter ☐ Parent ☐ Grandparent ☐ Grandchild

Go to Part C.

C Employee Information — Complete Section C.

C.1 **Name**

First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** ___

C.4 **Address of Employee** (if living):

Street Apt # P.O. Box

City State Zip Code

C.5 **Telephone Number of Employee:** _____

C.6 **Email Address of Employee:**

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start End

C.7c Employer Name: REECo

C.7d Work Site Location:

C.7e Supervisor's Name:

Sign Part G of the original petition.

Name or Social Security Number of First Petitioner: _____

LIST OF ACRONYMS AND ABBREVIATIONS

ABRWH	Advisory Board on Radiation and Worker Health
ALARA	"as low as reasonably achievable"
Anti-Cs	"anti-contamination clothing"
REECo	Reynolds Electric and Engineering Company
CP	Control Point
DOD	Department of Defense
DOE	Department of Energy
CATI	Computer Aided Telephone Interview
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
GZ	Ground Zero
H & N	Holmes & Narver
LOS	Line of Sight
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NRDS	Nuclear Reactor Development Station
NTS	Nevada Test Site
R&D	Research and Development
RDIP	Radionuclide Inventory Distribution Program
SCA	Sanford Cohen & Associates (Advisory Board's audit contractor)
SEC	Special Exposure Cohort
TBD	Technical Basis Document
TLD	Thermoluminescent Dosimeter (used for neutron monitoring)

BACKGROUND ON THE NEVADA TEST SITE

The Nevada Test Site (NTS) was created by Public Land Order 805 dated February 19, 1952. This order identified 680 square miles (1,800 square kilometers) for nuclear testing. Over time the site has expanded to its present size of approximately 1,350 square miles and is located 65 miles North of Las Vegas. Operations at the NTS have included nuclear weapons testing, nuclear rocket development, explosive testing, and other nuclear and non-nuclear operations.

Weapons Testing

A total of 1021 detonations in 928 nuclear tests occurred at the Nevada Test Site from 1951 – 1992; 100 were atmospheric tests and the remaining 828 were underground tests. The Limited Test Ban Treaty of 1963 banned all atmospheric, space and sub-sea nuclear weapons testing; therefore, from 1963 – 1992 testing at the NTS was conducted underground.

From January 1, 1963 to September 23, 1992, a total of 754 nuclear tests were conducted at the NTS.[1] Of these, four atmospheric tests were conducted in May and June 1963 as part of Operation Roller Coaster to evaluate the dispersal of plutonium related to the storage and transportation of nuclear materials, and six nuclear cratering tests were conducted as part of Operation Plowshare, which was intended to evaluate the peaceful applications of nuclear energy.

The vast majority of the tests conducted at the NTS from 1963 - 1992 were conducted in either shafts or tunnels designed to contain radioactive debris. Most of these tests were conducted beneath Yucca Flat; however, underground and cratering tests were also conducted under Buckboard, Pahute, and Rainier Mesas in the northern part of the site. Low yield tests were conducted in the Yucca Flat and higher yield tests beneath Pahute Mesa. Tests were conducted in 16 separate tunnels under Rainier Mesa from 1957 – 1992. The United States established a moratorium on nuclear weapons testing in 1992. No new tests have occurred since that time.

The yield from various nuclear weapons tests at the NTS during the period of January 1, 1963 - 1992 ranged from less than one kiloton (kt) to 1.3 megatons (mt).

Although most people typically associate worker radiation exposures at the NTS with atmospheric test releases, a majority of the underground tests released radiation and created surface contamination. Between August 5, 1963, when the Limited Test Ban Treaty was signed, and September 1992 when testing ended, 401 of the 723 tests had effluent releases, with 105 (15%) due to containment failure, 287 (39%) due to operational releases, and 9 attributed to late time seepage or the Plowshares cratering test. Only 322 (44%) of the tests conducted during the class period were contained underground.[2] In addition, four of these tests were atmospheric tests

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[1] United *States Nuclear Tests, July 1945 – September 1992*, US Department of Energy, Nevada Operations Office, DOE/NV – 209-REV 15, December 2000.

[2] *Radiological Effluents Released from U.S. Continental Tests 1961 through 1992*, DOE/NV-317 (Rev. 1), August, 1996

associated with storage and transportation (non-nuclear weapons tests) to evaluate the dispersal of plutonium under Operation Roller Coaster, and as noted above, four were cratering tests under Operation Plowshare. Releases from underground activities can occur via:

- containment failure;
- post-test operations, such as drillback activities (accidentally and deliberately); or
- post-test controlled purging of gasses from a tunnel.

Other post-test activities that exposed workers include: drillback releases associated with drilling to retrieve post-shot solid samples; gas-sampling releases associated with retrieving gas samples; late-time seepage releases during which noble gases leaked from the site after all operations in the area have ceased (over weeks or months); extracting equipment from tunnels after underground tests (e.g., pulling cables and catchers from shafts or tunnels); and construction, decontaminating, decommissioning, cleanup, or other activities in contaminated areas.[3] Additional incidents of contamination have been caused by the resuspension of radioactively contaminated soil or dust deposited by previous atmospheric, "safety," and underground tests.

Non-Weapons Activities at NTS

Nuclear activities not associated with nuclear weapons were conducted at a number of locations at the NTS. These include 31 nuclear rocket engine tests and 5 nuclear ramjet tests, as well as nuclear bomb assembly, open air reactor experiments, and the High Energy Neutron Reactions Experiment. These tests were conducted in the open, releasing fission and activation products that were deposited near the reactor test area to areas more than forty miles downwind.[4] As allowed under the Limited Test Ban Treaty of 1963, non-weapons shots could continue if the radioactive debris did not cross international boundaries. Project Schooner was tested above ground on December 8, 1968 as one of the Plowshares tests to assess whether nuclear explosives could be used to dig a new sea-level Panama Canal. Schooner produced a much larger fallout cloud than expected, and debris was detected in air samplers as far away as Finland.[5] Other non-weapons activities included waste management and environmental remediation.

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[3] Attachment 1: Nevada Test Site Building Trades Medical Screening Program: Summary of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

[4] Attachment 2: NIOSH Responses to S. Cohen & Associates Comments: Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA–TR-TASK1-0006, dated 12/31/05

[5] Anspaugh, Lynn R, "An Historical Perspective of the Nevada Applied Ecology Group", published in Summary of Nevada Applied Ecology Group and Correlative Programs, US Department of Energy, Nevada Field Office, Las Vegas NV, DOE/NV-357, pp. 97-117 (1992).

SUMMARY OF THE BASIS FOR THE NEVADA TEST SITE SPECIAL EXPOSURE COHORT PETITION

The class of Nevada Test Site (NTS) workers identified by this petition meet the requirements for inclusion in the Special Exposure Cohort based on the following factors that identify exposures which were systematically unmonitored, unrecorded or inadequately monitored (involving both incidents and routine practices):

1. NIOSH TBD-6 (External Dose) states that National Institute of Occupational Safety and Health (NIOSH) has no method to estimate dose for workers involved in eight underground tests that "vented" during the proposed class period (e.g., Baneberry, Camphor, Diagonal Line, Riola, Agrini, Midas Myth, Misty Rain, and Mighty Oak) as well as for those affected by drillbacks prior to 1965. As a result of this exemption, dose cannot be reconstructed for workers exposed in these eight events or the pre-1965 drillbacks. (Note: Although not related to this petition, NIOSH's implementation of this exemption has been inconsistent. NIOSH has improperly reconstructed dose for claims even though these events are specifically excluded in the site profile. NIOSH assumes that claimants will self identify their involvement in these eight tests or drillback work and thus flag this exemption during their Computer Aided Telephone Interview (CATI)—an assumption that has not proved reliable).

2. Workers were scrupulous about keeping work related information confidential, refusing to relate it to spouses, children, or experts, and thus making it impossible for survivors to provide the necessary information to enable NIOSH to adequately reconstruct dose.

3. Many releases from underground tests were excluded from the NIOSH (Internal Dose) TBD, Table 5D-21, which lists incidents involving releases from underground tests that NIOSH considers in dose reconstruction.

4. DOE has documented that the nuclear rocket and ramjet engine tests regularly released significant amounts of radionuclides that were detected hundreds of miles away, and therefore each test is a discreet incident.

5. NIOSH is not able to estimated plausible upper bound doses for many years due to inadequate monitoring. For example, beta and neutron monitoring was not conducted at NTS until 1966 and NIOSH has not presented methods for estimating pre-1966 beta dose. No neutron dose was collected until 1966, and there is only partial data until 1979. There are no beta results reported for 1971-73.

6. NIOSH lacks a method to estimate internal dose through 1967.

7. Whole body counts are unavailable until 1967, yet this data is used to extrapolate dose for workers who did different tasks in very different circumstances or only because of which area paid them.

8. Large hot-particle doses have not been evaluated. As a result, NIOSH is unable to adequately estimate external dose to gonads and skin and internal dose to the gastrointestinal tract for many personnel, including early NRDS reentry personnel, early tunnel reentry personnel, workers exposed to particles and gases from vented underground tests and drillback activity. This is a NTS complex-wide issue.

9. Exposure to radon is improperly estimated. There is no discussion of radon in Gravel Gerties, which could be substantial through 1985. Radon doses for G-tunnel are not claimant favorable, and NIOSH's proposal to use radon data from the Pantex facility in Amarillo, Texas lacks a technical basis.

10. Although NTS workers were assigned to work on classified projects in locations such as Area 51, NIOSH has not assessed their radiation exposure or developed methods to do so in its site profile.

11. It was common practice that workers, apparently at the direction of management, did not wear and/or hid dosimeter badges to prevent registering doses that would cause them to exceed project, monthly or cumulative doses. Consequently, film badge data will underestimate the exposure of individuals and groups of workers. This practice was documented by Jay Brady, former Rad Safe manager at NTS, and represents an intractable problem for certain workers in the class into the 1980s.

12. Resuspension models and factors are not scientifically defensible and a credible bounding dose estimate has not been developed. Doses may be underestimated by an order of magnitude due to the lack of data on "hot spots," the failure to use a time dependent model, incomplete radionuclide lists, lack of adequate soil data for resuspension analysis/calculation, using data not appropriate for retrospective dose reconstruction, and using data collected in areas after "hot spots" were cleaned up to estimate doses prior to the cleanup. Due to these and numerous other uncertainties, NIOSH cannot develop a plausible upper bound dose estimate.

13. Internal radiation exposure assessments rely on average air concentration values when the individual worker's location is not known. If the work location is unknown, there is no basis for dose estimates. Averages for workers whose locations are known will not lead to a bounding dose estimate.

14. Many workers were unmonitored for I-131 exposures from 33 tests which vented approximately 1,065 kCi of I-131. NIOSH has no method to estimate unmonitored worker exposures.

15. The presence of high-fired oxides resulting from atmospheric weapons testing has not been investigated.

16. There is no extremity dosimetry for bomb assembly workers.

17. There is no method of estimating internal dose for workers employed less than 250 days

prior to December 31, 1962.

18. DOE records used by NIOSH have not been subject to verification and validation—leading to errors. For instance, DOE claims to have dosimeter readings for workers when they were no longer employed at the site, and also claims that workers were no longer at the site when DOE or NIOSH documentation indicates that they were.

19. Workers report that monitoring and other records for NTS activities were lost or destroyed.

The large number of unresolved scientific issues, coupled with data integrity issues, raises the question of whether a plausible upper bound dose estimate can be developed for all members of the class. With six years having passed since the enactment of the Energy Employees Occupational Illness Compensation Program Act (EEOICPA), it is not feasible to do so in a timely manner.

See Attached

E Proposed Definition of Employee Class Covered by Petition — Complete Section E.

E.1 **Name of DOE or AWE Facility:** _____

E.2 **Locations at the Facility relevant to this petition:**

_____

_____

_____

E.3 **List job titles and/or job duties of employees included in the class. In addition, you can list by name any individuals other than petitioners identified on this form who you believe should be included in this class:**

_____

_____

_____

E.4 **Employment Dates relevant to this petition:**

Start _____ End _____

Start _____ End _____

Start _____ End _____

E.5 **Is the petition based on one or more unmonitored, unrecorded, or inadequately monitored or recorded exposure incidents?:** ☑ Yes ☐ No

If yes, provide the date(s) of the incident(s) and a complete description (attach additional pages as necessary):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Go to Part F.

SECTION E

PROPOSED DEFINITION OF EMPLOYEE CLASS COVERED BY PETITION

A Class member is any employee of the Department of Energy (DOE) or any DOE contractor or subcontractor during the period from January 1, 1963 through September 30, 1992, who was:

(1) present during an underground nuclear test and/or performed a drillback, tunnel reentry, or cleanup work following such test at the Nevada Test Site (NTS) (without regard to the duration of employment);

(2) present at an event involving the venting of an underground test or during a planned or unplanned radiation release at NTS;

(3) present for tests or post-test activities related to the Nuclear Rocket Testing Program;

(4) assigned to work at Area 51 (or other classified program areas);

(5) employed at NTS in a job activity that was monitored for exposure to ionizing radiation or worked in a job activity that is or was comparable to a job that is, was, or should have been monitored for exposure to ionizing radiation at NTS, or in combination with work days with the parameters established for one or more other classes of employees in the Special Exposure Cohort (SEC).

E.1 Name of DOE or AWE Facility:

Nevada Test Site

E.2 Location at the Facility Relevant to this petition:

The entire area of the Nevada Test Site.

E.3 Lists of job titles and/or job duties of employees included in the class:

See Attachment 3

E.4 Employment Dates relevant to this petition:

January 1, 1963 through September 30, 1992

E.5 This petition is based on numerous unmonitored, unrecorded, or inadequately monitored and recorded exposure incidents. The following is a description of these incidents:

A total of 754 weapons tests occurred at the NTS during the period of January 1, 1963 and January 1, 1993.[6] Although the timeframe covered by this petition is typically considered to be part of the "underground testing era" at NTS, four aboveground non-weapons tests were conducted and a number of intentional and unexpected releases, or ventings, from underground tests took place. The Technical Basis Document (TBD) indicates that there were 158 releases from underground tests at the NTS. These include four containment failures, four late-time seeps, ten controlled tunnel purgings, 108 operational releases, and 32 "major pre-1971" releases (1958-1970).[7]

The TBD lists ten tests conducted during the history of the site as being "unexpected releases of radioactivity."[8] Eight of these occurred during the January 1, 1963 – September 30 1992 time period, releasing nearly 7 million curies of radiation for which NIOSH has not issued a method for estimating internal and external doses. These eight tests are described below.

- Baneberry was part of Operation Emery. It was a 10 kiloton underground weapons-related test conducted on 12/18/1970. The test accidentally released radionuclides to the atmosphere through ground faults. Offsite release was detected in Utah.
- Camphor was part of Operation Emery. It was a less than 20 kiloton underground weapons-effects test conducted on 6/29/1971. The test accidentally released radionuclides to the atmosphere which remained onsite.
- Diagonal Line was part of Operation Grommet. It was a less than 20 kiloton underground weapons-effects test conducted on 11/24/1971. The test accidentally released radionuclides to the atmosphere which subsequently drifted offsite; however, the contamination could only be detected by aircraft.
- Riola was part of Operation Tinderbox. It was a 1.07 kiloton underground weapons-related test conducted on 9/25/1980. The test accidentally released radionuclides to the atmosphere that subsequently drifted offsite.
- Midas Myth was part of Operation Fusileer. It was a less than 20 kiloton underground weapons-effects test conducted on 2/15/1984.
- Agrini was part of Operation Fusileer. It was a less than 20 kiloton underground weapons-related test conducted on 3/31/1984. The test accidentally released radionuclides to the atmosphere that remained onsite.
- Misty Rain was part of Operation Grenadier. It was a less than 20 kiloton underground weapons-effects test conducted on 4/6/1985. A post-test controlled-release released radionuclides to the atmosphere that subsequently drifted offsite.
- Mighty Oak was part of Operation Charioteer. It was a less than 20 kiloton underground weapons-effects test conducted on 4/10/1986. A post-test controlled-release released radionuclides to the atmosphere that subsequently drifted offsite.

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[6] *Radiological Effluents Released from U.S. Continental Tests 1961 through 1992*, DOE/NV-317 (Rev. 1), August, 1996

[7] NIOSH TBD, ORAUT-TKBS-0008-2, Table 2-6.

[8] NIOSH TBD, ORAUT-TKBS-0008-6

Combined, these tests released approximately 6,749,013 Ci of radioactive materials into the atmosphere.[9] However, the National Institute of Occupational Safety and Health (NIOSH) specifically excludes these uncontrolled releases as part of the NTS Site Profile. The Site Profile states:

> *"Information contained in Revision 00 is applicable only to employment periods after 1962 (post atmospheric testing phase) and to workers not identified as involved with drillback activities prior to 1965. In addition, Revision 00 is not applicable to dose reconstruction for (1) workers involved with weapons testing at locations other than the NTS (South Pacific, Alaska, etc.); (2) workers affected by any of the following 10 underground tests that resulted in unexpected release of radioactive material:*
>
> *1. BLANCA (October 30, 1958)*
> *2. DES MOINES (June 13, 1962)*
> *3. BANEBERRY (December 18, 1970)*
> *4. CAMPHOR (June 29, 1971)*
> *5. DIAGONAL LINE (November 24, 1971)*
> *6. RIOLA (September 25, 1980)*
> *7. AGRINI (March 31, 1984)*
> *8. MIDAS MYTH (February 15, 1984)*
> *9. MISTY RAIN (April 6, 1985)*
> *10. MIGHTY OAK (April 10, 1986)*
>
> *It is also assumed that, because they were such a rarity, it would be likely that if a claimant was involved in one of these events, he [or his survivor] would mention it in his CATI [Computer Aided Telephone Interview]. All of these conditions are likely verifiable by careful examination of the DOL, DOE (incident reports and dosimetry records), and OCAS documents."*[10]

There is a practical problem with identifying which workers were in each of these tests. NIOSH's assumption is that claimants would self identify that they were in a drillback event or in one of the ten excluded tests. This assumption lacks support. a petitioner for this SEC, worked as a laborer and a foreman and filed a claim for multiple cancers. During his Computer Aided Telephone Interview (CATI), was not asked about his involvement in vented tests.[11] He did not volunteer that he was involved with the Baneberry test, even though he was caught up in that release. His NIOSH CATI interview form indicates that he was not present during any radiological accidents. However, a document in the NIOSH Administrative Record for listed some of the atomic weapons tests he was involved in and Baneberry was included.[12] Despite the existence of DOE documentation that he

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[9] NIOSH Technical Basis Document for the Nevada Test Site – Site Description; ORAUT-TKBS-0008-2, Table 2-6, pp. 44 (NIOSH 2004)
[10] NIOSH Technical Basis Document for the Nevada Test Site – External Dose; ORAUT-TKBS-0008-6, pp. 6 (NIOSH 2006)
[11] Attachment 4: Affidavit
[12] Attachment 4: Affidavi

participated in the Baneberry test, the NIOSH dose reconstruction report does not account for this event. This reveals the inconsistent quality control. This claim should have been pended, or an 83.14 SEC petition should have been initiated.

Since NIOSH interviewers never ask claimants if they were in these excluded uncontrolled releases or drillbacks, it is highly unlikely that claimants would mention them during an interview. Survivors would be even less likely than workers to volunteer such information, given the classification requirements that limited what workers could say to their families.

In addition, the radioactive plumes from these events often migrated for many miles on site, and in some cases, offsite. Therefore, the plumes from these events may have contaminated numerous site workers or other offsite individuals, either directly or indirectly, without those workers knowing the significance or magnitude of the contamination to which they may have been exposed.

If the events excluded from the NTS Site Profile had been the only large events that had occurred at the NTS, or if they occurred in a confined area where everyone was observing and/or working on them, it would be reasonable to assume that everyone knew of them and that they made a strong impression on each worker. However, although these events were large, they were among many large events (754 weapons tests occurred at the NTS during the period of January 1, 1963 and September 30 1992 and many of those were purged) on a very large site and may not have been as prominent on workers' minds as NIOSH suspects.

Another problem with relying on claimants to identify test names during CATI interviews is that post-shot drillers tended to identify the hole they were working on by the hole number, not the shot name—unless the test was particularly spectacular.

Other workers involved with these ventings were not protected. With previous tests, they had evacuated the Area 12 Camp; however, they decided not to during the Baneberry Test.[13] Furthermore, only the HP personnel who were going to be closer to the test site were wearing Anti-Cs."[14]

In addition, many releases from underground tests were excluded from the NIOSH (Internal Dose) TBD, Table 5D-21, which lists incidents involving releases from underground tests that NIOSH considers in dose reconstruction. Ten examples excluded from the TBD are listed below:[15]

- Parrot was a 1.3 kt weapons related test that took place on December 16, 1964. The test released radioactive effluent that was characterized by an initial burst followed by a

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[13] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, December 13, 2005. pp. 143.

[14] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, December 13, 2005. pp. 143.

[15] *Radiological Effluents Released from U.S. Continental Tests, 1961 through 1992,* Nevada. Prepared by Bechtel Nevada. DOE/NV – 317, Aug. 1996.

continuous leaking of a relatively small amount of activity. The test release started at H+10 minutes and lasted for approximately eight days. The mechanism of this release was later found to be a crack in the LOS pipe below the surface. The release was approximately 45% Cs-138, Kr-85m, and 10% Xe-135 (with traces of iodines). Isotopes released included: Kr-85m, I-131, I-133, I-135, Xe-135, Xe-138, Cs-138. Test release[16] at R+12 hours was 2.3E+5 curies.

- Sulky was a 92 ton Plowshare test that took place on December 18, 1964. The planned test release occurred from the surface ground zero area at H+1 second and lasted for 35 days. Isotopes released included: Kr-85m, Kr-87, Kr-88, Sr-89, Sr-91, Y-91, I-131, I-132, I-133, I-134, I-135, Xe-133, Xe-135, Xe-138, Cs-138, Ba-139, Ba-140. Test release at R+12 hours was 1.3E+5 curies.
- Palanquin was a 4.2 kt Plowshare test that took place on April 14, 1965. The planned test release occurred at the surface ground zero area at H hour and lasted for one minute. Isotopes released included: Sr-91, Y-91m, Zr/NB-95, Mo-99, Tc-99, I-131, I-133, I-135, Xe-135, Ba/La-140. Test release at R+12 hours was 1.1E+07.
- Pin Stripe was a less than 20 kt weapons effects test that took place on April 25, 1966. Test releases from a fissure near surface ground zero occurred at H+1 minute and at H=7 hours. The releases lasted for 3.5 minutes and 14 hours, respectively. Gross fission products were released as a result of this venting. Isotopes released included: I-131, I-133, I-135. Test release at R+12 hours was 2.1E+05 curies.
- Double Play was a less than 20 kt weapons effects test that took place on June 15, 1966. Double Play was a series of 4 tests: (1) seepage from cable holes occurred at H+29 hours. Primarily noble gases were released; (2) leakage from the portal occurred at H+5 minutes until H+50 hours. Noble gases and radioiodines were released; (3) controlled ventilation of the tunnel complex with effluent passing through the filter system occurred at H+50 hours until H+51.6 hours; (4) controlled ventilation of the tunnel complex was restarted at H+53.6 hours because of a buildup of explosive gases, and ventilation continued until the tunnel was cleared; and, (5) drillback release from the vent line occurred at 1800 hours on August 2, 1966 and lasted for four days. Isotopes released included: Noble gases and radioiodines. I-131, I-135, Xe-133. Test releases included: (1) Controlled release at R+12: 2.6E+4; (2) Uncontrolled Release at R+12: 8E+5'; and, (3) Drillback Release: 9.1E-1 (Xe-133).
- Nash was a 39 kt weapons related test that took place on January 19, 1967. It was a test release from the surface ground zero area of the crater. It began at H+9.25 hours on January 19, 1967, and lasted for 41 hours. Isotopes released included: Kr-87, Kr-88, I-131, I-133, I-135, Xe-133, Xe-135. Test release at R+12 hours was 6.9E+4 curies.
- Hupmobile was a 7.4 kt weapons effects test that took place on January 18, 1968. Venting from the LOS pipe at the surface ground zero area occurred at H+1.6 minutes and lasted for approximately 100 minutes. Isotopes released included: Kr-87, Kr-88, Rb-88, I-131, I-133, I-134, I-135, Xe-133, Xe-135. Test release at R+12 hours was 1.2E+5 curies.
- Cabriolet was a 2.3 kt Plowshare test that took place on January 26, 1968. The planned test release from the surface ground zero area occurred at H time and lasted for one

[16] Test Release: Otherwise known as "containment failures." They are spontaneous releases that occur after a test, but before potshot drilling operations begin.

minute. Isotopes released included: Kr-87, Kr-88, Rb-88, Sr-91, I-131, I-133, I-134, I-135, Te-132, Xe-133, Xe-135, W-187. Test release at R+12 hours was 2.2E+5 curies

- The Buggy tests (A-E) were Plowshare tests that yielded 5.4 kt combined. They took place on March 12, 1968. The planned test release from the surface ground zero area occurred at H time lasted for 2.5 minutes. It was not determined which detonation(s) released effluent. Isotopes released included: Sr-91, I-131, I-133, I-135, Te-132, Ba-140, W-187. Test release at R+12 hours was 1.2E+6 curies.
- Schooner was a 30 kt Plowshare test that took place on December 8, 1968. The planned test release from the surface ground zero area occurred at H time and lasted for one minute. Isotopes released included: Mn-54, Ru-106, I-131, Cs-137, W-181, W-187. Test release at R+12 hours was 3.7E+6 curies.

No documentation has been published that identifies who was at these tests and the extent to which the exposure environment is characterized for purposes of a reliable dose estimate. Furthermore, there is no data indicating dose rates at R + I.

In addition, the nuclear rocket and ramjet engine tests regularly released significant amounts of radionuclides that were detected hundreds of miles away, as documented by DOE. Every rocket test is a discrete incident. Below are eight examples of rocket and ramjet engine incidents. [17]

- The Kiwi B-4E test took place on August 28, 1964. The test released 21,000 curies on site as calculated for 12 hours after the time of release. Fresh fission products were obtained in or near Nyala, Currant, Ely, Ursine, Caliente, and Hiko. Cloud tracked 110 miles, NE. Radionuclides included: Te-132 (332 Ci); I-133 (288 Ci).
- The Kiwi test took place on January 12, 1965. The test released 15,000 curies on site as calculated for 12 hours after the time of release. Activity above background was detected off site at Lathrop Wells and Dansby Ranch in Nevada, at Death Valley in California, and at several highway locations between these points. Cloud tracked 250 miles, SW. Radionuclides included: I-131 (540 Ci); U-234 (9.1 Ci); Sr-89 (33 Ci); Mo-99 (6,900 Ci); Ce-143 (5,900 Ci); Sr-90 (0.4 Ci); Zr/Nb-95 (230 Ci); Te-132 (1,500 Ci); Np-249 (130 Ci).
- The Phoebus 1A test took place on June 25, 1965. The test released 22,000 curies on site as calculated for 12 hours after the time of the release. Radioiodine activity detected in air samples at Queen City Summit, Diablo, Alamo, and Hiko. Cloud tracked 120 mi, NE. Radionuclides included: Mo-99 (4.9 Ci); Zr-95 (1.7 Ci); Te-132 (71 Ci); Ce-141 (24 Ci); I-131 (14 Ci).
- The NRX-A4/EST (4) test took place on March 16, 1966. The test released 27,000 curies on site as calculated for 12 hours after the time of the release. Samples containing radioiodines were obtained in Nevada from Alamo, Butler Ranch turnoff and Highway 93, Warm Springs

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[17] The source for all of these figures is: Friesen, H.N., *Radiological Effluents Released from Nuclear Rocket and Ramjet Engine Tests at the Nevada Test Site, 1959 through 1969*. U.S. Department of Energy, prepared by Raytheon Services Nevada. June 1995. <http://www.osti.gov/bridge/servlets/purl/101088-sBTe7G/webviewable/101088.pdf> (last viewed 10/2/2006).

The figures reported in this study are from the United States Air Force, which did the cloud tracking.

Ranch, Glendale, and Caliente and in Utah at Cedar City and Parowan. No information on cloud, except that it went NE. Radionuclides included: I-131 (37 Ci), Mo-99 (10 Ci).

- The NRX-A4/EST (4A) test took place on March 25, 1966. The test released 28,000 curies on site as calculated 12 hours after the time of the release. Continuous recorders measured activity above background only at Beatty. Air force tracked effluent to 400 miles. Cloud tracked 600 mi SW. Radionuclides included: Te-132 (3,900 Ci); Ce-141 (410 Ci); Mo-99 (1,600 Ci); I-131 (460 Ci); Zr-95 (310 Ci); Xe-133 (3,000 Ci); Nd-147 110 Ci); Ba-140 (680 Ci).
- The NRX-A5 test took place on June 23, 1966. The test released 80,000 curies on site as calculated 12 hours after the time of the release. Ground monitoring activity was detected at Goss Ranch and Coyote Summit. Cloud tracked 910 miles NE (to Bowman N. Dakota). Radionuclides included: Zr/Nb-97 (19,000 Ci); I-131 (1,600 Ci); Mo-99 (5,000 Ci); I-133 (27,000 Ci); Te-132 (7,500 Ci).
- The Phoebus 1B (3) test took place on February 10, 1967. The test released 34,000 curies on site as calculated 12 hours after the time of the release. Activity above background was detected only at the junction of Highway 95 and Ash Meadows Road. No cloud tracking info except that it went SE.
- The Phoebus 1B (4) test took place on February 23, 1967. The test released 240,000 curies on site as calculated 12 hours after the time of the release. PHS tracked the cloud to Dubois, Idaho. Environmental samples: Radioiodine was detected on vegetation samples from 19 locations (mostly along highways); populated locations were Alamo, Springdale, Selbach Ranch, Warm Springs, Bradshaw Ranch, Sequra Ranch, Gardners Ranch, and Cold Creek Ranch. Cloud tracked 450 miles NE. Radionuclides included: I-131 (4,100 Ci); Mo-99 (3,400 Ci); Te-132 (14,000 Ci).
- The NRX-AG test took place on December 15, 1967. The test released 53,000 curies on site as calculated 12 hours after the time of the release. Fresh fission products were detected in air samples in Nevada from Lathrop Wells, Armargosa Farm Area, and Las Vegas. No information about cloud, except that it went SE. Radionuclides included: Te-132 (3,800 Ci); Nd-147 (60 Ci); Ba-140 (80Ci); Ru-103 (20 Ci); I-131 (820 Ci); Ce-161 (60 Ci).
- The Phoebus 2A test took place on June 28, 1968. The test released 51,000 curies on site as calculated 12 hours after the time of the release. Activity was detected in air samples obtained in Nevada from Hiko, Alamo, Twin Springs Ranch, Indian Springs, Geyser Maintenance Station, and Nyala. No information about cloud, except that it went SE.
- The PEWEE one test took place on December 4, 1968. The test released 230,000 curies on site as calculated 12 hours after the time of the release. Radioactivity was detected in air samples obtained from Caliente, Indian Springs, Las Vegas, Lathrop Wells, Mesquite, Warm Springs Ranch, and Pahrump. Cloud tracked 425 miles SE. Radionuclides included: Mo-99 (510 Ci); Te-132 (5,100 Ci); I-131 (1,100 Ci); Ba-140 (260 Ci); Zr-97 (1,700 Ci); Ce-141 (120 Ci).

Combined, these tests released approximately 801,000 Ci of activity in the atmosphere 12 hours after the time of release. No estimates are available for radioactivity at the time of release. NIOSH does not account for hot particle doses or ambient doses from these incidents in its Site Profile and in dose reconstructions. TLDs used for measuring neutrons were not used until some point in 1996. At a minimum, there was no TLD monitoring for the Kiwi and Phoebus rocket

tests. Moreover, it is documented that ambient monitoring using TLDs had failed. [18]

[18] Further, thin film TLDs, while useful, were problematic to use and maintain. In 1967, all five sets of TLDs used for backing up the ambient air samplers at the site failed because of light and heat damage. That loss not only reduced the NTS ability to verify/discount some high data points during that sampling season, but it also calls into question all previous results from similar TLDs at NTS because they may have failed or were at least less accurate than expected due to similar failures to some degree. Thin film TLD's were replaced with modern CaF2:Dy (TLD-200) TLDs in 1986.

See Attached

F Basis for Proposing that Records and Information are Inadequate for Individual Dose — Complete Section F.

Complete **at least one** of the following entries in this section by checking the appropriate box and providing the required information related to the selection. You are not required to complete more than one entry.

F.1 ☑ I/We have attached either documents or statements provided by affidavit that indicate that radiation exposures and radiation doses potentially incurred by members of the proposed class, that relate to this petition, were not monitored, either through personal monitoring or through area monitoring.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that potential radiation exposures were not monitored.

F.2 ☑ I/ We have attached either documents or statements provided by affidavit that indicate that radiation monitoring records for members of the proposed class have been lost, falsified, or destroyed; or that there is no information regarding monitoring, source, source term, or process from the site where the employees worked.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that radiation monitoring records for members of the proposed class have been lost, altered illegally, or destroyed.

Part F is continued on the following page.

See Attached

F.3 ☑ I/We have attached a report from a health physicist or other individual with expertise in radiation dose reconstruction documenting the limitations of existing DOE or AWE records on radiation exposures at the facility, as relevant to the petition. The report specifies the basis for believing these documented limitations might prevent the completion of dose reconstructions for members of the class under 42 CFR Part 82 and related NIOSH technical implementation guidelines.

(Attach report to the back of the petition form.)

F.4 ☑ I/We have attached a scientific or technical report, issued by a government agency of the Executive Branch of Government or the General Accounting Office, the Nuclear Regulatory Commission, or the Defense Nuclear Facilities Safety Board, or published in a peer-reviewed journal, that identifies dosimetry and related information that are unavailable (due to either a lack of monitoring or the destruction or loss of records) for estimating the radiation doses of employees covered by the petition.

(Attach report to the back of the petition form.)

Go to Part G.

G Signature of Person(s) Submitting this Petition — Complete Section G.

All Petitioners should sign and date the petition. A maximum of three persons may sign the petition.

_____ _____
Signature Date

_____ _____
Signature Date

_____ _____
Signature Date

Notice: Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided under EEOICPA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both. I affirm that the information provided on this form is accurate and true.

Send this form to: SEC Petition
Office of Compensation Analysis and Support
NIOSH
4676 Columbia Parkway, MS-C-47
Cincinnati, OH 45226

If there are additional petitioners, they must complete the Appendix Forms for additional petitioners. The Appendix forms are located at the end of this document.

Name or Social Security Number of First Petitioner: _____

SECTION F

BASIS FOR PROPOSING THAT RECORDS AND INFORMATION ARE INADEQUATE FOR INDIVIDUAL DOSE

F.1 We have attached documents and statements provided by affidavit that indicate that radiation exposures and radiation doses potentially incurred by members of the proposed class, that relate to this petition, were not monitored, either through personal monitoring or through area monitoring.

The following are summaries of the affidavits relevant to this section:

Attachment 5: Affidavit of , former NTS worker. describes eating, drinking and smoking on contaminated drill rigs. He explains how containment was nonexistend on the Boyles Angle rig on the drill hole, casing and pipe from 1963 to 1965. He explains that on almost every drillback steam, rocks and debris from ground zero would come back up through the drill pipe and shoot up twenty to thirty feet in the air while he and other workers took side wall samples. He describes the extreme humidity and the close proximity to ground zero while working in G-Tunnel. He describes the pattern of superintendents like himself to live and work at drillback sites from the start of postshot until completion of a drill back. He describes and incident in which a Geiger counter malfunctioned and workers were overexposed and were later taken to a remote railroad car where they were inspected and tested, but he never was told what tests were performed or what the results were.

Attachment 6: Affidavit for , former NTS worker. He describes being ordered by supervisory personnel to leave his Thermoluminescent Dosimeter (TLD) in his truck, lunchbox or elsewhere when he was welding, because such work could damage the badge. From his second day working at the NTS he did not wear his badge when welding potentially leaving him with no dose record. He describes the constant threat of breathing contaminated dust. He describes lapses in protocol while working in Area 5 when Holmes and Narver (H & N) technicians performed x-rays of his welds. He was often closer to the welds than the H & N technicians doing the shooting despite the fact that it was protocol for welders and other workers to be located in a "cold spot," a safe distance away from the source. He describes never using his badge while working in Area 25 in X-Tunnel. He describes being exposed to radiation venting from the vent shafts coming from N and T-Tunnels without wearing his TLD. He describes a lack of protective clothing while working in N and P Tunnels, which were contaminated with radioactive water. He describes how his dose reconstruction report incorrectly states that he never was required to "dress down." He was required to dress down while working inside the Butler Building and periodically in N, P and X-Tunnels. He believes this discrepancy is due to the inadequate clarification and questioning of the person performing his CATI. He describes regularly being exposed to radiated water outside of the Butler Building without wearing protective clothing.

Attachment 7: Affidavit of , former NTS worker. He describes working in dusty areas marked with signs saying the area was contaminated without wearing a respirator. Moreover, he explains that REECo Health and Safety Officials who were called to water down the ground so the contaminated dust would not be carried by the wind did not respond 50% of the time. He explains that security was the last to leave all tunnels and the first to reenter the tunnels before and after a test respectively. He describes one incident in which he had to take 6 showers before he was considered decontaminated. He recalls a time he had to sweep the Areas surrounding Area 7 after a shot because people were located in these Areas during the shot when they should have been evacuated. He describes the constant threat of breathing radioactive dust while security guards worked at the Tweezer facility located next to Plutonium Valley without wearing respirators. He describes securing an area in Area 25 or 26 where an NRDS reactor blew up while Rad Safe cleared the area of radioactive graphite. He recalls 19 or 20 security officers being sent into town to be tested for radiation after being exposed in Baneberry.

Attachment 10: Affidavit of widow of former NTS worker. She attached a letter her husband wrote to their family doctor to her affidavit that describes a radiological incident he was involved in some time in 1967 or 1968. She remembers a phone call from her husband in regards to this accident in which he told her that he had been exposed to radiation particles despite the fact that he was wearing protective clothing and a respirator. In the letter wrote to his doctor he describes he was on the reentry crew that went into a tunnel after a test involving plutonium had gone wrong. He further describes how he knows his respirator leaked and he was therefore breathing in contaminated air because of the distinct banana odor they used in the tunnel for this exact purpose of detecting leaks in respiration equipment. also describes documentation she received from NIOSH stating that there are no internal dosimetry records and no incident investigation reports for her husband and diagnostic dose records for her husband are not readily available, which is particularly alarming since he clearly ingested contaminated air in 1967 or 1968. She questions NIOSH's quality control because they performed a dose reconstruction on her husband despite the facts that NIOSH has not demonstrated it can estimate a bounding dose for plutonium, there is no published method for intern dose at NTS prior to 1967 and there is no neutron dose monitoring for the Nuclear Rocket Development Station (NRDS) where her husband worked.

Attachment 11: Affidavit of , former NTS worker. He describes breathing contaminated dust while working in areas where tests were previously conducted. He describes daily exposure to contaminated water running through the drainage ditches in the tunnels. He explains how he kept his badge in his pocket or underneath the protective leather clothing he wore on vertical welds in order to keep it from getting damaged. He describes being issued anti-contamination clothing in the tunnels the month after Baneberry vented, and then he explains how the protective clothing was only issued for a week or so, because they kept burning the protective coveralls and management was tired of issuing them new ones, so they had Rad Safe declare the area safe and that was the end of anti-contamination coveralls for the tunnel

welders only a few weeks after Baneberry. He describes how the main drift for the first event in E-Tunnel was so contaminated with radiation that they had to abandon it and dig a new drift for it about 300 or 400 feet to the west of the old one. He recalls having to use old drift for egress from E-Tunnel on several occasions despite the fact that it was roped off because it was contaminated. He describes welding contaminated steel in E-Tunnel while keeping his badge in his pocket, and moreover he alleges that Rad Safe would change the film in his badge every day because the area was so contaminated yet his records show all zeros. He explains that he worked with on the containment casks in Area 2 and being exposed to uranium and lead there.

Attachment 12: Affidavit of former NTS worker. describes how he and his co-workers did not wear the film badges they were issued when they were on the job site because management discouraged dirty or misplaced badges. He further explains that when badges were worn they were either placed in pockets or covered with plastic. He describes one incident in N or E-Tunnel, in which workers were sent into the tunnel after a shot to wash up and were instructed to get out of the tunnel when their badges read 5,000 MR. He describes the mushroom cloud that Baneberry made after it vented and how he was taken to E or N-Tunnel after it vented, then to Area 12, then to Rainier Mesa and then to CP Hill where he was wanded and sent home. He describes working and sleeping in Area 51 half of the time he worked at the NTS from 1981 to 2004. He describes how he participated in almost every test between 1962 and 1978 and was onsite for almost every test conducted between 1981 and 1993. He explains that there were 33 underground tests that released I-131 after January 1, 1963 and to date, no analysis of radioiodine releases that occurred after 1962 have been performed, and therefore NIOSH should not have performed a dose reconstruction on him inasmuch as I-131 is known to cause thyroid cancer.

Attachment 13: Affidavit of daughter and survivor of former NTS worker , describes how her father was involved in several venting and radiological accidents, one in which he suffered acute health effects. describes how a medical crew failed to respond in a situation where her father was vented on. She also describes the inaccuracy of the records NIOSH used to perform her father's dose reconstruction.

Attachment 14: Affidavit for daughter and survivor of former Nevada Test Site worker explains her that her father's radiation exposure records are all zeros despite the fact that her mother recalls him coming home with red welts on his back, vomiting and stomach problems as a result of his work at NTS and that he worked at the Nuclear Rocket Development Station for three years. She explains her distrust of the NIOSH dose reconstruction on her father because they assume that her father was not exposed to internal radiation simply because he was not given a bioassay test and furthermore, because they dismissed information given in the CATI explaining that her father had been given chelation therapy as a result of an exposure.

The following is a description, as complete as possible to the extent it might be unclear, of how the attached documentation and affidavits indicate that potential radiation exposures were not monitored.

There is significant information, both documented and anecdotal, that demonstrates that there was systematically insufficient monitoring at the Nevada Test Site during the below-ground testing years, that NIOSH is using inaccurate monitoring information, and that NIOSH is unable at this time to develop a plausible upper bound dose for all members of the class or to do so in a reasonable time period.

1) External: Beta and Neutron

NIOSH is not able to estimate plausible upper bound doses for many years due to inadequate monitoring. For instance, NTS did not monitor for beta radiation before 1966 and has inadequate beta monitoring data until 1975. In addition, NIOSH has no published procedure for estimating these beta doses. There is no neutron dose data until 1966 and only partial or inadequate data until 1979, and it appears that it will be impossible for NIOSH to recreate this data. The use of thermoluminescent dosimeters (TLD) first began in 1966 in the Nuclear Rocket Development Station (NRDS) for effluent monitoring. However, routine use of personal TLDs did not begin at the NTS until 1970, and sophisticated TLD and neutron programs were finally put into place in 1987 as a result of ALARA (as low as reasonably achievable) requirements and emphasis on accurate dosimetry at low doses. There are no beta results reported for 1971-73.[19]

2) Internal Exposures: Absence of Adequate Bioassay Monitoring Program Prior to 1967

There was not an adequate internal dosimetry program in place from 1963-1967. Full radionuclide coverage was not in place until 1967. Some tritium, plutonium and mixed fission products were bioassayed prior to 1967. The absence of an adequate bioassay program to capture the full range of radionuclides during this period represents an intractable problem with respect to dose reconstruction.

Whole body counts are unavailable until 1967, yet this data is used to extrapolate dose for workers who did different tasks in very different circumstances or only because of which area paid them.

3) Internal Exposure: Large Hot Particle Doses

Large sized hot particle exposures resulted from intakes when the reactors were tested at the NRDS, as well as from reentry into tunnels and from drillback activity. GI-tract doses due to large hot particle ingestion cannot be estimated based on procedures used at the NTS. Fecal assays are necessary for evaluating the ingestion for large particles. NIOSH has stated that "Fecal Bioassay data at the NTS have been found to be sparse and mostly limited to individuals involved with cleanup activities where plutonium was the radionuclide of interest."[20] Hot

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[19] NIOSH Technical Basis Document for the Nevada Test Site—External Dose, ORAUT-TKBS-0008-6

[20] Attachment 2: NIOSH Responses to S. Cohen & Associates Comments: Draft Review of the NIOSH Site Profiel for the Nevada Test Site, SCA–TR-TASK1-0006, dated 12/31/05, Response 2c.

particle estimates are an intractable problem because of the lack of data on particle characteristics.

Workers who were downwind from various vented tests, who traveled through or worked in contaminated areas, along with workers who were allowed to eat and drink food along roadways and other areas within the site boundaries that may have been contaminated with radionuclide effluents, are at risk of hot particle ingestion.

4) Internal and External Dose: Pre-1965 Post-Shot Operations (Drillback)

After the temperature of a cavity cooled from an underground test, a post-shot hole was usually drilled to the point of the explosion to collect cores or to retrieve gas or debris samples, and to seal the drillback hole. Post-shot holes drilled from 1962 – 1965 were not cased.[21] Uncased boreholes drastically increased the likelihood of blowing contamination back up the borehole and on to the drilling crew. , a driller, provided an affidavit that reported that "(w)hile post-shot drilling on the Boyles angle rig frame from 1963 to 1965, containment was nonexistent on the drill hole, casing or drill pipe" and "(i)t wasn't unusual while side wall sampling for steam, rocks, and debris from Ground Zero (GZ), where [workers] were taking samples, to come back up through the drill pipe and shoot in the air twenty to thirty feet." also states that "[workers] drilled many holes without containment" and "(f)rom 1965 until [he] retired, the containment equipment became very sophisticated and more efficient."[22] The blowback from the drilling resulted in unmonitored internal and ingestion dose, as well as external dose. lso stated that drillers "smoked, ate food, and drank coffee and water on rig floors while sampling and drilling on post shot operations," which could drastically increase the probability of ingesting contamination.

Pre-1965 post-shot drillback activity (and related decontamination of equipment) is specifically excluded from the NIOSH site profile. No method has been published which addresses these exposures. Given the lack of adequate internal and external monitoring for these workers, NIOSH cannot develop a plausible upper bound dose estimate for workers who performed post-shot drillbacks from 1963 to 1965.

5) Radon Monitoring in Tunnels and Gravel Gerties:

Radon can be derived from the decay of naturally occurring uranium or thorium. Concentrations of radon and its daughter products in the air can be affected by ventilation rates, barometric pressure, relative humidity, temperature, the degree of fracturing of rock, and smoke and dust in the air. Understanding the degree of equilibrium is a critical factor for estimating inhalation exposure and is of equal importance to the radon concentration itself.

Radon sampling was conducted in 1984, 1991, and 1992 in G, N, and T tunnels. Radon monitoring data are likely insufficient for G-tunnel workers.[23] DOE's data did not measure

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[21] Attachment 5: Affidavit of

[22] Attachment 5: Affidavit of

[23] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005.

radon levels in the earlier years or for periods when ventilation was inadequate. Significant worker exposures resulted from employment in inadequately ventilated tunnels, according to a report prepared by Boston University for NIOSH.[24]

Prior to 1984, DOE and the contractor did not realize the importance of radon exposure and did not regularly sample or protect against it. The representativeness and validity of the data is uncertain (see the factors above). The analysis does not report air concentrations (whether they were typical to historical highs, lows, averages) or the equilibrium measurements/calculations, which are "of equal importance to the radon concentration itself."[25] NIOSH uses three samples, and then assigns an arbitrary uncertainty factor. Absent representative data, NIOSH cannot develop a plausible upper bound dose estimate for radon.

NIOSH also has no radon monitoring for workers employed in Gravel Gerties carrying out weapons assembly. NIOSH's proposal to derive data from the Pantex facility lacks a technical basis.

6) "Black" Programs and Undisclosed "Top Secret" Areas

NTS workers were assigned to work in top-secret classified areas, such as Area 51. The NIOSH Site Profile is silent on exposures at these classified areas, and does not even list Area 51 on the map delineating the site. It is unknown if the information necessary to complete a dose reconstruction can be included in the TBD without impermissibly disclosing classified information. If it cannot, neither workers nor their survivors will be able to provide information on radiological activities associated with these programs. Since the burden of proof lies with claimants, this is an insurmountable hurdle. Key questions about Area 51 are below.

- Did the workers at Area 51 and other Black Areas have potential radiation exposures? If so, during what time periods, what types, and from what sources?
- What were the doses to Area 51 workers from tests such as Baneberry? Is there data at R+1 from tests that blew over Area 51?
- Were Area 51 and other Black Area workers monitored? If so, by whom: Department of Defense or DOE?
- Who retains the radiation and monitoring records for these workers?
- What happened to the work history for those NTS workers assigned to Area 51?
- Were these records reintegrated into the worker's exposure records?

NIOSH has no plan for including these exposures within the TBD. This has not been identified by SCA, the Advisory Board's auditor, in its report.

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[24] Attachment 1: Nevada Test Site Building Trades Medical Screening Program: Summary of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

[25] Attachment 1: Nevada Test Site Building Trades Medical Screening Program: Summary of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

7) Radiation Exposures and Radiation Doses That Were Not Monitored

SCA stated that "(t)he TBD needs to investigate the possibility that workers sometimes did not wear their badges when the quarterly dose was near the 3 rem limit or above it, because they were sent to lower paying jobs or were laid off from their jobs for the rest of the quarter."[26] It is unclear how long this continued.

An interview with , who was employed from 1952-1991 as a Rad Safe manager and retired as Principal health Physicist, stated:[27]

> *If workers got "burned out" they could not go to work in the forward areas. Monitors put film badges into lead boxes or between 2"-thick lead bricks – that was common. At Hardtack II, there were 39 people in Rad Safe. They were told, "Don't get overexposed; we don't have anyone to replace you." said he himself told them "don't get overexposed." Some guys would take two lead bricks and put them in their truck glove compartment with their film badges in between. The whole point was not to get overexposed in 1958. Different operations had different problems. For NIOSH or anyone else to estimate now as to how much people got exposed at the test site is kind of ridiculous because there were no general rules until 1957. Even then they put their film badges in lead boxes."*
>
> *had his film badge and his accompanying monitor's badge in between lead bricks in one initial survey. It read 800 mR when processed. We had gone through a fallout area close to ground zero in excess of 50 R/h gamma. The jobs in the forward areas paid more and so in a funny way employees were working against the clock and telling people that they never got exposed. In response to the question as to how long the problem of hiding badges in lead boxes and the like went on, said that it was minimized in the late 1960s.*

SCA postulated that "one possible time when the practice may have decreased is about 1966 when the integrated film and ID badge was introduced. However, other site experts indicated that the problems with personnel deliberately removing their badges in radiological control areas may have extended into the 1970s."[28] An affidavit provided by suggests that this practice continued throughout the 1980s.[29]

Therefore, there are an unknown number of workers who likely have under-reported doses that cannot be quantified or reproduced. This poses an intractable problem.

NIOSH responded to the concerns raised in the SCA Site profile Review by stating:

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[26] Attachment 2: NIOSH Responses to S. Cohen & Associates, Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05, SCA comments 11d and 20.

[27] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005.

[28] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005.

[29] Attachment 6: Affidavit of

"NIOSH sees no way of retrieving missing data when this practice may have occurred because: 1) it cannot be definitively established that the claimant actually failed to use the badge; 2) cohort dosimetry is probably not available because the entire cohort is likely to have adopted the same practice at the same time." Therefore, NIOSH recognizes that this practice occurred, but that there is no way of credibly establishing which workers actually engaged in this practice and there is no way to estimate the dose that these workers received.

8) Resuspension of Radionuclides in the Soil

Resuspension of previously deposited radionuclides caused by atmospheric tests is likely to be important in calculating total dose to personnel from incidents such as venting or blowback, as well as conventional explosions. Section E.5 of this petition contains examples of numerous incidents related to underground tests where resuspension is clearly an exposure pathway. Resuspension of previously deposited radionuclides caused by atmospheric "safety" Plowshares, or vented tests, is likely to be important to calculating total dose to personnel.[30]

There were also conventional weapons tests at NTS that would have led to resuspension of radionuclides that NIOSH has not accounted for in its Site Profile. Aboveground non-nuclear testing that occurred before 1992 took place at Areas 5, 10, 12, 16, and 18. Examples include the following tests.

- Gravel Gerties, a test to simulate an accidental explosion of high explosive material in an underground bunker, was conducted in late 1982. This test took place at Area 4, where 35 underground tests took place through 1991.
- In 1960, a 500-ton conventional high-explosive experiment created the Scooter crater at Area 10, which was the site of 4 atmospheric tests and 54 underground tests through 1991.
- In September 1993, a 1,300,000-kilogram conventional explosive was detonated at Area 12. Area 12 was the site of 61 underground tests and no atmospheric tests. In addition, DOD operated a high-explosive research and development (R&D) tunnel, where they detonated conventional and high explosives and munitions through the end of the 1990s.
- DOD conducted several non-nuclear tests in the 1960s in Area 16, where 6 underground nuclear effects experiments took place. Today, DOD uses Area 16 for high explosives research and development for developing conventional and high explosives and munitions.
- In 1964, a Plowshare-sponsored test called Project Dugout detonated chemical high explosives to research the potential use of nuclear explosives for ditch digging in dense hard rock. This test created a 285 long crater that was 35 feet deep.[31]

The radionuclides in shallow soil in affected areas can irradiate workers directly, be consumed or inhaled during excavation or other work on or within the soil column. It can also be re-suspended into the atmosphere and inhaled or ingested in the "plume" of the soil or dust.

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[30] Attachment 2: NIOSH Responses to S. Cohen & Associates, Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05 (SCA comments 6, 8, 11)

[31] NRAMP NTS and NAFR Complex Description, Preparatory material for NTS tour by A.E. Hechinova and L.J. O'Neill: Description of the Nevada Test Site and Nellis Air Force Range Complex Activities in Nevada, May 1998.

According to an affidavit of , workers "would go into areas with big signs along the Mercury highway that said "Wind rows contain alpha contamination, Do Not Disturb"... REECo would cut through the wind rows with road graders and bulldozers to clear an area for the drill rig...(t)his always kicked up dust. REECo Health and Safety people were supposed to come and water this dust down, but most of the time they would not come."[32] In fact, he states that he and other union members would fight on a daily basis to get REECo Health and Safety out there with the water trucks and despite their requests and complaints REECo Health and Safety's water trucks would only show up half of the time[33].

The level of contamination in the soil in any affected area at any given time is the cumulative amount of contamination created by irradiation or radionuclides deposited, less the reduction due to radioactive decay of the radionuclides present. This is complex if there have been multiple deposits of radionuclides over time at a given location. Methods used by NIOSH seriously underestimate the level of contamination, and NIOSH may not be able to adequately reconstruct intakes of radionuclides via resuspension, even for monitored workers.

Some of the problems that may lead to underestimating these doses include: assumptions concerning soil contamination and amount of dust stirred up (including from vehicles in unpaved areas); hot spots; ease of suspension; length of time workers were exposed; lack of monitoring for suspension; worker locations; stay times; meteorological conditions; soil type and composition; distribution of radionuclides in the horizontal and vertical axis; particle size; and soil moisture, land cover and solubility. points out that whether the dose reconstruction utilizes resuspension or dust loading models, the calculated doses are still only a guess because of the large number of variables.[34]

Relative to reconstructing potential doses from direct soil irradiation or resuspension, NIOSH recommends the use of site average values based on the Radionuclide Inventory Distribution Program (RIDP). NIOSH claims that the average intakes provided in Table 4.2.2-3 of the TBD "represent a reasonable underestimate which is appropriate for use with compensable cases and that the maximum values provided in 4.2.2-3 represent a reasonable overestimate for use with non-compensable cases." For the cases where work location is not obtainable, NIOSH stated that the maximum values (which multiply averages by 10) will be applied to assure that the claimant receives favorable consideration.

NIOSH, it appears, misapplied the RIDP as a basis for determining the source term. The goal of the RIDP was to determine within a factor of two the distribution and inventory of man made radionuclides in surface soil of the NTS; however, the source term was calculated to a common date of January 1, 1990. NIOSH incorrectly assumed that these source terms that were reported and measured in the RIDP were constant throughout the period from 1951 to present.[35] The method, according to an analysis performed by Lynn Anspaugh for Sanford Cohen &

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[32] Attachment 7: Affidavit of

[33] Attachment 7: Affidavit of

[34] Attachment 8.: Email correspondence from regarding SC&As findings on the NTS Site Profile, dated February 23, 2006

[35] Attachment 9: Anspaugh, Lynn. The Resuspension Pathway for Nevada Test Site Workers. Sanford Cohen & Associates. October 8, 2006 (Revision 3)

Associates, is "entirely inappropriate for dose reconstruction purposes."[36] For example, Europium-155 levels in 1990, which has a short half life (4.753 years), would be approximately 50 times higher if it were measured in 1963 at the beginning of the proposed SEC class period.

In addition, NIOSH has incomplete radionuclide lists in its site profile. NIOSH excluded a number of radionuclides that were reported in the RIDP from the source term used in its resuspension model, including Mn-54, Ru-106, Rh-101, Rh-102m, Ag-100m, Sb-125, Cs-134, Ba-133, Ce-144 and Lu-174. These all have short half-lives. For example, Ru-106 has a half-life of 1.023 years, and Ce-144 has a half-life of only 0.78 years. By correcting the values back to the time of the beginning of the SEC class, the importance of these short-lived radionuclides would be much greater. Moreover, NIOSH has excluded many of the device-related radionuclides (activation and fission products) that were deposited in the surface from either atmospheric tests or underground tests that vented.[37]

Further, the RIDP data does not account for cleanups that may have taken place subsequent to a test, but before sampling was done as part of the RIDP. Samplings began in 1984 and were calculated through January 1, 1990. This means that radiation dose samples taken after cleanup will likely underestimate doses for the time period before areas were cleaned up.

SCA's review of the NTS Site Profile claims that NIOSH's approach may underestimate the exposure by a considerable amount, given the differences between locations and the differences between average and maximum intakes (NTS TBD Vol. 4, tables 4.2.2.2 and 4.2.2-3).[38] By averaging the dose over a large area, this process does not represent a maximum dose to which workers may have been exposed, because it potentially underestimates doses to personnel that were in areas containing hot spots. This issue is critically important when considering the uncertainty associated with both the underlying sampling/grid sampling procedures, and the procedures utilized to analyze soil contamination.

In the TBD, NIOSH uses "the total estimated inventory over an entire area for each listed radionuclide and divided by the area to determine the surface contamination to be used for estimating resuspension."[39] However, this approach does not take the large variability of soil contamination levels into account. SCA stated that "it is possible, even likely, that considerably higher concentrations would be found in the form of hot spots..." Given the grid size of the sampling system utilized, it is likely that at least some significant hot spots were missed.

The grid system utilized by the primary sampling program relied on for this evaluation[40]

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[36] Attachment 9: Anspaugh, Lynn. The Resuspension Pathway for Nevada Test Site Workers. Sanford Cohen & Associates. October 8, 2006 (Revision 3)

[37] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005.

[38] Attachment 2: NIOSH Responses to S. Cohen & Associates, Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05 (SCA comments 6)

[39] Attachment 2: NIOSH Responses to S. Cohen & Associates, Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05 (SCA comments 23)

[40] McArthur, R.D. Radionuclides in the Surface Soil at the Nevada Test Site. Desert Research Institute, DOE/NV/10845-02. Nevada Office: 1991.

consisted of 400 – 500 ft^2, thereby having a potential area of about 200,000 ft^2 (almost 20,000 m^2). SCA stated that many older surveys used grids that were even cruder. SCA further points out for comparison that in its 1992 decommissioning guidelines (NUREG/CR-5449), the Nuclear Regulatory Commission (NRC) suggested a grid consisting of 10x10 meters, or 100 m^2, for outdoor contaminated areas defined as "affected areas" (NRC 1992, pg.4-12), and the NRC recommends that surveys should provide 100% coverage of affected areas. Given the size of the NTS, it is not unreasonable for NIOSH to use selected statistical sampling. While NRC guidance is not directly applicable to this situation, given the importance of this data set, the total size of the area sampled appears to be relatively small. Considering the size of the grids utilized, it appears likely that significant hot spots could have been missed. This potential discrepancy is readily apparent in light of the data found in Area 10, where average concentration for Cs-137 given in Table A-2 of McArthur (1991) is approximately 1,930 nCi/m^2; however, isopleths shown in Figure 6 shows a concentration of 10,000 nCi/m^2.[41] Given the size of the grid systems utilized and the very heterogeneous nature of contamination distribution in the soils at NTS, it is reasonable to assume that the sampling data may not accurately reflect critical contamination in the soil at NTS.

NIOSH responded to the SCA stating that it "does not believe the review of raw data that required five years to obtain over a decade and has undergone three years of analysis (not including the re-analysis completed by McArthur 1991) is practicable in the context of the EEOICPA dose reconstruction project."[42] NIOSH also stated that any additional information obtained from such an analysis would be of limited value in making decisions related to compensability. In coming to this conclusion, NIOSH considered the limited information available as to the exact location of workers during various employment periods, the time interval the worker may have been located on the "hot spot," the relative insensitivity of organ dose, and compensability relative to the environmental internal dose pathway.[43]

SCA concurs with NIOSH's assessment that it is unlikely that NIOSH can complete a scientifically credible sampling and analysis program to fill in these gaps in a timely manner.

The level of uncertainty associated with sample area, locations, and sampling density discussed above is compounded by the relatively large level of uncertainty inherent to radiological analytical processes. For example, relative to soil sampling, McArthur discusses errors related to radiological counting (3-40%); physical parameters (using the same default values for air and soil densities and for soil moisture content for all samples – "a few percent"); high variability associated with "inverse relaxation lengths" (extremely sensitive); determining radionuclide ratios (high uncertainty); and sampling errors (20 – 40%).[44]

The above questions concerning the potential weakness of the soil sampling program is

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[41] McArthur, R.D. Radionuclides in the Surface Soil at the Nevada Test Site. Desert Research Institute, DOE/NV/10845-02. Nevada Office: 1991.

[42] Attachment 2: NIOSH Responses to S. Cohen & Associates (Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05) NIOSH Response 23b, page 37.

[43] Attachment 2: NIOSH Responses to S. Cohen & Associates (Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05) NIOSH Response 23b, page 37.

[44] McArthur, R.D. Radionuclides in the Surface Soil at the Nevada Test Site. Desert Research Institute, DOE/NV/10845-02. Nevada Office: 1991.

further called into question by SCA's observation that "(r)esuspension doses to monitored workers...may be underestimated, due to the presence of short-lived radionuclides and higher resuspension expected in the days and months after a test (including safety tests)...Bioassay done every few months would not detect the presence of relatively short-lived radionuclides...Workers entering contaminated areas within days of detonation of a...test that vented may have been exposed to a variety of short-lived radionuclides..."[45]

Only selected NTS workers were bioassayed, rather than all workers who may have been working in a contaminated area. Given the fact that bioassays may not have been conducted on all NTS personnel working in contaminated areas and that those conducted may not have been in a time period capable of assessing the presence and/or impact of short-lived radionuclides, it is not unreasonable to assume that the doses to NTS personnel may have been underestimated. Further, NIOSH has not accounted for soil ingestion as an environmental dose.

Given the high level of uncertainty associated with the NTS soil sampling and analysis program and our understanding that we cannot accurately determine when, where, how long and what specific activity workers may have been engaged in at any specific location, it becomes very difficult to provide reasonable assurances that NIOSH has a credible approach that accounts for potentially large doses that NTS personnel received. This confirms observation that relative to resuspension, calculated doses may only be a guess because of the large number of variables.[46]

Considering the complexities of the NTS environment, the challenge of reconstructing a credible resuspension dose at NTS is far more complex than anything NIOSH has proposed, and results in estimates that are far from claimant favorable.[47]

9) Routine Tunnel and Reentry (Mine-back) Operations

Tunnels used for nuclear explosions were contaminated from radioactive contaminants and naturally occurring radionuclides (e.g., radon). At the completion of an underground test, crews routinely would go to the site within days or weeks to retrieve debris samples. Because tunnels are confined spaces, which can maintain or even concentrate naturally occurring or test-generated radionuclides, workers who reentered the tunnels could receive significant external and internal radiation exposures. They also would mine, handle radioactively contaminated mine spoils, transport, and dispose of this contaminated material. The TBD considers two potential exposure scenarios for reentry and mine-back operations: (1) routine drilling operations or the failure of containment equipment, and (2) the presence of fission or activation products via geologic migration or escape via LOS pipes or personnel entering the cavity. As noted above, resuspension must be accounted for all tunnel workers.

While the weapons testing programs reentry personnel typically would have been suited

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[45] Attachment 2: NIOSH Responses to S. Cohen & Associates (Draft Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, dated 12/13/05) SC&A Comment 7, pages 15-16.

[46] Attachment 8.: Email correspondence from regarding SC&As findings on the NTS Site Profile, dated February 23, 2006

[47] Nevada Test Site Technical Basis Document, Vol. 4, pg 33.

up in personal protective equipment (PPE), this PPE was not consistently effective in preventing exposure and, absent comprehensive monitoring, would result in unmonitored dose. An affidavit from , includes a letter her husband wrote to their family doctor that states:[48]

> *I was about two years out of college with a physics degree when I went to work for Lockheed as an engineer and "test conductor" in the Nuclear Weapons Effects group. We installed test items and instrumentation for an underground nuclear test that was conducted at the Nevada Test Site in 1967-1968. Some hours after detonation, we were told that a Los Alamos researcher had erred in placing a plutonium sample in the test, and that oversight personnel had overlooked it too. When the weapon detonated, that sample vaporized into atomic size particles that contaminated the test tunnel and atmosphere. One of my tasks was to lead a reentry crew back into the tunnel to quickly recover out test specimen so that any effects could be assessed in the laboratory. This was planned as a fairly routine and "clean" task, but the unexpected plutonium contamination was severe. As a consequence, we "suited" up for the reentry. This included double cloth coveralls, boots, lots of tape, and a breathing apparatus. It was very hot in the tunnel. The work has physically difficult and significantly complicated by the heavy bulky "suits." The result was lots of perspiration and labored movements that led to leakage of the breathing apparatus. It slipped about and often banged against things in the dark, debris filled and partially caved-in tunnel. I know there was leakage, because a chemical was placed in the tunnel to make us aware of leakage (you got a strong banana odor when your breathing apparatus leaked). We tried to stop the leaks, but they were so frequent that it was impractical. And the health physics persons who helped us suit up were too far from the actual work site to be of immediate assistance. Anyway, we got the specimen out on time, and I think it only took a few days. The airborne plutonium seemed of no special concern at the time. You could not see, taste or sense it in any way.*

An affidavit from describes how welders working in tunnels contaminated from Baneberry only a few weeks after Baneberry vented were issued anti-contamination coveralls (anti-Cs) only to be told a week later that they would no longer be issued the anti-Cs; not because the area was no longer contaminated, but because they kept damaging the coveralls and needed too many replacement anti-Cs. states, "We had to keep the anti-Cs on in the tunnel while we worked because when Baneberry vented, the radiation cloud went up into Area 12 and they didn't shut off the tunnel ventilation systems, so it sucked the radiation into the tunnels contaminating them. The steel we were welding on was obviously contaminated like everything else, but they never issued us any masks or respirators. After a week or so, Rad Safe told us (welders) we weren't to be issued the coveralls because at the end of each shift our coveralls were all burned full of holes from welding. From then on it was declared safe and none of us wore the anti-C's, only the clothes we wore everyday to work and took home to our families to be washed!"[49]

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[48] Attachment 10: Affidavit of

[49] Attachment 11: Affidavit o

10) External/Internal: Environmental Dose to Unmonitored Workers (including I-131)

- No external environmental measurements took place between 1968-1976. NIOSH proposes to use a maximum dose from 1967 as a surrogate. SCA points out that extrapolating from 1967 is inappropriate, because there were no large unplanned vented tests in that year. However, significant radionuclide deposits from vented tests from1968 through 1970 may have caused external doses during that time period and several years after to be higher than the doses in 1967. For example, of the ten large underground tests excluded from the site profile, 3 of the 10 occurred in the 1968-76 time period (Baneberry, 1970; Camphor, 1971; and Diagonal Line, 1971.)

- NIOSH erroneously reduces potential environmental doses for workers who remained continuously on site (lived on site), claiming without sufficient support that they spent most of their off-duty time indoors. This reduction should only be done if NIOSH can prove conclusively that workers indeed spent a large portion of their time indoors, and that they worked in buildings that were sealed, positively pressured, and/or were air conditioned, rather than in trailers, tents or old buildings that relied on open windows and doors for cooling and ventilation, or that potentially drafted in air from the outside when the windows and doors were closed.

- Iodine-131 (internal) was vented from 33 tests at levels that produced off-site releases, estimated at 1,065kCi.[50] Even though there were tests with large I-131 releases, such as PALANQUIN (April 14, 1965), which released 910 kCi of I-131, workers were not monitored. NIOSH has no method for estimating a bounding dose estimate for I-131 for unmonitored workers.

Former NTS worker who was diagnosed with thyroid cancer, worked on almost every shot between 1963 and 1978 and was onsite or in very close proximity (in Area 51) to almost every shot between 1981 and 1993, and therefore was involved in numerous tests that leaked I-131. reports barely ever wearing his badge from 1963 to 1967 while working up in Rainier Mesa—the times he did wear his badge it was in his pocket. He also reports covering his badge in plastic or leaving it in his lunch pail from 1969 to 1978.[51]

11) No Method for Estimating Internal Dose to Workers Employed Less than 250 Days prior to 12/31/62

None of NIOSH's guidance addresses the cumulative internal dose from individuals employed less than 250 days during the atmospheric testing period in conjunction with periods of underground testing that occurred during the SEC class period from 1951-1962. Dose reconstructions for those whose employment bridges both time periods will be underestimated. Absent a method for internal and external dose, it will not be feasible to estimate dose for those individuals employed prior to 1963 who are compensated as members of the SEC.

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[50] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005, pp. 46.

[51] Attachment 12: Affidavit of]

12) Integrity of Records

There is evidence that DOE documentation of readings is inaccurate. For instance, DOE claims to have dosimeter readings for workers when they were no longer employed at the site. Credible dose reconstructions cannot be done without data that has been subjected to validation and verification.

According to , NIOSH has dosimeter readings for her father, until 1975. father "quit the Nevada Test Site on September 30, 1970 and he passed away November 20, 1975."[52]

NIOSH also assumes that if a worker was not bioassayed then it is unlikely they were exposed to internal radiation.[53] This assumption is problematic.

13) High-fired Oxides

The presence of high-fired oxides resulting from atmospheric weapons testing has not been investigated. High-fired plutonium oxides are less soluble than other oxides and, therefore, are retained in the lungs longer than other oxides and can take significantly longer to show up in a bioassay. These doses are not addressed in the TBD or dose assessments and it could take decades to construct an adequate dose model to estimate these exposures.[54]

14) Extremity Dosimetry

According to Sanford Cohen & Associates, there is no extremity dosimetry for bomb assembly workers.[55]

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[52] Attachment 13: Affidavit of

[53] Attachment 14: Affidavit of

[54] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005

[55] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005

F.2 We have attached documents and statements provided by affidavit that indicate that radiation monitoring records for members of the proposed class have been lost, falsified, or destroyed; or that there is not information regarding monitoring, source, source term, or process from the site where the employees worked.

The following is summary of the affidavits relevant to this section:

Attachment 12: Affidavit of , former NTS worker. describes how he and his co-workers did not wear the film badges they were issued when they were on the job site because management discouraged dirty or misplaced badges. He further explains that when badges were worn they were either placed in pockets or covered with plastic. He describes one incident in N or E-Tunnel, in which workers were sent into the tunnel after a shot to wash up and were instructed to get out of the tunnel when their badges read 5,000 MR. He describes the mushroom cloud that Baneberry made after it vented and how he was taken to E or N-Tunnel after it vented, then to Area 12, then to Rainier Mesa and then to CP Hill where he was wanded and sent home. He describes working and sleeping in Area 51 half of the time he worked at the NTS from 1981 to 2004. He describes how he participated in almost every test between 1962 and 1978 and was onsite for almost every test conducted between 1981 and 1993. He explains that there were 33 underground tests that released I-131 after January 1, 1963 and to date, no analysis of radioiodine releases that occurred after 1962 have been performed, and therefore NIOSH should not have performed a dose reconstruction on him inasmuch as I-131 is known to cause thyroid cancer.

Attachment 15: Affidavit of ., former NTS worker. He describes drilling management deciding to perform plug-backs on the swing or graveyard shift in order to avoid Rad Safe—Rad Safe worked mainly during the day and would slow the plug-back process down by monitoring for radiation safety. He explains that he barely ever wore his badge while welding because he did not want to damage it. He describes working on plug-backs in which he would cut the cap off of a pipe and nuclear gases would come out and he had to breathe the gases. He describes almost daily removal of badges despite the fact his records only the standard once a month change. He describes acute health problems resulting from his work at NTS. He describes working on equipment that should have been decontaminated before he worked on it. He describes working on containment canisters in Area 2, in which he explains that Rad Safe employees in wearing protective clothing and respiration would dump uranium and lead into casks while he and his coworkers stood by only a few feet away with no protective clothing or respirators. He describes radiation alarms going off on almost a daily basis and he explains that protocol is for all workers to leave the area, however, this did not happen—workers kept on working and the Fenix and Scission employees in charge of the alarms would reset the alarms and someone from CP would come and take their badges. He describes being exposed to radiation while Holmes and Narver employees x-rayed casing. He describes working on equipment in Plutonium Valley without protective clothing or a respirator despite the fact that he often had to lay in the contaminated dirt in order to fix the HazVac trucks he worked on.

Attachment 6: Affidavit for , former NTS worker. He describes being ordered by supervisory personnel to leave his Thermoluminescent Dosimeter (TLD) in his truck, lunchbox or elsewhere when he was welding, because such work could damage the badge. From his second day working at the NTS he did not wear his badge when welding potentially leaving him with no dose record. He describes the constant threat of breathing contaminated dust. He describes lapses in protocol while working in Area 5 when Holmes and Narver (H & N) technicians performed x-rays of his welds. He was often closer to the welds than the H & N technicians doing the shooting despite the fact that it was protocol for welders and other workers to be located in a "cold spot," a safe distance away from the source. He describes never using his badge while working in Area 25 in X-Tunnel. He describes being exposed to radiation venting from the vent shafts coming from N and T-Tunnels without wearing his TLD. He describes a lack of protective clothing while working in N and P Tunnels, which were contaminated with radioactive water. He describes how his dose reconstruction report incorrectly states that he never was required to "dress down." He was required to dress down while working inside the Butler Building and periodically in N, P and X-Tunnels. He believes this discrepancy is due to the inadequate clarification and questioning of the person performing his CATI. He describes regularly being exposed to radiated water outside of the Butler Building without wearing protective clothing.

The following is a description, as complete as possible to the extent it might be unclear, of how the attached documentation and affidavits indicate that radiation monitoring records for members of the proposed class have been lost, altered illegally, or destroyed.

1) External: Data Integrity Compromised by Management-Directed Interference with Use of Film Badge Monitors and Manipulation of the Official Record

- Use of personal dosimetry badging was inconsistent. For example, claims to have been issued a film badge the whole time he worked at the NTS, but he did not always wear it. He states, "When I was a driller from 1963 to 1967 I never wore my badge while I worked up in Rainier Mesa. We only wore our badges when we went to the job site and then we would put them away in our lunch pails. We would put them back on when we left the job site. We did this because we would get in trouble if they got too dirty or if we lost them and it was easy to get them dirty and lose them with the work that we were doing. The times I did wear my badge I had kept in my pocket. When I was a miner and a core driller from 1969 to 1978 we either covered our badges in plastic, so as not to get them dirty, or we would leave them in our lunch pails."[56]

- An affidavit from lescribes how management purposefully performed drillbacks on swing and graveyard shifts so as to avoid being bogged down by Rad Safe officials who only worked during the days.[57] He states, "Drilling managers knew that if we did the plug backs during the day when Rad Safe was there we would have to stop working

[56] Attachment 12: Affidavit of .
[57] Attachment 15: Affidavit of

so they could check for radiation. Therefore, we always did plug backs at night so we wouldn't be bothered by Rad Safe....Most of the time, I would leave my badge in my truck anyway because I didn't want to damage it. We always got in trouble for damaging our badges so we simply stopped wearing them while we welded."[58]

- Production imperatives led to management decisions to not monitor workers and interfere with the proper use of film badges. These data integrity problems create insurmountable problems for dose reconstruction. For example, workers were told to lose their external dose badges to avoid reporting overexposures, and others were told to leave their badges in trucks or in lead lined boxes to avoid recording doses in excess of the exposure limits[59].

- In his book *Elements of Controversy*,[60] Barton Hacker documented that workers, at the direction of management, often did not wear and/or hid dosimeter badges to prevent registering doses that would exceed project, monthly, or cumulative doses. Exceeding maximum dose would exclude workers from participating in further radiation work and force them to take lower paying off-site jobs or to be let go for the remained of the year. Hacker documented workers removing their dosimetry badges at the urging of management to avoid exceeding quarterly maximum dose limits.

- Interviews with , who was employed from 1952-1991 at NTS and retired as the Principal Health Physicist, also corroborated statements that management directed workers to place film badges in lead lined boxes to avoid exceeding dose limits. participated in 89 atmospheric tests and hundreds of below ground tests.[61]

  - An Affidavit from [62], a former pipefitter/foreman at NTS in Area 12 and who worked in N and P tunnels, and in Area 25 in X tunnel, shows that:

    (1) Early on in his work at NTS he damaged his film badge while welding, and rather than having to risk damaging his badge again (and generate the attendant paperwork), he was told by management to put his film badge in his lunch box or truck. states: "(t)hat's why you will see on my report "badge damaged" and then the rest of my employment badges showed zero because I was told to put it away when welding, and that was all of the time. So they could not keep readings on me." This intentional non-monitoring of workers indicates that the dosimetry data lacks integrity, and will cause a systematic under-recording of dose in tunnels used for nuclear weapons testing.
    (2) In the Area 5 spill test project, badges were left in a lunch trailer or truck. states: "(t)hey shot X-Rays of the welds, and most of the time I

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[58] Attachment 15: Affidavit of
[59] Attachment 6: Affidavit of
[60] Barton C. Hacker, *Elements of Controversy: The Atomic Energy Commission and Radiation Safety in Nuclear Weapons Testing 1947 – 1974*. University of California Press (1987).
[61] Sanford Cohen & Associates, Review of the NIOSH Site Profile for the Nevada Test Site, SCA-TR-TASK1-0006, December 13, 2005.
[62] Attachment 6: Affidavit of

was closer to the welds than the technician doing the shooting. I was present at 6000 to 7000 weld shots. That's a lot of dose with no monitoring." These were not isolated instances, and they reveal systematic unmonitored exposure to radiation.

- Testimony of Dorothy Clayton before the Advisory Board on Radiation and Worker Health (ABRWH)[63] documented several years during which her husband was told to lose his dose badge and management facilitated his efforts in filing lost film badge reports. In addition, she pointed to documents revealing that official dosimetry records understate actual film badge readings. Ms. Clayton's September, 19, 2006 testimony before the ABRWH states:

  MS. CLAYTON: "I have some records to share with you. My husband worked at the Nevada Test Site for 29 and a half years, and I was able to get 1,370 pages of declassified records from the DOE, but I just chose about five years that I'd like to share with you of - - of the records that -- that I have gotten from him -- for him.

  "I'll start with 1959 when the radiation exposure at the Test Site at that time was three rems per quarter and five rems per year.

  "His radiation exposure history from the DOE shows that he got 12,130 millirems. That includes 10,100 in tritium. Also there's a -- there's a memo from -- it's for -- to the Nevada Operations Department, Division of the Atomic Energy Commission, asking that his radiation exposure be raised to 12,000 millirems a year. This memo is dated September the 4th. He was already up to 8.3 at that point, so he was well over the 5 -- 5,000 millirems at that -- at that time.

  "Then in October, October the 1st, his radiation exposure was 11.9. The radiation chief wrote a memo that said (reading) 'It would be my recommendation that Mr. Clayton be transferred from his present work assignment to an area where his exposure possibilities would be removed entirely.'

  "That didn't happen. There are urine samples done, nasal swabs done from October the 19th, 1959 all the way through December of 1959. On the -- the year-end report it shows the radiation dosage that he received up through September. October, November and December are blank. They did not record any radiation at all that he had gotten because he was -- he was already over the 12,000 that they had given him -- had raised it to. That was 1959.

  "1961, this is -- there was a teletype from Reynolds Electric to James B. (unintelligible) of the U.S. AEC. This is dated November the 28th, 1961 asking to raise my husband's radiation limit again to the 12,000 millirems per year. It says

[63] Meeting 40: Advisory Board on Radiation and Worker Health, Volume 1, Day One: The verbatim transcript of the 40th Meeting of the Advisory Board on Radiation and Worker Health held at the Westin Casuarina, Las Vegas, Nevada, on Sept. 19, 2006. Pages 176 – 182.

'We urgently request that approximately 30 key personnel now working in B tunnel, all of whom have exceeded or are about to exceed three R for the quarter, be allowed to continue working in B tunnel. And this is considered necessary if we are to meet the test schedules, and it's highly desirable from an economic standpoint.'

"They didn't want to bring in new hires and train them to do the job. They'd rather these men be over-exposed to radiation. That was in 1961.

"In 1962 -- I have copies of his film badge cards, the original film badge cards. It shows -- on the radiation exposure history it shows that he had gotten 1,955 millirems for that year. However, on this film badge card right here, which is date-stamped November the 29th, 1962, his radiation exposure was 3,113 – a discrepancy there. There's log book entries. They blacked out some of the names to protect-- you know, to prevent other people's names from showing, but they made a notation of one of the men having radiated hair, radiation in his hair. They also made a note in this log book regarding the lost film badges, that the men were requested -- if they had an abundance of radiation -- to lose their badges. Here -- it said there was a call from the lab and said we should get some lost film badge cards to provide for the men who were asked to lose their badges and replace them.

"There's another note in another log book that said the call -- they had received a call for information on one of the men who had lost his film badge.

"About eight months before my husband passed away he dictated a ten-page work history to me, and this was in 19-- this was October the 26th, 1998. He passed away in 1999, June the 5th. He had been working on the mesa above the tunnels, and when the rad safe monitor came to -- back to him, he made a report to the net control, and as soon as the monitor told the people at the net control how much radiation my husband had at that time and how high the radiation was at that level, they told him to get him off of the mesa, then, and the rad safe supervisor recommended that my husband lose his film badge, which he did, because at that time my husband -- his words, the miners were in fear of losing their jobs if they got too much radiation.

"They weren't aware of the consequences of overabundance of radiation. They knew it was bad - - the workers did, I'm sure -- but they didn't know the consequences of -- of losing a badge and not being able to count that radiation.

"Then in 1963 the radiation exposure history shows 240 millirems of radiation. However, a film -- copy of a film badge card that I have dated 8/29/63 shows that he had 4,611 millirems for the year.

"In 1964 the radiation exposure history shows zero. That was a year that -- where they had an abundance of heavy-duty tests. The -- one of his film badge cards which is date-stamped May the 2nd, 1964 shows 5,675 millirems.

"The last one I have to show you is 1965. The radiation exposure history shows 265 millirems. However, his film badge card shows 6,486 millirems. And it's their -- it's a copy of the actual film badge cards.

"So I don't see how an accurate dose reconstruction can happen when they were doing things like this. I don't see how a radiation exposure history can be determined when they have records like this, the film badge cards, to go by."

2) Lost, Falsified or Destroyed Records

Former Nevada Test Site worker Sandie Medina claims to have filed records, including toxic-materials reports, personnel rosters, weekly safety meetings, accident log books and lists of miners and craftsmen who reentered a tunnel where nuclear bombs were detonated for 25 years in cardboard boxes in an alcove building at the entrance to N-Tunnel in Area 12.[64] In February of 1998, Mrs. Medina noticed all of the records were gone, and after making some inquiries she found out a forklift operator had carted off the boxes and taken them to a landfill at the NTS to be buried.[65] Whether or not the records were lost or destroyed is perhaps irrelevant, this issue is they are gone.

Workers have reported the film in their badges being replaced after exposures. In his affidavit claims that not only did he fail to wear his badge most times, but when he did wear his badge it was often taken away at the end of the day or when you were found to have been exposed. He states "At the end of the shift someone from CP (Control Point) would come by and take your film badge and give you a new [badge]. Who knows what they did with the badges, because all you see on my record is the standard once a month badge change, but they took our badges a lot more than once a month."[66] He also describes the systemic practice of management ignoring radiation alarm from the 1970s to the early 1990s. He states, "On a daily basis radiation alarms would go off, but management would tell us to keep working. We were supposed to go to the dog house or get off location if an alarm sounded, but we were always told just to keep on working[67]."

[64] Attachment 16: *Test Site Workers 'RecordsDumped* Las Vegas Review-Journal (Nevada), September 25, 2006 Monday, B; Pg. 1B, 1303 words, Keith Rogers
[65] Attachment 16: *Test Site Workers 'RecordsDumped* Las Vegas Review-Journal (Nevada), September 25, 2006 Monday, B; Pg. 1B, 1303 words, Keith Rogers
[66] Attachment 15: Affidavit of
[67] Attachment 15: Affidavit of

F. 3 We have attached a report from a health physicist or other individual with expertise in radiation dose reconstruction documenting limitations of existing DOE or AWE records on radiation exposures at the facility, as relevant to the petition.

See Attachment 1

The following is a summary of how the report specifies the basis for believing these documented limitations might prevent the completion of dose reconstructions for members of the class under 42 CFR part 82 and related NIOSH technical implementation guidelines:

Boston University conducted an assessment of 2,753 NTS workers who were involved in the former worker medical screening program to ascertain whether cumulative lifetime gamma dose calculations from the NTS dosimetry database could be used as a surrogate to estimate cumulative dose.[68] This report, which was prepared under contract for NIOSH, compares and contrasts information from personal interviews and survey questionnaires versus hardcopy information and electronic information contained in the various NTS radiological databases.[69] The report points out the lack of internal dosimetry data, especially radon data for workers within inadequately ventilated tunnels.[70] In addition, it describes missing and mis-transcribed data in NTS databases and, in some cases, the inability to correlate electronic data with its original hardcopy source (e.g., Pu 238/239 data from releases during tunnel venting).

Based on in-depth case reviews, approximately 25% of the cases reviewed by the authors either had no external dose records in the electronic databases or were missing monitoring results. Even when there were sufficient radiological data, it was difficult to determine if the results were predictive of a worker's cumulative gamma exposure because of the inability to correlate a worker's designated job function to the actual work conducted.

The report noted that pre-1989 databases contained very little internal dose data. Therefore, the team developed a database utilizing Radiation Exposure History summary reports and evaluated records for 1752 workers who had external dose records, and 100 workers who had internal dose records (it was noted that the records contained no data for radon exposures). Because of the lack of internal exposure data, it was concluded that "analysis of work history parameters as a function of total lifetime internal dose would not be useful."

The authors concluded that they could not develop a statistical model to estimate total cumulative dose based on the work history questionnaire variables they utilized, because of the lack of discernable statistical trends in the data. Potential reasons for this include:

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[68] Attachment 1: Nevada Test Site Building Trades Medical Screening Program: Summary of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

[69] Attachment 1: Nevada Test Site Building Trades Medical Screening Program: Summary of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

[70] Attachment 1: Nevada Test Site Building Trades Medical Screening Program: Summary of Radiation Exposure Date Analyses, All Workers Interviewed By June 30, 2003, Construction Worker Exposure And Job Task Data Project, June 8, 2004.

- A relatively large portion of the tunnel worker's dose could have been due to internal exposures; however, there was insufficient summary internal dose data to conduct a valid statistical analysis.
- Approximately 25% of the cases studied either had no external dose records in the electronic database or were missing some time periods.
- It was unclear whether the primary work related variables were predictive of overall cumulative does, because they could not correlate workers' job categories with the actual work they conducted.

Some selective conclusions gleaned from this study include:

- "...it appears that at least in some cases only some workers were monitored for internal exposures."
- "It appears that the NTS electronic database may not be very useful in considering worst case scenarios since it appears to have fairly extensive data gaps and the bioassay data with the database clearly needs to be validated and verified prior to use."
- "...use of co-worker data for estimation of mission data will have to be very specific since work performed and the areas where they worked varied greatly."
- "Caution should be exercised in using area-monitoring for determining internal doses since bioassay data from the one case study they evaluated (the E tunnel decontamination work), was inconsistent with area monitoring and air sampling results were not representative of worker exposures."

F.4 **We have attached the following reports which identify dosimetry and related information are unavailable (due to either a lack of monitoring or the destruction or loss of records) for estimating the radiation doses of employees covered by tbe petition:**

Attachment 17
Anspaugh, Lynn R., et. al. "Movement of Radionuclides in terrestrial Ecosystems by Physical Processes." Health Physics. Vol. 82, No. 5., May 2002. 669-79.

Attachment 18
Anspaugh, Lynn R. Technical Basis for Dose Reconstruction. Virginia: Lawrence Livermore National Laboratory, UCRL-JC-123714. 31 Jan. 1996.

Attachment 19
Anspaugh, Lynn R. Introduction to Section II and Overview of Dose Reconstruction: Lessons Learned from Studies in the U.S. California: Lawrence Livermore National Laboratory. UCRL-JC-126357. Jan. 1997.

Attachment 20
Boice, John D., et. al. "A Comprehensive Dose Reconstruction Methodology for Former Rocketdyne/Atomics International Radiation Workers." Health Physics. Vol. 90, No.5, May 2006. 409-430.

Attachment 21
Layton, David, et. al. Risk Assessment of Soil-Based Exposures to Plutonium at Experimental Sites Located on the Nevada Test Site and Adjoining Areas. California: Lawrence Livermore National Laboratory. UCRL-ID-113605. June 1993.

Attachment 22
Martell, E.A. "Iodine-131 Fallout from Underground Tests." Science. New Series, Vol. 143, No. 3602, 10 Jan. 1964. 126-129.

Attachment 23
Rodgers, John, et. al. Performance Evaluation of LANL Environmental Radiological Air Monitoring Inlets at High Wind Velocities Associated with Resuspension. Los Alamos National Laboratory, LA-UR-00-3091.

Public Burden Statement

Public reporting burden for this collection of information is estimated to average 300 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

Privacy Act Advisement

In accordance with the Privacy Act of 1974, as amended (5 U.S.C. § 552a), you are hereby notified of the following:

The Energy Employees Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385) (EEOICPA) authorizes the President to designate additional classes of employees to be included in the Special Exposure Cohort (SEC). EEOICPA authorizes HHS to implement its responsibilities with the assistance of the National Institute for Occupational Safety (NIOSH), an Institute of the Centers for Disease Control and Prevention. Information obtained by NIOSH in connection with petitions for including additional classes of employees in the SEC will be used to evaluate the petition and report findings to the Advisory Board on Radiation and Worker Health and HHS.

Records containing identifiable information become part of an existing NIOSH system of records under the Privacy Act, 09-20-147 "Occupational Health Epidemiological Studies and EEOICPA Program Records. HHS/CDC/NIOSH." These records are treated in a confidential manner, unless otherwise compelled by law. Disclosures that NIOSH may need to make for the processing of your petition or other purposes are listed below.

NIOSH may need to disclose personal identifying information to: (a) the Department of Energy, other federal agencies, other government or private entities and to private sector employers to permit these entities to retrieve records required by NIOSH; (b) identified witnesses as designated by NIOSH so that these individuals can provide information to assist with the evaluation of SEC petitions; (c) contractors assisting NIOSH; (d) collaborating researchers, under certain limited circumstances to conduct further investigations; (e) Federal, state and local agencies for law enforcement purposes; and (f) a Member of Congress or a Congressional staff member in response to a verified inquiry.

This notice applies to all forms and informational requests that you may receive from NIOSH in connection with the evaluation of an SEC petition.

Use of the NIOSH petition forms (A and B) is voluntary but your provision of information required by these forms is mandatory for the consideration of a petition, as specified under 42 CFR Part 83. Petitions that fail to provide required information may not be considered by HHS.

Name or Social Security Number of First Petitioner: _____