


# **Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vendor Facilities**

Prepared by:  
National Institute for Occupational Safety and Health



---

John Howard, M.D.  
Director  
December 2006

## I. Summary of Results

This update to the Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vendor Facilities is the second revision of the original study reported in November 2002 and revised in June 2004. The National Institute for Occupational Safety and Health (NIOSH) is required to submit this report by the National Defense Authorization Act for Fiscal Year 2005 (NDAA) (Pub. L. 108-375), which amended the Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), 42 U.S.C. §§ 7384 *et seq.*, as follows:

1. *For each facility for which such report found that insufficient information was available to determine whether significant residual contamination was present, determine whether significant residual contamination was present;*
2. *For each facility for which such report found that significant residual contamination remained present as of the date of the report, determine the date on which such contamination ceased to be present;*
3. *For each facility for which such report found that significant residual contamination was present but for which the Director has been unable to determine the extent to which such contamination is attributable to atomic weapons-related activities, identify the specific dates of coverage attributable to such activities and, in so identifying, presume that such contamination is attributable to such activities until there is evidence of decontamination of residual contamination identified with atomic weapons-related activities;*
4. *For each facility for which such report found significant residual contamination, determine whether it is at least as likely as not that such contamination could have caused an employee who was employed at such facility only during the residual contamination period to contract a cancer or beryllium illness compensable under subtitle B of the Energy Employees Occupational Illness Compensation Program Act of 2000; and*
5. *If new information that pertains to the report has been made available to the Director since that report was submitted, identify and describe such information.*

NIOSH found that there were 94 Atomic Weapons Employer (AWE) facilities and 65 Beryllium Vendors that required evaluation as described above. The documents reviewed did not indicate the existence of a current, unrecognized occupational or public health threat. NIOSH evaluated new information that had been identified since 2004. NIOSH also based findings on information posted on the Department of Energy (DOE) Office of Environment, Safety, and Health (ES&H) website as of July 31, 2006 (changes made to the DOE ES&H website after July 31, 2006 are not reflected in this report).

The following actions have been taken in this report:

1. A determination on the presence of significant residual radioactive or beryllium contamination has been made for all of the facilities for which the previous report found that

insufficient information was available to determine whether significant residual contamination was present.

2. A determination on the date when significant residual contamination was no longer present has been made for many facilities for which the previous report found that significant residual contamination remained present as of the date of the report. However, many sites were determined to have significant residual contamination remaining as of the date of this report. This is described on a facility-by-facility basis.
3. For all facilities for which the previous report was unable to determine that significant residual contamination was attributable to atomic weapons-related activities, specific dates of coverage attributable to such activities have been determined and, when the source of such contamination was not clear, the contamination was presumed to be associated with atomic weapons-related activities.
4. All facilities for which significant residual contamination was determined to be present after the period of weapons related production are considered to have the potential of causing an employee who was employed at such facility only during the residual contamination period to contract a cancer or beryllium illness compensable under subtitle B of the Energy Employees Occupational Illness Compensation Program Act of 2000.
5. All information used in making the determinations in this report are referenced in the individual facility evaluations found in Appendices A-3 and B-3.

Individual results for the 94 AWEs evaluated as required by the NDAA are as follows:

- 18 of the 94 atomic weapons employer facilities have little potential for significant residual contamination outside of the periods in which weapons-related production occurred.
- 72 of the 94 atomic weapons employer facilities have the potential for significant residual contamination outside of the periods in which weapons-related production occurred.
- 4 of the 94 previously listed Atomic Weapons Employer facilities are no longer listed as Atomic Weapons Employers on the DOE ES&H website.

Individual results for the 65 Beryllium Vendor Facilities evaluated are required by the NDAA are as follows:

- 7 of the 65 beryllium vendor facilities have little potential for significant residual contamination outside of the periods in which weapons-related production occurred.
- 58 of the 65 beryllium vendor facilities evaluated have the potential for significant residual contamination outside of the periods in which weapons-related production occurred.

## II. Background and Purpose

The Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), 42 U.S.C. §§ 7384 *et seq.*, established a program to compensate individuals who developed illnesses as a result of their employment in nuclear weapons production-related activities at certain facilities in which radioactive materials or beryllium was processed. DOE was directed by Executive Order 13179 to publish in the Federal Register a list of facilities covered by the Act. On January 17, 2001, DOE published a list of AWEs, DOE facilities, and beryllium vendors, in the Federal Register; the list was revised on December 27, 2002, 67 Fed Reg. 32,690. Updates to the list (corrections, additions, and deletions) have been made periodically by DOE. This update to the Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vendor Facilities is the second revision to the original study reported in November of 2002 and revised in June of 2004.

The DOE ES&H website (<http://www.eh.doe.gov/advocacy>) provides a synopsis of the work performed at each facility, including a listing of periods during which DOE believes, based on current information, that weapons-related processing was conducted. In determining these periods, DOE has applied the definitions in EEOICPA to the known facts about the time and conditions of weapons-related processing at each facility. DOE changes the entries on its database as additional information is obtained. These periods are referred to in this report as "Periods in which weapons-related production occurred." It must be noted that the Department of Labor (DOL) is responsible for determining actual periods of covered employment based upon DOE's findings as well as information from claimants and other sources.

This study consisted primarily of an evaluation of documents pertaining to AWEs. These include documents compiled by DOE ES&H, documents obtained through NIOSH data capture efforts, and documents located on the Formerly Utilized Sites Remediation Action Program (FUSRAP) and U.S. Army Corps of Engineers websites. The quantity and quality of the information available for each site varied significantly. Examples of documentation reviewed include radiological surveys, descriptions of production operations, contractual agreements, and interoffice correspondence. In addition, interviews with current and past employees of these facilities were conducted to obtain information not contained in available documentation. When such interviews were used in the facility evaluation, they are listed in the individual site descriptions in Appendix B-3.

NIOSH believes that contamination levels at designated facilities in excess of those indicated in 10 C.F.R. pt. 835, Appendix D (Occupational Radiation Protection, Surface Contamination Values) indicate that there is "significant contamination" remaining in those facilities. Documentation for each facility was reviewed, as available, to determine if there was an indication that residual radioactive contamination was present outside of the periods in which weapons-related production occurred. Those levels then were compared to current radiation protection limits as listed in 10 C.F.R. pt. 835, to determine if there was "significant contamination." If there was no documentation or limited documentation on radiation levels at specified facilities, NIOSH made a professional judgment regarding the residual contamination.

If NIOSH determined there was “the potential for significant contamination” at a designated facility, then NIOSH determined, pursuant to NDAA, that such contamination “could have caused or substantially contributed to the cancer of a covered employee with cancer.”

In the case of beryllium contamination, if there was no evidence that the beryllium areas had been decontaminated, it was determined that this material could have caused or substantially contributed to the beryllium illness of an employee. Because beryllium sensitization can occur at very low levels of exposure, the level of residual beryllium contamination remaining was not included in the determination.

Because the investigation involved evaluating potential radioactive contamination and beryllium contamination, the study was divided so that the required expertise could be devoted to the radiological facilities and the beryllium facilities. Appendices A-1 and B-1 provide synopses of the findings for the 159 facilities that were evaluated as required by NDAA: Appendix A-1 applies to 94 facilities evaluated for residual radioactive contamination while Appendix B-1 applies to 65 facilities evaluated for residual beryllium contamination.

Some of the periods in which weapons-related production occurred have been changed on the DOE ES&H website since the June 2004 report. Appendices A-2 and B-2 provide the current descriptions and evaluations for all AWE and Beryllium Vendor facilities, respectively. Appendices A-3 and B-3 provide descriptions of each facility, the data reviewed as a part of this evaluation, and the final findings.

#### Periods of Residual Contamination

The evaluations focused on determining whether the potential for significant residual contamination existed outside of the periods in which weapons-related production occurred. In many cases, no records of decontamination were found or surveys performed outside of the period in which weapons-related production occurred indicated the existence of significant residual contamination. However, some of the documentation provided dates of decontamination, dates of demolition of the facility, or descriptions of the radiological controls in place during operations. For sites that exhibited a potential for significant residual radioactive contamination outside of the periods in which weapons-related production occurred, and for which an indication of a more accurate period was available, this time period was provided. For sites that exhibited a potential for significant residual radioactive contamination outside of the periods in which weapons-related production occurred, and for which an indication of a more accurate period was not available, it was assumed that significant residual contamination existed until the time which the facility was demolished or until the present, defined as July 2006, when this report was written.

Some sites performed work with radioactive material and/or beryllium for commercial purposes, in addition to work for the Atomic Energy Commission (AEC)/DOE. When it was impossible to distinguish residual contamination resulting from AEC/DOE activities from those resulting from commercial purposes, it was assumed that the contamination was attributable to weapons-related activities.

### III. Residual Radioactive Contamination Evaluation

This study consisted primarily of an evaluation of documents pertaining to AWEs. These include documents compiled by DOE ES&H, documents obtained through data capture efforts of NIOSH, and documents located on the FUSRAP and U.S. Army Corps of Engineers websites. In all cases, the individual site finding is based on the available information. The finding on any single site was based on the quantity and completeness of the information available regarding that site and professional judgment as necessary.

In this evaluation of residual radioactive contamination, as in the previous report, the following factors were considered:

- 1) The radionuclides involved;
- 2) The quantity of radioactive material processed;
- 3) The physical form of the radioactive material processed (*i.e.*, solid, liquid, or gas);
- 4) The operations performed and their potential for radiation/radioactivity exposure;
- 5) Documented radiological control and monitoring programs that were in place during operations; and
- 6) Documented decontamination of facilities

These factors were used to estimate the potential for radiation exposure both during operations and after production/processing had ceased. For example, a facility for which a decontamination survey was documented was classified as having little potential for residual radioactive contamination after the decontamination date, while a facility with a high potential for residual radioactive contamination during operations and no documented decontamination data was classified as having a potential for residual contamination after operations had ceased.

Each site was assigned to one of two categories:

1. Documentation reviewed indicates there is little potential for significant residual contamination outside the period in which weapons-related production occurred.  
A site was assigned to this category if the documentation available for the facility indicated one or more of the following characteristics:
  - a) The facility was decontaminated within the periods in which weapons-related production occurred,
  - b) The facility had very little potential for residual contamination during actual operations, or
  - c) The facility is still in operation and the end date is listed as "present."
2. Documentation reviewed indicates there is a potential for significant residual contamination outside the period in which weapons-related production occurred.  
A site was assigned to this category if there was documentation indicating the following:

- a) Radioactive material was present in quantities or forms which could have caused or substantially contributed to the cancer of a covered employee, and
- b) Radioactive material was processed or present outside of the dates as listed on the DOE ES&H website.

This type of documentation often included FUSRAP surveys conducted after Manhattan Engineering District (MED)/AEC/DOE operations were complete, which indicated the presence of residual radioactive contamination that could be attributed to those activities.

In some cases, the facilities processed radioactive material for not only nuclear weapons production, but also commercial, non-DOE contracts. Sometimes the material processed for nuclear weapons production was indistinguishable from material processed for commercial purposes. Wherever residual radioactive contamination due to DOE operations was not clearly distinguishable from that resulting from commercial operations, it was assumed that the contamination was the result of weapons production activities. As a result, in these cases, the findings were that the potential for significant residual contamination existed outside of the periods in which weapons-related production occurred. For sites that exhibited a potential for significant residual radioactive contamination outside of the periods in which weapons-related production occurred, and for which an end date could not be determined, it was assumed that significant residual contamination existed until the time the facility was demolished or until the present, defined as the date this report was written.

#### Findings of Evaluation of Facilities for Residual Radioactive Contamination

The results of this study indicate that there are atomic weapons employer facilities for which the potential for significant residual radiological contamination exists outside of the periods in which weapons-related production occurred as listed on the DOE ES&H website.

Appendix A-1 lists the findings for the potential for significant residual radioactive contamination at the 94 facilities required for evaluation by NDAA. Appendix A-2 lists all of the AWE facilities and the findings for potential residual radioactive contamination. Appendix A-3 describes each facility evaluated for residual radioactive contamination, the data reviewed as a part of this evaluation, and the final findings.

#### **IV. Residual Beryllium Contamination Evaluation**

The primary sources of information used to evaluate each site were the individual facility files compiled by DOE ES&H. In addition, interviews with current and past employees of these facilities were conducted to obtain information not contained in available documentation.

The finding on any single site was based on the quantity and completeness of the information available regarding that site and professional judgment as necessary.

In this evaluation of residual radioactive contamination, as in the previous report, the following factors were considered:

- 1) If beryllium was actually handled at the site.
- 2) If there was evidence of decontamination of the facility.

These factors were used to estimate the potential for beryllium exposure both during operations and after production/processing had ceased. For example, a facility for which a decontamination survey was documented or for which personal interviews indicated that decontamination was performed, was classified as having little potential for residual beryllium contamination after the decontamination date; a facility without such evidence of decontamination was classified as having a potential for residual beryllium contamination after operations had ceased.

Each site was assigned to one of two categories:

1. Documentation reviewed indicates there is little potential for significant residual contamination outside the period in which weapons-related production occurred.  
A site was assigned to this category if the documentation available for the facility indicated one or more of the following characteristics:
  - a) Evidence of decontamination and/or beryllium contamination survey data,
  - b) The facility had very little potential for residual contamination during actual operations, or
  - c) The facility is still in operation and the end date is listed as “present.”
2. Documentation reviewed indicates there is a potential for significant residual contamination outside the period in which weapons-related production occurred.  
A site was assigned to this category if either of the following conditions existed:
  - a) Documentation was available indicating that beryllium was processed or present outside of the dates listed on the DOE ES&H website that could have caused or substantially contributed to the beryllium illness of a covered employee.
  - b) There was no evidence of a decontamination of the facility or area where beryllium was processed.

In some cases, the facilities processed beryllium material for not only nuclear weapons production, but also commercial, non-DOE contracts. Sometimes the material processed for nuclear weapons production was indistinguishable from material processed for commercial purposes. Wherever residual beryllium contamination due to DOE operations was not clearly distinguishable from that resulting from commercial operations, it was assumed that the contamination was the result of weapons production activities. As a result, in these cases, the findings were that the potential for significant residual contamination existed outside of the periods in which weapons-related production occurred. For sites that exhibited a potential for significant residual beryllium contamination outside of the periods in which weapons-related production occurred, and for which an end date could not be determined, it was assumed that



significant residual contamination existed until the time the facility was demolished or until the present, defined as the date this report was written.

#### Findings of Evaluation of Facilities for Residual Beryllium Contamination

The results of this study indicate that there are Beryllium Vendor facilities for which the potential for significant residual beryllium contamination exists outside of the periods in which weapons-related production occurred as listed on the DOE ES&H website.

Appendix B-1 lists the findings for the potential for significant residual beryllium contamination at the 65 facilities required for evaluation by NDAA. Appendix B-2 lists all Beryllium Vendor facilities and the findings for potential residual beryllium contamination. Appendix B-3 describes each facility evaluated for residual beryllium contamination, the data reviewed as a part of this evaluation, and the final findings.

### **V. Conclusions**

The findings of this study are: 1.) Some atomic weapons employer facilities and beryllium vendor facilities have the potential for significant residual radiological and beryllium contamination outside of the periods in which weapons-related production occurred. 2.) For the purposes of this report, NIOSH believes that facilities having “significant contamination” had quantities of radioactive material that “could have caused or substantially contributed to the cancer of a covered employee with cancer.” 3.) The documents reviewed did not indicate the existence of a current, unrecognized occupational or public health threat.