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12-21-09 OMB Number: 0920-0639

Expires: 07/31/2010

Special Exposure Cohort Petition — Form B

POA09:11 RCVD

Page 1 of 7

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

General Instructions on Completing this Form (complete instructions are available in a separate packet):

Except for signatures, please PRINT all information clearly and neatly on the form.

Please read each of Parts A — G in this form and complete the parts appropriate to you. If there is more than one petitioner, then each petitioner should complete those sections of parts A — C of the form that apply to them. Additional copies of the first two pages of this form are provided at the end of the form for this purpose. A maximum of three petitioners is allowed.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

If you have questions about the use of this form, please call the following NIOSH toll-free phone number and request to speak to someone in the Office of Compensation Analysis and Support about an SEC petition: 1-877-222-8570.

If you are:	<input type="checkbox"/> A Labor Organization,	Start at D on Page 3
	<input type="checkbox"/> An Energy Employee (current or former),	Start at C on Page 2
	<input type="checkbox"/> A Survivor (of a former Energy Employee),	Start at B on Page 2
	<input checked="" type="checkbox"/> A Representative (of a current or former Energy Employee),	Start at A on Page 1

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 Are you a contact person for an organization?  Yes (Go to A.2)  No (Go to A.3)

A.2 Organization Information:

Name of Organization

Position of Contact Person

A.3 Name of Petition Representative:

Mr./Mrs./Ms. First Name

Middle Initial

Last Name

A.4 Address:

Street

Ant #

P.O. Box

City

State

Zip Code

A.5 Telephone Number

A.6 Email Address:

A.7  Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner

Special Exposure Cohort Petition — Form B

**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 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 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 1953 End 1989

C.7c Employer Name: W.R. GRACE

C.7d Work Site Location: CURTIS BAY MD

C.7e Supervisor's Name:

Go to Part E

Special Exposure Cohort Petition — Form B

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

E.1 Name of DOE or AWE Facility: W.R. GRACE - CURTIS BAY M.D.

E.2 Locations at the Facility relevant to this petition:  
SPECIALTY, MONASITE, LDI PLANTS, TECH. CENTER.  
Buildings 109-193-194 + 224.

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:

CHEMICAL OPERATOR  
BALL MILL, POT OPERATOR, RARE EARTH, ROTARY DRYER,  
PILL MACHINES, NAUTA MIXER (SIEVES) HYDROXIDE DRYER, BLENDER  
#1 AND #3 REACTOR 906 + 902 MATERIAL, RED DOG + VANADIUM MATERIAL.

E.4 Employment Dates relevant to this petition:

Start	<u>1953</u>	End	<u>1990</u>
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):

ALL WORK PERFORMED AT THE W.R. GRACE  
FACILITY IN CURTIS BAY, MARYLAND BETWEEN  
1953-1990 WAS CONDUCTED WITHOUT THE USE  
OF DOSE MONITORING EQUIPMENT OR ALL  
MONITORING DATA WAS DESTROYED OR MISSING.

Go to Part F.

**Special Exposure Cohort Petition — Form B**

**D Labor Organization Information — Complete Section D ONLY if you are a labor organization.**

**D.1 Labor Organization Information:**

\_\_\_\_\_  
Name of Organization

\_\_\_\_\_  
Position of Contact Person

**D.2 Name of Petition Representative:**

\_\_\_\_\_

**D.3 Address of Petition Representative:**

\_\_\_\_\_  
Street

\_\_\_\_\_  
Apt #

\_\_\_\_\_  
P.O. Box

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

**D.4 Telephone Number of Petition Representative:** (\_\_\_\_) \_\_\_\_\_

**D.5 Email Address of Petition Representative:** \_\_\_\_\_

**D.6 Period during which labor organization represented employees covered by this petition**  
(please attach documentation): Start \_\_\_\_\_ End \_\_\_\_\_

**D.7 Identity of other labor organizations that may represent or have represented this class of employees (if known):**

\_\_\_\_\_

**Go to Part E.**

Special Exposure Cohort Petition — Form B

**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.

ON PAGE 5 OF THE MOSH DOSE RECONSTRUCTION  
REPORT: MOSH DOL CASE  
IT CLEARLY STATES THAT NO RECORDS WERE  
FOUND TO INDICATE ANY MONITORING WAS  
DONE FOR THE PERIOD FROM 1955 THROUGH  
1989.

- 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.

**Special Exposure Cohort Petition — Form B**

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 \_\_\_\_\_ on. A maximum of three persons may sign the petition.

12/12/10

\_\_\_\_\_  
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.**

Special Exposure Cohort Petition — Form B

Appendix — Continuation Page

Continuation Page — Photocopy and complete as necessary.

ONE FINAL POINT FOR GRANTING THIS SEC  
REQUEST IS THAT THERE IS ALREADY PRECEDENCE  
FOR W.R. GRACE FACILITIES ON RECORD.  
SPECIFICALLY, THE SISTER PLANT TO THE  
CURTIS BAY FACILITY IN TENNESSEE IS  
ALREADY ON THE SEC LIST. SINCE  
THE PROCESSING OF RADIOACTIVE MATERIALS  
AND LACK OF MONITORING AT THE CURTIS  
BAY FACILITY ARE CONSISTANT WITH THAT  
AT THE TENNESSEE FACILITY, ONE WOULD  
EXPECT THAT BOTH FACILITIES ARE  
CANDIDATES FOR SEC.

Attach to Form B if necessary.

Name or Social Security Number of First Petitioner:

**Special Exposure Cohort Petition — Form B**

**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.



**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: 09/20/2013

**Petitioner Authorization Form**

Page 1 of 2

**Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.**

**Instructions:**

If you wish to petition HHS to consider adding a class of employees to the Special Exposure Cohort and you are NOT either a member of that class, a survivor of a member of that class, or a labor organization representing or having represented members of that class, then 42 CFR Part 83, Section 83.7(c) requires that you obtain written authorization. You can obtain such authorization from either an employee who is a member of the class or a survivor of such an employee. You may use this form to obtain such authorization and submit the completed form to NIOSH with the related petition. **Please print legibly.**

**For Further Information: If you have questions about these instructions, please call the following NIOSH toll-free phone number and request to speak to someone in the Division of Compensation Analysis and Support about an SEC petition: 1-877-222-8570.**

**Authorization for Individual or Entity to Petition HHS on Behalf of a Class of Employees for Addition to the Special Exposure Cohort**

I, \_\_\_\_\_  
Name of Class Member or Survivor

\_\_\_\_\_  
Street Address of Class Member or Survivor                      Apt. #                      P.O. Box

\_\_\_\_\_  
City, State, Zip Code of Class Member or Survivor

d- hereby authorize:

\_\_\_\_\_  
Name of Petitioner

\_\_\_\_\_  
Address of Petitioner                      Apt. #                      P.O. Box

\_\_\_\_\_  
City, State and Zip Code of Petitioner

**to petition the Department of Health and Human Services on behalf of a class of employees**

\_\_\_\_\_  
Name of Class Member (employee, not the employee's survivor)

**for the addition of the class to the Special Exposure Cohort, under the Energy Employee's Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385).**

**In providing this authorization, I recognize that the petitioner named above will have all the rights of a petitioner as provided for under 42 CFR Part 83.**

\_\_\_\_\_  
Signature of Petitioner                      Date: 12/12/10

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: 09/20/2013

**Petitioner Authorization Form**

Page 2 of 2

**Public Burden Statement**

Public reporting burden for this collection of information is estimated to average 3 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.

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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 this form is voluntary. Failure to use this form will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Name or Social Security Number of First Petitioner: \_\_\_\_\_



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

NIOSH Tracking Number:

National Institute for Occupational  
Safety and Health  
Robert A. Taft Laboratories  
4676 Columbia Parkway  
Cincinnati, OH 45226-1998  
Phone: 513-533-6800  
Fax: 513-533-6817

July 2, 2009

Dear

This letter is to provide you with information on the status of the dose reconstruction for the claim you filed under the Energy Employees Occupational Illness Compensation Program Act (NIOHS Tracking Number 5148).

**The National Institute for Occupational Safety and Health's (NIOSH) Office of Compensation Analysis and Support (OCAS) has completed a revised reconstruction of the radiation dose based upon additional relevant information that NIOSH has obtained.**

Enclosed you will find a copy of a revised Draft NIOSH Report of Dose Reconstruction under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA) that supercedes any previous dose reconstruction reports we have sent you. During the next two weeks, we will attempt to contact you to schedule a convenient date and time for conducting a new closing interview with you. The purpose of the closing interview is to review the revised dose reconstruction results and the basis on which the results were calculated. This will be the final opportunity during the dose reconstruction process for you to provide additional relevant information that may affect the dose reconstruction or indicate that you are in the process of obtaining such information. To facilitate the scheduling of the interview, you can contact us at the following telephone number 1-800-790-6728 (1-800-790-ORAU). If, after three weeks from the date of this letter, we have not heard back from you regarding a convenient time to schedule the interview, then we will assume that you have decided not to participate in the interview.

We have also enclosed a copy of a form (OCAS-1) that should be signed and returned to us within 60 days. You should sign and return this form even though you may have previously signed and returned a similar form after reviewing a previous version of a draft dose reconstruction report. Your signature on this form certifies that you agree with the following statements: 1) you are not aware of any additional information that may be relevant to the dose reconstruction; 2) you have reviewed the revised draft dose reconstruction report and agree that it identifies all of the relevant information you provided to NIOSH regarding the dose reconstruction; and 3) the revised dose reconstruction report is ready to be forwarded to the Department of Labor (DOL) for a determination regarding your claim. Your signature on this form is not an indication that you agree with the decisions NIOSH made concerning how to use or not use information you provided for dose reconstruction or that you agree with the findings of the NIOSH dose reconstruction. DOL's Office of Workers' Compensation Programs (OWCP) will notify you of any action that it may take regarding your claim, and of any rights you may have to raise objections. You will have an opportunity to raise objections to the final NIOSH Dose Reconstruction Report under EEOICPA following your receipt of a copy of the recommended decision on your claim from DOL by following the procedures described in the notice accompanying the recommended decision.

Page 2

Once we receive the signed OCAS-1 form from you, we will send the final copy of the dose reconstruction report to the DOL for adjudication of your claim. We will also send you and the Department of Energy a copy of the final dose reconstruction report. It is important that you return the properly signed OCAS-1 form to us within the above-described time frame so that there is no delay in the adjudication of your claim. We will not forward the dose reconstruction report to DOL for adjudication without receipt of a properly signed OCAS-1 form. If we do not receive the OCAS-1 form within the time frame described above, we may administratively close the dose reconstruction and notify DOL of this action. PLEASE USE THE ENCLOSED PRE-ADDRESSED, POSTAGE-PAID ENVELOPE TO RETURN THE SIGNED OCAS-1 FORM TO US.

If you have any additional questions regarding the revised dose reconstruction report, please contact our dose reconstruction contractor, Oak Ridge Associated Universities, toll-free at 1-800-322-0111.

Sincerely yours,



Larry J. Elliott  
Director  
Office of Compensation Analysis and Support


Enclosures

cc:

**NIOSH**

**OCAS**

**NIOSH Report of Dose Reconstruction under the  
Energy Employees Occupational Illness Compensation  
Program Act (EEOICPA)**

<b>NIOSH ID:</b>			<b>DOL Case No.</b>			<b>DOL District Office</b> Cleveland					
<b>Energy Employee Name:</b>											
<i>Last</i>			<i>First</i>			<i>Middle</i>			<i>Date of Birth</i>		
<b>Covered Employment:</b>											
<i>Dates</i>						W. R. Grace and Company			Curtis Bay, MD		
						<i>Location</i>					
<b>Cancer:</b>											
<i>Type</i>						<i>ICD Code</i>			<i>Date of Diagnosis</i>		
<b>Calculations Performed By:</b>			Lawrence A. Page, Jr.			5/13/2009					
			<i>Name</i>			<i>Date</i>					
<b>Peer Review Completed By:</b>			Muty M. Sharfi, CHP			6/05/2009					
			<i>Name</i>			<i>Date</i>					
<b>Dose Reconstruction Approved By:</b>						7/1/2009					
			<i>Signature</i>			<i>Date</i>					
			Peter A. Darnell, CHP, RRPT								
			<i>Name</i>								

## **Introduction**

### **The Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), Executive Order No. 13179, and the Radiation Dose Reconstruction Rule (42 CFR 82)<sup>1</sup>**

EEOICPA established a compensation program to provide a lump sum payment of \$150,000 and medical benefits as compensation to covered employees suffering from designated illnesses incurred as a result of their exposure to ionizing radiation, beryllium, or silica while in the performance of duty for the Department of Energy and certain of its vendors, contractors, and subcontractors. This legislation also provided for payment of compensation to certain survivors of these covered employees.

In Presidential Executive Order No. 13179, the President designated the U.S. Department of Labor to administer this program for claims by current and former employees of nuclear weapons production facilities and their survivors who seek compensation for cancers caused by radiation exposures sustained in the performance of duty. The Executive Order also directed the Department of Health and Human Services to estimate (reconstruct) the radiation doses received by these employees. The Department of Labor uses the reconstructed radiation dose in evaluating whether the employee's cancer was at least as likely as not related to employment at the facilities covered by EEOICPA. To fulfill the responsibilities assigned to the Department of Health and Human Services, the National Institute for Occupational Safety and Health's (NIOSH) Office of Compensation Analysis and Support (OCAS) completes dose reconstructions using the methods described in the Radiation Dose Reconstruction Rule (42 CFR 82)<sup>1</sup> for the Department of Labor's use in making compensation decisions.

#### **The Purpose of Radiation Dose Reconstruction**

A radiation dose reconstruction is used to estimate the radiation dose received by the specific organ(s) in which a worker developed cancer, particularly when radiation monitoring data are unavailable, incomplete, or of poor quality. Even in instances when radiation dosimetry data are available, they rarely specify dose to an organ and often are based on monitoring procedures that do not meet modern standards.

The basic principle of dose reconstruction is to characterize the occupational radiation environment to which a worker was exposed using available worker and/or workplace monitoring information. In cases where radiation exposures in the workplace environment cannot be fully characterized based on available data, default values based on reasonable scientific assumptions are used as substitutes.

EEOICPA recognized that the process of estimating radiation doses would require dealing with uncertainties and limited data and thus required that the government establish methods for arriving at reasonable estimates of radiation dose received by an individual who was not monitored or inadequately monitored for exposures to radiation, or for whom exposure records are missing or incomplete. To the extent that the science and data involve uncertainties, these uncertainties are typically handled to the advantage, rather than to the detriment, of the claimant. NIOSH has used the best available science to develop the methods and guidelines for dose

reconstruction. These methods have been reviewed and commented upon by the public, including experts in the field of dose reconstruction, and the Presidentially-appointed Advisory Board on Radiation and Worker Health.

### **How Radiation Doses Are Reconstructed**

NIOSH reconstructs radiation doses by evaluating all available, appropriate data relevant to the employee's radiation exposure. Some examples of data that may be included in the dose reconstruction include, but are not limited to, internal dosimetry (such as results from urinalysis), external dosimetry data (such as film badge readings), workplace monitoring data (such as air sample results), workplace characterization data (such as type and amount of radioactive material processed), and descriptions of the type of work performed at the work location.<sup>3</sup>

Although the specific methods used for each dose reconstruction may vary, after a claim has been referred by the Department of Labor to NIOSH for a dose reconstruction, NIOSH typically requests the worker's personal radiation monitoring information from the Department of Energy. Upon receipt of the requested information, at least one voluntary informational interview with the claimant and/or survivors is conducted and a copy of the interview report is sent for review. After all of the necessary and available information is gathered, a dose is estimated, using the methods in the Radiation Dose Reconstruction Rule. After a NIOSH health physicist reviews the information, methods, and results, the claimant receives a draft copy of the dose reconstruction report followed by a concluding interview, during which the claimant can add any additional relevant information that may affect the dose reconstruction. If the claimant certifies that he/she has completed providing information and that the record for dose reconstruction should be closed, a final dose reconstruction report is sent to the claimant, the Department of Labor, and the Department of Energy.

As applied in the EEOICPA, dose reconstructions must rely on information that can be developed on a timely basis and on carefully stated assumptions. Therefore, the guiding principle in conducting these dose reconstructions is to ensure that the assumptions used are fair, consistent, and well-grounded in the best available science, while ensuring that uncertainties in the science and data are handled to the advantage, rather than to the detriment, of the claim when feasible. When dose information is not available, is very limited, or the dose of record is very low, NIOSH may use the highest reasonably possible radiation dose, based on reliable science, documented experience, and relevant data, to complete a claimant's dose reconstruction. In other instances, NIOSH may not need to complete fully a dose reconstruction because a partial dose reconstruction results in an estimated dose which produces a probability of causation of 50% or greater.

### **How Radiation Dose Reconstructions Are Used in Final Compensation Determinations**

The results of an employee's dose reconstruction are used by the Department of Labor to determine the probability that a worker's cancer was "at least as likely as not" due to his/her occupational exposure to ionizing radiation during employment at a covered facility. Criteria and guidelines for making this determination are established by EEOICPA and the Probability of Causation Guidelines (42 CFR 81).<sup>2</sup> The dose reconstruction is not the final determination of a claim, but rather an interim product that is used by the Department of Labor in making its final

decision. Final determinations are made by the Department of Labor based on standards determined by EEOICPA and its implementing regulations.

### Dose Reconstruction Overview

The Office of Compensation Analysis and Support has performed a dose reconstruction for in accordance with the applicable requirements of the Energy Employees Occupational Illness Compensation Program Act. Information provided by the Department of Labor (DOL) indicates that worked at the W.R. Grace and Company, at Curtis Bay, Maryland, from and that he was diagnosed with W.R. Grace and Company was contracted by the Atomic Energy Commission (AEC) to process monazite sand in order to extract thorium. The operational period was 1955 through 1958, with the residual radiation period from 1959 through July, 2006.

radiation exposure was received during employment as a according to records received from the Department of Labor and information provided in the interview process. To process this claim, the radiation dose assigned was overestimated using efficiency measures. Claimant-favorable assumptions related to radiation exposure and intakes were applied, based on current science, documented experience, and relevant data. Using this approach, the dose to the brain was calculated to be The dose was calculated only for this organ because of the specific type of cancer associated with this claim. Even under these assumptions, NIOSH has determined that further research and analysis will not produce a level of radiation dose resulting in a probability of causation of 50% or greater. In accordance with 42 CFR § 82.10(k),<sup>1</sup> NIOSH has determined that sufficient research and analysis have been conducted to consider this dose reconstruction complete. Per the requirements of 42 CFR § 82.10(j),<sup>1</sup> only the dose incurred up to the point of cancer diagnosis was included in this dose reconstruction.

If the facts surrounding this dose reconstruction change (e.g., the date of diagnosis is modified, an additional covered cancer is diagnosed, or additional covered employment is identified), the efficiency measures used to reconstruct the dose may not be applicable. In this case, if the facts were to change, the dose reconstructed for the brain could be lower than that reported using the efficiency process.

dose reconstruction is being revised pursuant to a Remand Order by the Final Adjudication Board, dated December 22, 2008. The Order requires re-evaluation of the assigned dose based on additional job descriptions provided after the original dose reconstruction. Additionally, the Order requires evaluation of the dose received during overtime hours worked. Payroll records for the year have been provided to facilitate this. Specific data regarding the number of records per year and the average hours worked per year are provided in Table 1 below.



### **Information Used**

As indicated above, [redacted] was employed prior to, throughout, and after the period during which W.R. Grace and Company was contracted by the Atomic Energy Commission (AEC) to process monazite sand in order to extract thorium. This dose reconstruction addresses the operation period (1955 through 1958) and the residual radiation period.

No records were found to indicate [redacted] was monitored during his employment. Therefore, during the portion of this dose reconstruction addressing the operational period, the primary data source was a survey performed by the Industrial Hygiene Branch, Health and Safety Laboratory (HASL) of the AEC New York Operations Office, in September 1952 (published in 1953)<sup>12</sup> at the Lindsey Light Company in West Chicago, Illinois. This site was the largest of the thorium extraction facilities operated for the AEC and had been operating as a commercial entity since 1932. The data provided by Lindsey Light will likely be claimant favorable when compared to the actual operating conditions which could be expected at the Curtis Bay facility. Another data source used is the *Results of the Indoor Radiological Survey at the W.R. Grace Co., Curtis Bay Site, Baltimore, Maryland.*<sup>6</sup>

According to the information contained in the document, *Thorium: Its Industrial Hygiene Aspects*,<sup>9</sup> the most commonly used process in the United States for the processing of monazite sand was sulfuric acid digestion. According to the report from HASL,<sup>12</sup> this appears to have been the main method employed at Lindsey Light. The job titles for as provided in the DOL files, are consistent with those at Lindsey Light. Therefore, the assignment of doses from the larger more productive Lindsey Light facility should provide a claimant-favorable estimation of dose.

Additional claimant-favorable assumptions were applied. Specific parameters were applied to calculated doses in order to assign organ dose based on information in the External Dose Reconstruction Implementation Guideline<sup>4</sup> and the Internal Dose Reconstruction Implementation Guideline.<sup>5</sup> ORAUT Technical Information Bulletins were also used in this dose reconstruction (see References).

In addition to the above information, the record of the computer assisted telephone interview was reviewed carefully by the dose reconstructor. The information provided was considered in the dose estimation process. Additional information on the evaluation of the interview is provided in subsequent sections of this report, as applicable.

In the absence of monitoring information for data were used from the HASL report, based on the job descriptions or work areas provided by DOL. These are provided in Table 2 below.

**Table 2. Jobs and/or Work Locations**

Ball Mill Operator	Rotary Dryer Operator	Thorium Oxide Preparation
Thorium Sulphate	Pot Operator	Dissolving Operator
Thorium Extraction	Press Operator	Cascade Operator
Thorium Nitrate Mold Crusher	Hydroxide Dryer	Thorium Nitrate Crystallization
Rare Earth Rotary Dryer		

External gamma doses, based on locations around the various corresponding work locations at the Lindsey Light facility, have been provided in Table 3 below.

**Table 3. External Doses Based on Plant Location<sup>12</sup>**

Location	Gamma Dose (mrem/hr)
Thorium Nitrate Drums – Top	20.0
Thorium Nitrate Drums – Side (6 inches)	20.0
Lanthanum Treating Room (3-foot Level)	1.4
Center of Furnace Room (Floor Level)	1.5
Center of Furnace Room (3-foot Level)	0.7
Men's Locker Room, Center (3-foot Level)	0.1
Pot Area, Near Basket (Floor Level)	2.0
Pot Area, Front of Sand Hopper (3-foot Level)	1.6
Pot Area, Bucket of Sand (1 foot)	2.0
Black Mud Press (Floor Level)	9.0

**Table 3. Continued**

Location	Gamma Dose (mrem/hr)
Bottom Pan Under Black Mud Press	10.0
Around Second Gray Mud Press (Floor Level)	3.0
Barrel of First Gray Mud – Side (6 inches)	7.0
Red Mud Dissolving Tank – Side (6 inches)	6.5
Between Rare Earth Dryers (3-foot Level)	0.6
Deep Rare Earth Hydrate in Tray	1.2
Front of Feed End, Rare Earth Dryers (Floor Level)	0.25
Discharge End, Rare Earth Dryers (Floor Level)	0.4
Front of Elevator – Balcony (General Area – 3-foot Level)	1.8
Front of Thorium Nitrate Kettles (3-foot Level)	4.0
Table at End of Cascade	2.5
Front of Mold Crusher (Floor Level)	4.0
Thorium Extraction Filter Press (Floor Level)	4.0
Ball Mill Discharge – Side	4.5
Mall Mill Charger Hopper	4.5
Charger Dryer	1.5

Data for the Daily Weighted Averages of inhaled thorium dust and thoron, based on job location, are provided in Table 4 below.

**Table 4. Daily Weighted Averages of Thorium Dust and Thoron Gas, Based on Job Location<sup>12</sup>**

Job Location/Task	Thorium Dust (dpm/M <sup>3</sup> )	Thoron* (pCi/Liter)
Ball Mill	560	6.4
Rotary Dryer	870	6.4
Pot Operator	2000	7.5
Pot Diggers	330	7.5
Press Operator	110	5.2
Press Foreman	90	3.0
Thorium Oxide Preparation	510	5.9
Thorium Nitrate Crystallization	40	2.8
Rare Earth Rotary Dryer	1300	10.4
Hydroxide Dryer	280	10.5
Thorium Sulphate	110	9.7
Thorium Extraction	180	20.0
Dissolving Operator	220	20.2
Cascade Operator	14	16.0
Thorium Nitrate Mold Crusher	18	15.2
Chemical Operator Foreman	150	14.2
Maintenance and Repair (maximum)	130	10.0
Other Personnel (non-thorium)	33	3.9
Plant Superintendent	23	2.0

case, thoron exposure would not increase the assigned dose to

and has not been included.

Table 4. Continued

Job Location/Task	Thorium Dust (dpm/M <sup>3</sup> )	Thoron* (pCi/Liter)
Production Superintendent	69	4.8
Assistant Superintendent	75	4.7
Maintenance and Repair Supervisor	6	1.3
Receiving and Shipping	12	1.2
Control Laboratory	12	1.9
Labor Crew	92	6.1
Office Personnel	6	0.8

case, thoron exposure would not increase the assigned dose to and has not been included.

In addition to the assignment of internal dose based on the thorium dust values, the possibility of ingestion of this material was also considered.

Details of how these data were applied are addressed in the appropriate sections of the report.

### Dose Estimate

#### External Dose

External dose is received from radiation originating outside the body and is typically measured by dosimetry worn on the body. Radiation dose measured on a film badge or a thermoluminescent dosimeter (TLD) may have been delivered quickly (acute exposure) or slowly over the period of time that the employee was exposed (chronic exposure). External dose records received from the Department of Energy were reviewed and evaluated for the external dose estimate. The external dose to the brain was determined by using the dose calculated for the thyroid.<sup>11</sup>

For the purpose of estimating probability of causation, all doses are assumed to be acute.<sup>4</sup>

#### *Radiation Type, Energy, and Exposure Geometry*

Although there were no records indicating that [redacted] had ever been monitored, it was assumed that he was routinely exposed to gamma radiation. The photon energy distribution assumed for thorium is 25% 30–250 keV and 75% > 250 keV.<sup>10</sup> The external dose values were converted to organ dose using a correction factor of 1.44 for 30–250 keV photons<sup>4</sup> and 1.0 for >250 keV photons.

#### *Calculated Dose*

It was assumed that [redacted] worked a 50-hour workweek, 50 weeks per year for the period 1958–1968. For the years 1969–1989, he was assumed to have worked the average number of hours per week provided in Table 1, above, for 50 weeks per year.

In the HASL report for Lindsey Light, there are Job Analysis Sheets for each position that [redacted] worked. These indicate how much time is spent at different locations during an 8-hour shift. Table 5 below shows these data, which include the doses for both an 8-hour and 10-hour workday.

Table 5. External Exposure Data Used

<b>Ball Mill Operator</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Loading Hopper	200	5
Unload at Discharge	15	5
Work at Dryer	200	2
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	24.7 mR	
10-hour Total Dose	30.9 mR	

<b>Rotary Dryer</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Loading Buggies	90	5
Loading Dryer	64	2.5
Unloading Dryer	86	2.5
Loading Truck	18	2.5
General Area – Mill/Dryer	162	1.
Lunch and Breaks	47	0.1
Lockers	15	0.1
8-hour Total Dose	17.1 mR	
10-hour Total Dose	21.4 mR	

<b>Thorium Oxide Preparation</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Loading Trays into Furnace	12	1.5
Unloading Trays	2	1.5
General Area – Prep Room	406	1.4
General Area – Building	90	0.7
Lunch and Breaks	44	0.1
Lockers	15	0.1
8-hour Total Dose	11.0 mR	
10-hour Total Dose	13.8 mR	

<b>Thorium Sulphate</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
General Area - Press	100	1.2
General Area – Tank Area	200	23.4
General Area – Main Floor	180	1
Lunch and Breaks	44	0.1
Lockers	15	0.1
8-hour Total Dose	28.5 mR	
10-hour Total Dose	35.7 mR	

<b>Pot Operator</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Dump Sand into Pot	15	2
Unload Sand Hopper	60	1.6
Unload Sand into Acid	30	2

General Area – Pot Area	375	1.6
Lunch and Breaks	44	0.1
Lockers	15	0.1
8-hour Total Dose	13.2 mR	
10-hour Total Dose	16.5 mR	
<b>Dissolving Operator</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
General Area – Stirring Battery	60	4
General Area – Main Floor	210	2
General Area – Balcony	210	1.8
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	17.4 mR	
10-hour Total Dose	21.8 mR	
<b>Thorium Extraction</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
General Area – Press	100	1.2
Cleaning Mud	39	1.2
Load Mud into Drum	6	5.5
General Area – Main Floor	170	2
General Area – Balcony	165	1.8
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	14.1 mR	
10-hour Total Dose	17.8 mR	
<b>Press Operator</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Cleaning Press – Black Mud	34	10
Loading Black Mud into Drum	8	9
Cleaning Press – 1 <sup>st</sup> Gray Mud	66	3
Loading 1 <sup>st</sup> Gray Mud into Drum	40	7
Cleaning Press – 2 <sup>nd</sup> Gray Mud	24	3
Loading 2 <sup>nd</sup> Gray Mud into Drum	12	7
Cleaning Press – Red Mud	46	7
Loading 2 <sup>nd</sup> Gray Mud into Drum	48	6.5
General Area – Press Area	362	3
<b>Press Operator (continued)</b>		
General Area – Under Press	200	3
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	56.6 mR	
10-hour Total Dose	70.8 mR	
<b>Cascade Operator</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
General Area – Cascade Room	420	2.5

Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	17.6 mR	
10-hour Total Dose	22.0 mR	
<b>Thorium Nitrate Mold Crusher</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Crushing Mold in Hood	216	4
General Area – Cascade Room	204	2.5
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	22.8 mR	
10-hour Total Dose	28.5 mR	
<b>Hydroxide Dryer</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Unload Hydroxide into Drum	101	1.2
Load Wet Hydroxide into Pans	146	1.2
Load Pans into Dryer	38	1.2
Cleanup	6	0.6
General Area – Dryer Area	166	0.6
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	59.3 mR	
10-hour Total Dose	74.1 mR	
<b>Thorium Nitrate Crystallization</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Load Mixing Bottle	36	20
General Area – Prep Room	384	1.4
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	101.7 mR	
10-hour Total Dose	128.0 mR	
<b>Rare Earth Rotary Dryer</b>		
<b>Task/Location</b>	<b>Total Time/Day (min)</b>	<b>Dose Rate (mR/hr)</b>
Shoveling into Dryer	52	1.2
Charging Grinding Hopper	224	0.25
Discharging into Drum	24	0.4
General Area – Main Floor	120	0.6
Lunch and Breaks	45	0.1
Lockers	15	0.1
8-hour Total Dose	3.3 mR	
10-hour Total Dose	4.3 mR	

The covered period of employment was 1955–1958. Site records indicate that the thorium-bearing material was removed and buried in 1957 and 1958. External doses for the remaining period of employment were based on the mean reported dose for all areas of Building 23, as

reported in *Results of the Indoor Radiological Survey at the W.R. Grace Co., Curtis Bay Site, Baltimore, Maryland*,<sup>6</sup> conducted by the Oak Ridge National Laboratory in 1988. This value was 91.4 microrem/hour, which was converted to annual doses and then divided according to photon energies, as described above. These doses are provided in Table 6 below.

**Table 6. Assigned Annual External Doses**

<b>Time Period Addressed</b>	<b>Annual Photon Dose 30–250 keV (rem)</b>	<b>Annual Photon Dose &gt;250 keV (rem)</b>
	2.213	4.609
	0.081	0.168
	0.079	0.165
	0.071	0.147
	0.075	0.157
	0.082	0.170
	0.092	0.191
	0.092	0.191
	0.070	0.146
	0.087	0.181
	0.090	0.187
	0.100	0.209
	0.097	0.202
	0.103	0.215
	0.079	0.165
	0.090	0.187
	0.084	0.175
	0.081	0.169

**Table 6. Continued**

<b>Time Period Addressed</b>	<b>Annual Photon Dose 30–250 keV (rem)</b>	<b>Annual Photon Dose &gt;250 keV (rem)</b>
	0.072	0.151
	0.082	0.171
	0.082	0.171
	0.082	0.171
	0.082	0.171

The external dose assignment is considered claimant favorable for the following reasons:

- Lindsey Light and Chemical Company had been operating the site, processing monazite sand in West Chicago since 1932, and had operated for 19 years at the time of the



HASL survey. Fixed contamination, which would impact the external dose, would be significantly higher than anything encountered at the Curtis Bay site.

- During the year that the Curtis Bay site processed thorium, less than 1000 tons was processed. During the period 1932–1973, the West Chicago site processed 136,000 tons, or an average of more than 3,300 tons per year. The volume of material processed at Curtis Bay would have resulted in lower external doses.
- The doses assigned for the residual period were based on the highest external dose found on the first floor of Building 23, where the Ball Mill was located. While on the same floor, the location was not in the immediate vicinity of the Ball Mill or the Dryer Area. The actual doses which would have received would be considerably smaller.

#### *Occupational Medical Dose*

In addition to the estimated dose received from site operations, the dose received from diagnostic X-ray procedures that were required as a condition of employment was also included in the overall dose to the brain. Based on information in Table 6.5 of the Technical Information Bulletin: Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures<sup>7</sup> and an assumed annual X-ray procedure each year of employment through the operational period (1955–1958), a total X-ray dose of 0.026 rem was assigned. This X-ray dose is considered claimant favorable as it likely exceeds the true X-ray dose to the brain.

#### Internal Dose

Radioactive materials taken into the body cause internal dose. A chronic intake of radioactive material occurs over an extended period (weeks or longer) and an acute intake occurs over a short period (minutes to hours). Regardless of the rate at which the intake occurs, the internal dose received from radioactive materials having long half-lives occurs over an extended period and is considered chronic.

The Integrated Modules for Bioassay Analysis (IMBA) was used to estimate intakes of radioactive material and annual organ doses. The ICRP 66 lung model (with default aerosol characteristics with the ICRP 68 metabolic models) was used. Intake dates, scenarios, and levels were based upon mathematical models and do not prove that the intakes occurred on the given dates. These dates and scenarios provide an acceptable explanation of exposure and dose based upon the bioassay data provided.<sup>1,5</sup> No records of bioassay monitoring results were found for Mr. Ellison.

As stated above, dust monitoring information was used to determine internal dose. The daily weighted average for all the jobs which worked was tabulated and the mean of 597,308 dpm/cubic meter was established,<sup>13</sup> based on a 10-hour workday. All samples performed by HASL have been subjected to Monte Carlo analysis to determine the geometric standard deviation (GSD)<sup>8</sup> of 1.24 used in this dose reconstruction. This assessment is considered claimant favorable based on the following reasons:

- Lindsey Light and Chemical Company had been operating the site, processing monazite sand in West Chicago since 1932, and had operated for 19 years at the time of the HASL

survey. Fixed contamination (which would impact the external dose) and dust buildup in and around the equipment (which would impact the internal dose) would be significantly higher than anything encountered at the Curtis Bay site.

- During the year that the Curtis Bay site processed thorium, less than 1000 tons was processed. During the period 1932–1973, the West Chicago site processed 136,000 tons, or an average of more than 3,300 tons per year.

Inhalation intake values were based on an assumed breathing rate of 12 cubic meters per day,<sup>15</sup> for 250 working days per year. Ingestion intake values are 20% of the values for the daily weighted average assumed for inhalation.<sup>14</sup> Intake rates for the residual period were based on the operational period values and adjustment factors from *Dose Reconstruction during Residual Radioactivity Periods at Atomic Weapons Employer Facilities*.<sup>14</sup>

**Table 7. Assigned Annual Internal Intakes of Thorium-232, Thorium 228, and Radium-228**

Time Period	Adjustment Factors for Residual Period <sup>14</sup>	Annual Inhalation Intake (dpm/year)	Annual Ingestion Intake (dpm/year)
	Not applicable	716769.2	14908.8
	0.03	21503.08	447.264
	0.007	5017.385	104.3616
	0.007	4846.632	100.8099
	0.007	4314.951	89.75098
	0.007	4590.907	95.49086
	0.007	4977.001	103.5216
	0.007	5591.771	116.3088
	0.007	5591.875	116.311
	0.007	4271.619	88.84967
	0.007	5293.341	110.1015
	0.007	5483.061	114.0477

**Table 7. Continued**

Time Period	Adjustment Factors for Residual Period <sup>14</sup>	Annual Inhalation Intake (dpm/year)	Annual Ingestion Intake (dpm/year)
	0.007	6126.784	127.4371
	0.007	5904.549	122.8146
	0.007	6302.393	131.0898
	0.007	4819.961	100.2552
	0.007	5472.085	113.8194
	0.007	5130.276	106.7097
	0.007	4944.054	102.8363
	0.007	4415.298	91.83821
	0.007	5017.385	104.3616

The total internal dose to \_\_\_\_\_ was determined to be \_\_\_\_\_ rem.

### **Dose from Radiological Incidents**

The record of the telephone interview was evaluated carefully by the dose reconstructor. The telephone interview process did not indicate that there had been any incidents.

### **Uncertainty**

For calculated external doses, point estimates (constant values) were input into the NIOSH-Interactive RadioEpidemiological Program (NIOSH-IREP). Internal doses were applied as a lognormal distribution with a geometric standard deviation of 1.24.<sup>5</sup> X-ray doses were applied as a normal distribution with a geometric standard deviation equal to 30% of the assigned dose.

### **Possible Overestimate of Radiation Dose**

This dose estimate represents an overestimate of true radiation dose. These include claimant-favorable dose conversion factors to convert dose to the brain. More realistic dose conversion factors would result in lower estimated external and medical X-ray doses. Claimant-favorable assumptions were also used to develop a hypothetical intake. More realistic assumptions would result in a lower estimated dose to the brain. Estimated missed doses are likely larger than any doses that were unmonitored or unrecorded.

## **Summary**

\_\_\_\_\_ was exposed to various sources of radiation during his employment and his estimated dose was \_\_\_\_\_ rem to the brain. The reported dose is an overestimate of \_\_\_\_\_ occupational radiation dose which will support claim determination. Attachment 1 contains the IREP dose reconstruction summary sheets that will be used by the Department of Labor to make the final probability of causation determination of the claim.

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**ATTACHMENT 1: IREP Input Tables**

2

