

Joslyn Manufacturing and Supply Co. Special Exposure Cohort Petition Evaluation Report SEC-00200

Samuel Glover, PhD
Research Health Scientist
National Institute for Occupational Safety and Health
Division of Compensation Analysis and Support

**December 2012
Knoxville, TN**

Brief Site Description

- Joslyn is listed as an Atomic Weapons Employer for the Atomic Energy Commission (AEC) from March 1943 to 1952
- Principal operations included the machining and rolling of uranium rods with limited thorium machining operations
- Joslyn was the primary commercial rolling facility for the AEC prior to Simonds Saw and Steel

Petition Overview

- **Petition SEC-00200 received March 15, 2012 and was qualified May 10, 2012**
- **Petitioner proposed class definition:**
 - **All employees who worked in any area of the Joslyn Manufacturing and Supply Company in Fort Wayne, Indiana, from 1944 through 1952**
- **Class Evaluated by NIOSH**
 - **All employees who worked in any area of the Joslyn Manufacturing and Supply Company in Fort Wayne, Indiana, from March 1, 1943 through December 31, 1952**

Status of Claims

(as of December 3, 2012)

- Total number of claims submitted: 62
- Total number of claims who worked during proposed (SEC): 62
- Total number with a DR (at DOL): 36
- Total number claims with internal or external records: 0
- Total number claims greater than 50%: 27

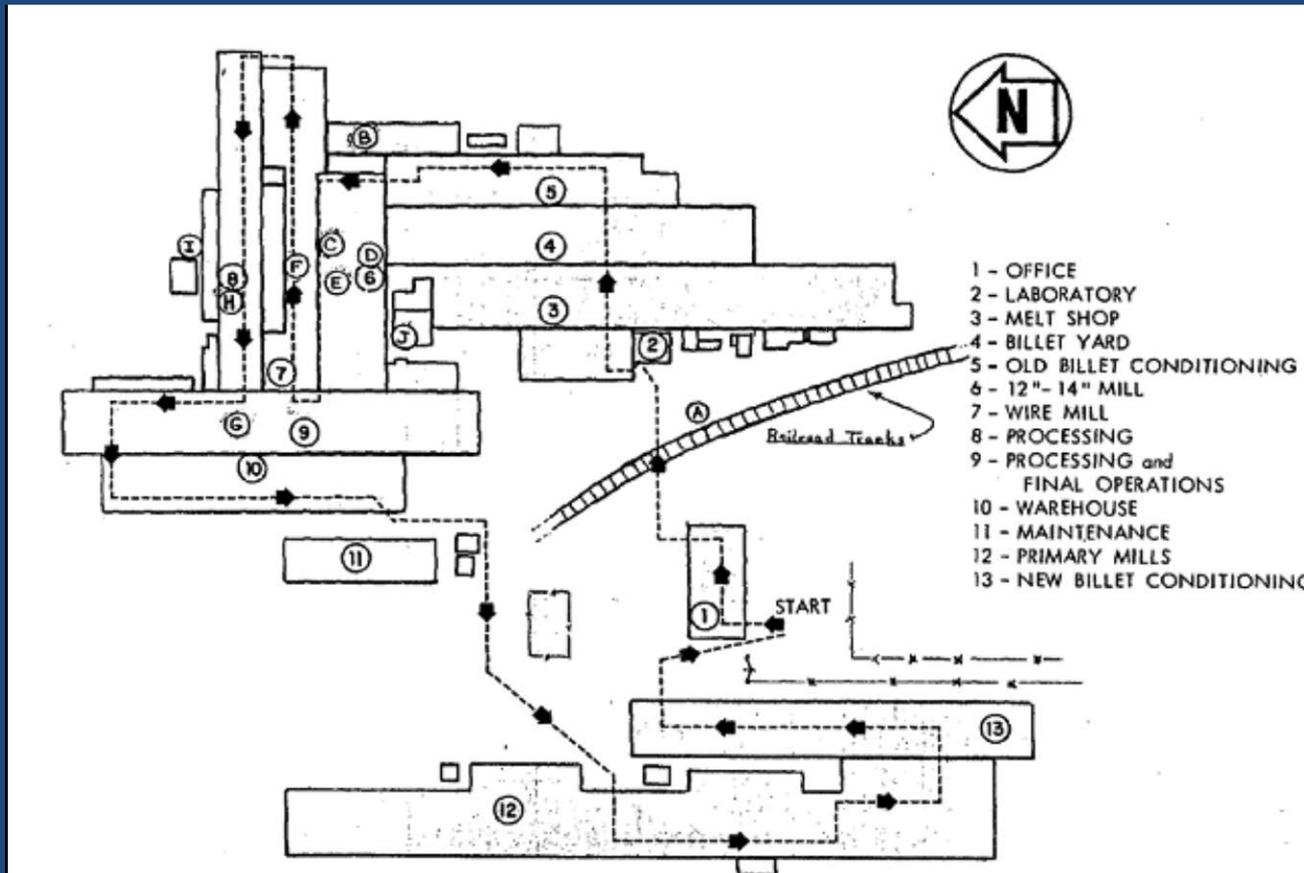
Background

- **Joslyn Manufacturing and Supply Company is located in Fort Wayne, IN with a long history of producing stainless steel**
- **Joslyn participated in a number of radiological operations for the Manhattan Engineer District (MED) and later the AEC including hot rolling, quenching, straightening, cooling, grinding, waste burning, and abrasive cutting of natural uranium billets into metal rods**

Background—cont.

- Much of the early work at Joslyn (pre-1948) was related to production of uranium for the Hanford site
- Also used for numerous experiments to develop procedures for rolling uranium metal for use in nuclear reactors
- Performed rolling operations associated with testing uranium metal rods at the Chalk River reactor in Canada
- Prepared uranium metal for the British government

Background—cont.



Sources of Exposure

- Principal source for workers included the inhalation and ingestion of natural uranium oxide from the production and shaping of uranium metal rods
- Joslyn was a hand operated shop, rods were manually reinserted into the mill the required number of times and then dragged to the next process
- Joslyn operated three rolling mills (18 inch, 12 inch, and 9 inch) which were co-located and used for various operations simultaneously
- Rolling of uranium was conducted on rollers which had water cooled bearings which produced steam and high levels of contamination

Sources of Exposure—cont.

- **Additional machining and preparation steps (i.e. centerless grinding, cutting, heat treating and quenching, and threading) were carried out on uranium metal prepared at Joslyn as well as from other facilities**
- **Billets were stored onsite for relatively long periods of time in a storage area**
- **Uranium waste was noted to be collected and burned outside**
 - **Worker interviews supported the burning of waste**
 - **Document reviewed describes an offsite explosion of a drum of uranium metal from Joslyn which had not been properly treated**

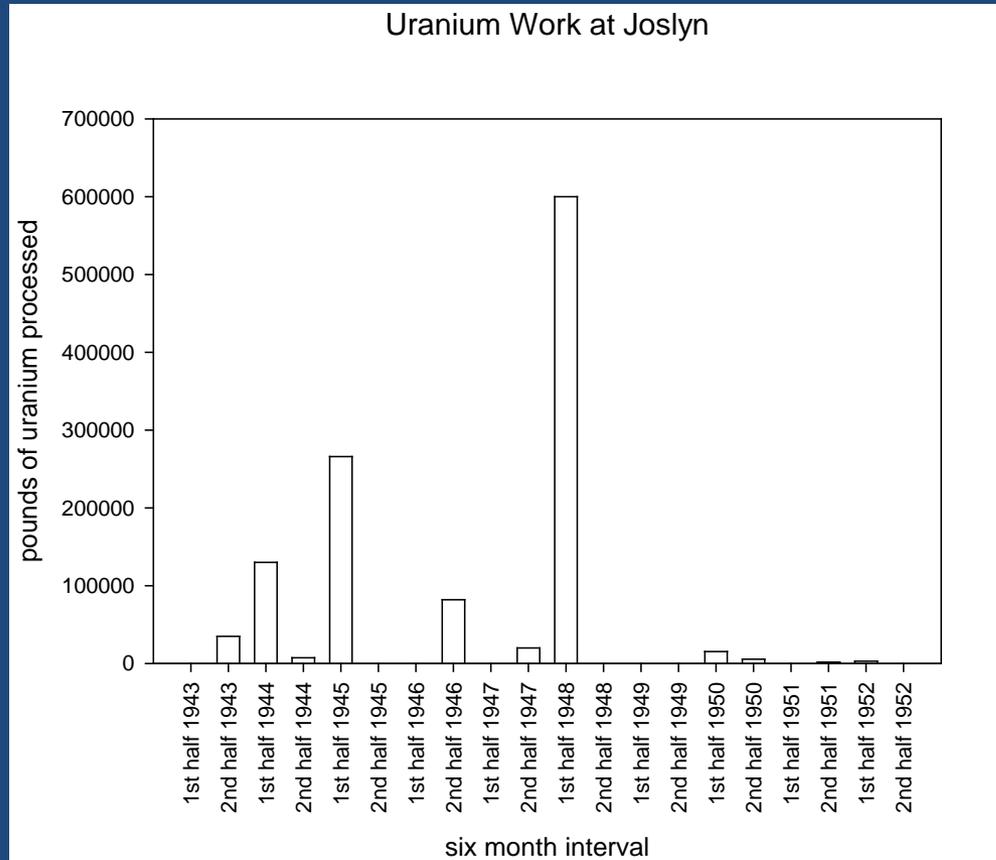
Sources of Exposure—cont.

- Grinding operations described as being conducted inside of a shed inside the larger building
 - Grinder had an overhead hood which discharged inside the larger building
- Machining operations were noted to be conducted with a heavy flow of coolant fluid over the cutting/grinding surfaces to reduce sparking
- Tenting of area to prevent contamination of surrounding areas discussed

Sources of Exposure—cont.

- For all operations, Joslyn was responsible for packaging, handling, and loading
- The Manhattan Engineer District (MED)/AEC kept strict records of metals and sought to regain as much of the material as possible
 - Joslyn was responsible for cleanup and accounting for materials
- Documents describe a required medical surveillance program for Joslyn workers including x-rays and blood work

Approximate Quantities of Uranium Processed at Joslyn



Sources of Exposure—cont.

- **Joslyn has two recorded thorium related processing period**
 - **June 21, 1946: Straightening and centerless grinding of six thorium rods**
 - **January 21, 1947: Centerless grinding of five extruded thorium rods**

External Monitoring Programs and Data Availability

- No evidence that a routine monitoring program existed
- Extremely few measurements are available, source term basis needed
- Survey by Health and Safety Laboratory (HASL) in 1949 reported contamination levels and dose rates in several areas

Internal Dose Monitoring Programs and Data Availability

- No routine air monitoring or bioassay program
- Limited air samples taken on three different occasions (December 1943, May 1944, October 1951)
 - Very limited in scope
 - Mostly General Area (GA) samples
 - Early data taken using equipment (electrostatic precipitator) which would not be comparable to HASL equipment
- Much more substantial study performed January 8, 1952: HASL conducted a time weighted average study of various production operations at Joslyn

Approach to Bounding Doses

January 1, 1948-December 31, 1952

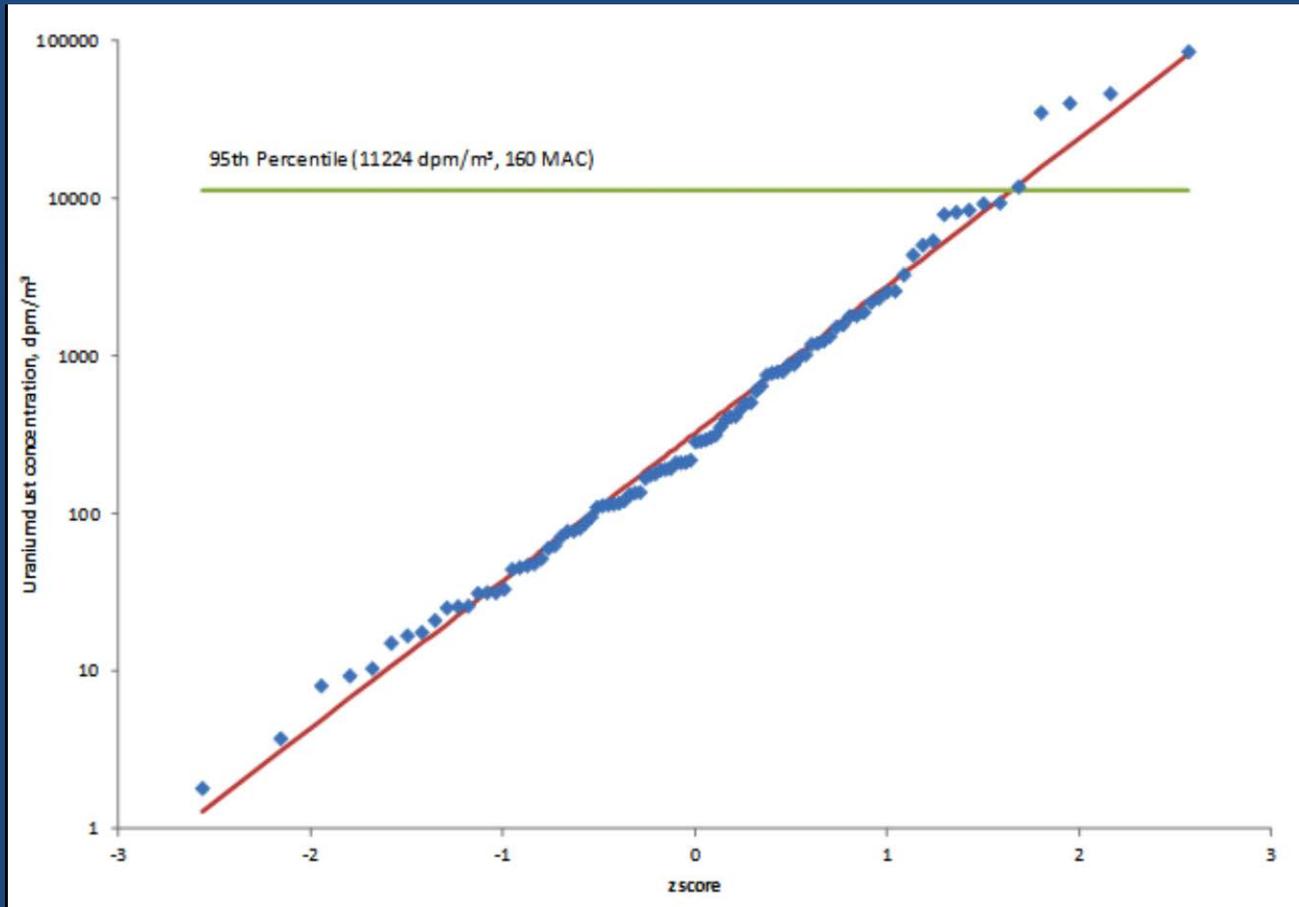
- Beginning with January 1, 1948 NIOSH proposes to use the data from TBD-6000 and known rolling days to determine internal and external dose
- Standard approach to medical X-ray dose using OTIB-0006

Post 1947 Internal Dose

- TBD-6000 tabulated data converted from per calendar day to per rolling day exposures for ingestion and inhalation (assuming 250 work days per year)

	Non-Rolling		pCi/rolling day		pCi/non-rolling day		pCi/calendar day	
	Rolling days	Days	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion
1948	42	208	18500	380	1695	34	3086	63
1949	2	248	18500	380	1695	34	1253	25
1950	5	245	18500	380	1695	34	1392	28
1951	2	248	16958	348	1695	34	1245	25
1952	3	247	16958	348	1695	34	1283	26

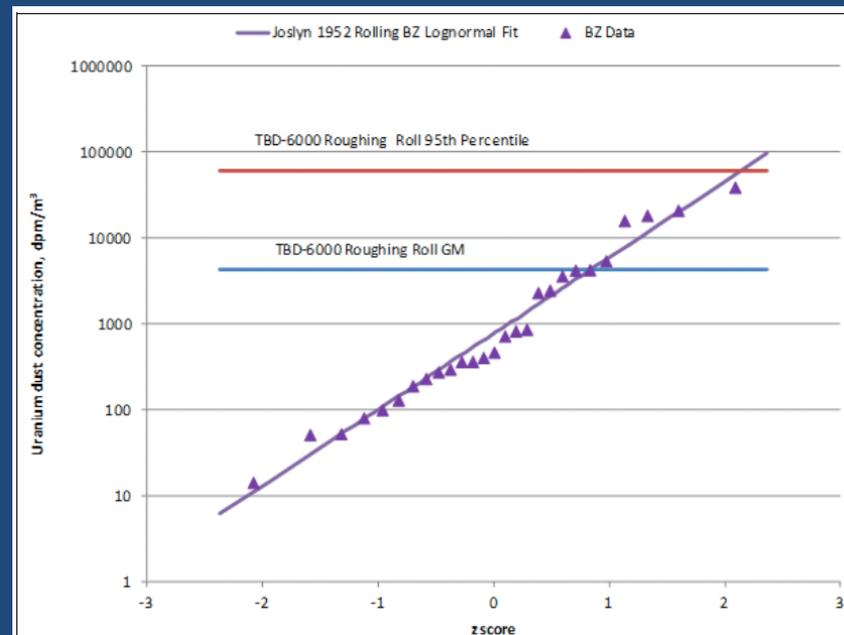
Lognormal Fit of All 1952 Air Concentration Data



1952 Air Concentration Exposure Information

Table 6-2: Results of a 1952 Time-Weighted Average Exposure Study

Work Area/Job Description	Time Weighted Average Exposure (pCi/m ³)
18" Rough Roll East	3,322
18" Rough Roll West	375
Roller Forman	725
Asst Roller (Ass't Foreman)	725
Furnace Heaters	16
Recorder	16
12" Rough Roll East	605
12" Rough Roll West	570
Drag Down (Billet)	310
9" Finishing Roll East	16,542
9" Finishing Roll West	5,791
Quench Tank	155
Draggers	831
Rod Stamper	242
Rod Bundler	128
Lathe Operation	12
Centerless Grinder	100
Grinder (portable)	277
Cutomatic	191



External Dose Post 1947

- External dose rate factors for rolling days and contaminated surfaces will be applied
- Billets were stored onsite for an extended amount of time
- For the purposes of the example dose reconstructions external dose determined
 - Rolling day: 10 hour exposure to a long billet at 1 foot per rolling day (7.03 mR/day)
 - Billet storage: 10 hour exposure to a long billet at 1 meter per non-rolling day (1.08 mR/day)

Summary of Monitoring Gaps

- **External**
 - No film badge results
 - Source term and operational information required

Summary of Monitoring Gaps

- **Internal**
 - **No bioassay**
 - **Very limited air monitoring for single operation**
 - **Early air data not representative of the varied operations and was obtained using non-standard equipment**
 - **Back extrapolation of 1952 air sample data to support operation exposure prior to 1948 not appropriate**
 - Accounts for experience gained and undocumented changes in procedures and oversight
 - Change in maximum allowable limits (MED to AEC in 1948)

Proposed Class

All Atomic Weapons Employees who worked in any buildings/area owned by the Joslyn Manufacturing and Supply Co. (or a subsequent owner) in Fort Wayne, Indiana, from March 1, 1943 through December 31, 1947, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort

Joslyn SEC Petition 200

- **Why the class?**
 - **Workers were potentially exposed to uranium and thorium who were not monitored nor does a suitable dose reconstruction method exist prior to 1948 at Joslyn.**
 - **Decision was based on lack of adequate biological monitoring data, sufficient air monitoring information, and differences in operational characteristics from other metal working facilities which were monitored after 1948 (no appropriate surrogate data exists)**

Joslyn SEC Petition 200—cont.

- **Why everyone?**
 - **Based on reports by the AEC and facility layout, the process areas were broadly distributed and controls for preventing movement in these areas was not enforced .**

Joslyn SEC Petition 200—cont.

- **What about employees not included in the SEC?**
 - **NIOSH intends to use any internal monitoring data that may become available for an individual claim (and that can be interpreted using existing dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at the Joslyn site during the period from March 1, 1943 through December 31, 1947, but who do not qualify for inclusion in the Special Exposure Cohort, may be performed using these data as appropriate.**

Joslyn SEC Petition 200—cont.

- NIOSH may be able to reconstruct external dose from March 1, 1943 through December 31, 1947, using the known rolling days and TBD-6000 approaches (similar to the post 1947 external dose)
- Furthermore, NIOSH intends to estimate doses from medical x-rays using information from employee medical records and claimant favorable medical dose reconstruction assumptions and methods.

Joslyn SEC Petition 200—cont.

- **Why stop in 1948?**
 - **NIOSH feels that the surrogate data from TBD-6000 coupled with the known operational data and source term information provides support that a realistic dose can be determined.**

Health Endangerment

- The evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of radionuclides and direct exposure to radioactive materials.
- Consequently, NIOSH is specifying that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

Summary

Feasibility Findings for Joslyn Petition SEC-200

March 1, 1943 – December 31, 1952

Source of Exposure	Reconstruction Feasible	Reconstruction NOT Feasible
Internal		
- Uranium	1/1/1948- 12/31/1952	3/1/1943- 12/31/1947
-Thorium	N/A	3/1/1943- 12/31/1947
External		
- Gamma/Photon	All years	
- Beta	All years	
- Neutron	N/A	
- Occ. Medical X-ray	All years	