Update for Kansas City Plant Special Exposure Cohort Petition

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Acronyms

Bq: Becquerel

DB: database

D&D: Deconstruction and demolition

DU: Depleted uranium

mrem: milli-rem

N/P: neutron/proton

NTA: Neutron Track

pCi/m3: pico-curies/cubic meter

µCi/ml: micro-curies/milli-liter

V&V: Validation and verification

Petition Overview

- Received Special Exposure Cohort (SEC) petition on March 12, 2013
- Petitioner-requested class:

  All employees who worked at the Bannister Federal Complex from 1949
- Qualified for evaluation July 1, 2013

Class evaluated by NIOSH

- All employees who worked in any area of the Kansas City Plant (KCP) from January 1, 1949 through December 31, 1993

Petition history

- Basis for evaluation
- On January 7, 2014, NIOSH completed petition evaluation report (ER)
- Petition report findings first presented to the Advisory Board on Radiation and Worker Health (Advisory Board) on January 28, 2014

Radiological projects over time

- Natural Uranium Operations - May 1, 1950 through February 28, 1955
- Post Natural Uranium Operations Period - March 1, 1955 to August 11, 1959 and January 1, 1978 through May 31, 1984
- D&D - June 1, 1984 through September 3, 1986
- Nickel 63 Operations - 1959-1975

Radiological projects over time

- Tritium Water Operations (tritium monitors) – 1959-1975
- Magnesium Thorium Operations - 08/23/1961-03/31/1963 and 08/28/1970-12/31/1977
- Organically Bound Tritium Operations (hi-lo switch plates) – 1963-1968

Work group meetings

- Work Group (WG) met
  - October 26, 2015
  - July 16-17, 2015
  - January 20, 2015
  - June 10, 2014
- Worker outreach meetings in 2004, 2005 and 2009
- SEC workshop meetings in 2008, 2009

Work group Follow-up Activities

- Completed extensive database, internet searches and site visits
- 2,032 individual references added to the Site Research Database (SRDB)
- KCP records included personal monitoring, area monitoring, industrial processes, and radiation source materials

Work group actions, interviews

- 7 data capture visits between December 2012 and March 2015
- 56 personnel - including several interviews with same person and 7 interviews for the Technical Basis Document (TBD) from December 2012 and March 2015
- 1 special interview for petitioner at July work group meeting

Work Group Issues

- Original KCP ER review identified 19 issues
- 20th issue added after records reviews indicated KCP worked on 2 tritium projects
- Closed Issues: 4, 5, 6, 7, 8, 11, 12, 14, 15, 16, 17, 18, 19; 20
- Issues moved to the site profile review: 2, 3, 10, 13
- Issues 1 and 9 pending WG action (NIOSH provided V&V of the DB used for the coworker model)

DB and V&V

- KCP first created an electronic DB to facilitate their access to dosimetry information in 2001
- KCP provided extracted information from the DB to NIOSH in 2004 and the entire DB in 2012
- NIOSH used the data to develop a coworker model in 2006 in the KCP Site Profile
- ER uses coworker model to bound some doses
- Internal and external dosimetry data 1950 to 2010

DB V&V - continued

- 15,000-plus lines each containing between one and five individual records
- The V&V extracts raw data from NOCTS dose records and compares them to the DB
- Each record is the sum of the individual monitoring results collected throughout a given year
- NOCTS contains 223 claims with external and 95 claims with internal dosimetry records
- V&V compiles 5878 lines of data

DB V&V - Internal

- The V&V compares annual sums of 173 NOCTS records with DB annual totals - 162 (94%) agreed
- Internal V&V discrepancies:
- 9 instances of an actual zero value recorded in NOCTS or the DB and the other is blank
- The DB lists 4.55 and NOCTS lists 4.5
- DB lists 9.5 µg entered in DB; NOCTS blank
- 10 U in U entries unverified due to legibility - NIOSH has requested a cleaner copy from KCP

DB V&V - External

- The V&V compared annual sums of 1502 NOCTS records to the DB annual totals - 1462 (97%) agree
- External V&V discrepancies noted:
- 27 actual zero values recorded in NOCTS or the DB and the other is blank
- 15 NOCTS records with an M value and DB is blank
- 13 discrepancies with a >0 mrem exposure difference (12 with exposure difference <70mrem; 1 with note of “light leak on film”)

DB V&V - continued

- NIOSH classified 8 additional entries as unverified due to legibility - NIOSH has requested a cleaner copy from KCP
- NIOSH determined that KCP accurately transferred dosimetry information from raw exposure records into an electronic format. The electronic DB used by NIOSH to develop a coworker model is sufficiently accurate.

NIOSH approach to data findings

- NIOSH determined that the available monitoring records, process descriptions and source-term data are sufficiently accurate to complete dose reconstructions
- External dose is bounded using the TBD coworker dose model
- Depleted uranium operations are bounded using ORAUT-TBD-0031 methodologies

Feasibility - Natural Uranium

- 5/1/1950 to 2/281955 – TBD-6000
- Post Operations 3/1/1955 to 8/11/1959 – Bounding scenario: maximum gross-alpha air sample – 49 pCi/m3
- Post Operations 1/1/1978 to 3/31/1984 – Bounding scenario: DU and D&D operations maximum surface contamination; ORAUT-OTIB-0070 to model doses
- TBD-6000 for workers with less exposure potential than machine operators

Feasibility – Various Operations

- D&D Operations 6/1/1984 through 9/3/1986 – NIOSH will use Rockwell dosimetry data
- Nickel 63 Operations 1959-1975 – Committed dose to all organs is <1 mrem; no dose assigned
- Tritium Operations 1959-1975 – Bounding scenario: 400 mL bottle of tritiated water spilled over a work year and absorbed by a worker. ICRP 68 dose conversion factor is 1.8E-9 rem/Bq. 6.66 mrem/year worker dose applied to all workers.

Feasibility – Various Operations

- Mg-Th Operations 08/23/1961-03/31/1963 and 08/28/1970-12/31/1977 – Bounding limit 3E-11 µCi/ml. OCAS-TIB-009 ingestion rate. TBD-6000 methodology for worker classes with less exposure potential than machine operators.
- Tritium Operations 1963-1968 – Bounding scenario: surface contamination transferred to skin and absorbed. ICRP 68 dose conversion factor is 4.19E-9 rem/Bq. 1.77 mrem/year dose applied to all workers.

Feasibility Summary

January 1, 1949 through December 31, 1993		
Source of Exposure	**Feasible**	**Not Feasible**
External	X	
Internal	X	