



Dose Reconstruction Template Review for the Peek Street Facility, Schenectady, New York

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Review chronology of Peek Street Facility dose reconstruction methodology

- ◆ No technical basis document (TBD) for Peek Street Facility (PSF). Instead, NIOSH developed:
 - “Dose Reconstruction Methodology for the Peek Street Facility” (“PSF guideline”)
 - DR template with facility-specific data, assumptions, and references that provide basis for data and assumptions
- ◆ **12/3/2018:** SC&A tasked to review DR template/methodology for PSF
- ◆ **1/29/2019:** SC&A submitted review of PSF DR template, “DR Draft PSF 3.0.doc” and the PSF guideline (2009)
- ◆ **12/7/2020:** NIOSH issued revised template, “DR Draft PSF 4.0.doc” (issuance of PSF 4.0 did not address SC&A’s findings/observation from review of PSF 3.0)

PSF description

- ◆ Located in Schenectady, NY
- ◆ Was a temporary location for the work of the Knolls Atomic Power Laboratory (KAPL) until facilities constructed at the KAPL Site in Niskayuna, NY
- ◆ Used for two basic purposes:
 - the design of an intermediate breeder reactor concept, later converted to the design of the S1G/S2G submarine reactor plan for the Navy
 - the design of a chemical process for the recovery of uranium and plutonium from irradiated nuclear reactor fuel
- ◆ Operated during 1947–1954

Finding 1

The assumption of 100% 30–250 keV for the photon energy distribution is unsupported and inconsistent with assumptions used in the Hanford TBD

- ◆ DR template states more than one photon energy distribution associated with PSF photon radiation source terms
- ◆ PSF used Hanford-type, two-element film dosimeters during the operational period
- ◆ Hanford TBD specifies 25% 30–250 keV and 75% >250 keV photon energy distribution for reactor and plutonium processing facilities
- ◆ OCAS-IG-001 recommends using 30–250 keV for unknown fields, which should be referenced if basis for assumption

Finding 2

A dosimeter uncertainty factor of 1.3 for penetrating photon dose is unsupported and inconsistent with Hanford TBD

- ◆ PSF guideline states there is no site-specific information for dosimeter limits of detection, uncertainty, and bias; therefore, NIOSH assumed Hanford Site's information
- ◆ Hanford TBD specifies systematic uncertainty for two-element film dosimeter as 1.2

Finding 3

SC&A unable to verify the neutron-to-photon ratio of 1.2 using the cited references

- ◆ DR template states neutron-to-photon ratio determined from facilities with similar neutron-producing activities
- ◆ SC&A reviewed neutron-to-photon ratios in external TBDs for Hanford, Savannah River Site, Oak Ridge National Laboratory (ORNL), and Los Alamos National Laboratory
- ◆ SC&A calculated an average neutron-to-photon ratio of 1.29

Finding 4

PSF DR template
does not specify
dosimeter LOD

- ◆ Based on NIOSH's calculations, it appears an LOD of 0.050 rem was assumed
- ◆ This value is not consistent with Hanford dosimeter information
- ◆ PSF guideline does not address dosimeter exchange frequency or LOD

Finding 5

SC&A unable to verify the PSF annual maximum ambient dose value of 0.423 rem using the cited references

- ◆ PSF DR template states onsite ambient dose based on radiation levels at other sites with similar activities and cites ORAUT-PROC-0060
- ◆ SC&A reviewed onsite ambient doses reported in PROC-0060 for Hanford, ORNL, and Idaho National Laboratory
- ◆ SC&A calculated an average 0.342 rem from the 3 sites and an average from ORNL and Hanford of 0.433 rem

Finding 6

PSF DR template occupational medical dose basis contains incorrect information and outdated references

- ◆ DR template states occupational medical doses based on table 6-5 of ORAUT-OTIB-0006, rev. 04. Table 6-5 does not exist in rev. 04 of OTIB-0006
- ◆ DR template states x-ray doses incorporate 1.3 uncertainty factor based on ORAUT-PROC-0061, rev. 03, which is inconsistent with current approved guidance in PROC-0061, rev. 04

Finding 7

Fission product information in the PSF DR template is not consistent with current guidance

- ◆ DR template cites fission products intakes from ORAUT-OTIB-0054, rev. 00 PC-1 (2007)
- ◆ Current version of OTIB-0054, rev. 04 (2015), does not contain information used in template

Finding 8

PSF DR template contains no reproducible basis or reference for recycled uranium (RU) activity fractions

- ◆ DR template does not provide a basis for RU radionuclides and ratios
- ◆ SC&A reviewed Hanford data/TBD and Feed Materials Production Center TBD and was unable to verify RU activity fractions
- ◆ PSF guideline cites ORAUT-OTIB-0053 as basis for RU radionuclides and ratios
- ◆ SC&A was unable to locate a draft, issued, or archived version of OTIB-0053

Observation 1

SC&A did not locate a PSF-specific tool containing preprogrammed plutonium dose conversion factors (DCFs)

- ◆ PSF DR template specifies use of OCAS-IG-001 special DCFs for plutonium, calculated assuming AP geometry and 20 keV mono-energetic photons
- ◆ Template states plutonium DCFs programmed into the tool that was created for the PSF

Observation 2

Natural uranium physically significant level (PSL) in the DR template is not consistent with values cited in referenced document

- ◆ PSF DR template lists PSL of 5 $\mu\text{g}/\text{day}$ for natural uranium and cites reference as “Excerpts from the KAPL Radiological History Report” (1997)
- ◆ “Excerpts from the KAPL Radiological History Report” (1997) states PLS of 3 $\mu\text{g}/\text{day}$ for natural uranium

Observation 3

PSF DR template provides correct radionuclide composition for plutonium; however, cites outdated reference

- ◆ Reference cited for weapons-grade plutonium mixture is Hanford Occupational Internal Dose TBD, rev. 04 (2010)
- ◆ Current version of Hanford Occupational Internal Dose TBD is rev. 07 (2020), which lists plutonium composition and should be referenced



Questions?