

# **Evaluation of Internal Monitoring for Fission and Activation Products among INL Claimants (1949–1970)**

**Bob Barton, Health Physicist  
S. Cohen and Associates**

**Contractor to:**

**Advisory Board on Radiation and Worker Health/ABRWH  
Center For Disease Control and Prevention**

**November 10, 2015**

# Background

- March 12, 2015: NIOSH releases the Petition Evaluation Report for SEC-00219 Revision 00, Idaho National Laboratory (INL)
- July 6, 2015: SC&A releases the Work Group Status Update Report: *“Interim Summary Report on the Evaluation of NIOSH’s Idaho National Laboratory SEC-00219 Petition Evaluation Report”*
- The SC&A report was discussed at the July 8, 2015 INL Work Group Teleconference

## Background (continued)

- SC&A identified four main assumptions (Items A–D) used in establishing internal dose reconstruction feasibility
- Item A read as follows: *“FAP Bioassays – Sufficient workers’ records containing fission and activation product (FAP) bioassay (in-vitro and in-vivo) results are available to assign intakes and resulting doses from FAP (some periods/areas may need an FAP coworker model developed).”*
- Item A is the subject of this review and presentation

# Background (continued)

- Internal dose reconstruction feasibility for FAPs per the Evaluation Report for SEC-00219:

Site Area	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Test Reactor Area (TRA)	N	N	N	F	F	F	F	F	F	F	F
Chemical Processing Plant (CPP)	N	N	N	N	F	F	F	F	F	F	F
Test Area North (TAN)	N	N	N	N	N	N	F	F	F	F	F
Misc. Reactor Areas	N	N	N	N	N	N	F	F	F	F	F
Burial Ground	N	N	N	F	F	F	F	F	F	F	F
Central Facilities Area (CFA)	F	F	F	F	F	F	F	F	F	F	F
Site Area	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Test Reactor Area (TRA)	F	F	F	F	F	F	F	C	C	C	C
Chemical Processing Plant (CPP)	F	F	F	F	F	F	F	C	C	C	C
Test Area North (TAN)	F	F	F	F	F	F	F	C	C	C	C
Misc. Reactor Areas	F	F	F	F	F	F	F	C	C	C	C
Burial Ground	F	F	F	F	F	F	F	C	C	R	R
Central Facilities Area (CFA)	F	F	F	F	F	F	F	C	C	C	C

\*Designations: Out of Period or Not Applicable (N), Feasible (F), Requires Coworker Model (C), and Reserved for Further Evaluation (R)

## Background (continued)

- As noted in the table, NIOSH has determined coworker models are necessary for each area for the period of 1967–1970 (with the exception of the Burial Ground, which is “in reserve” for 1969–1970)
- For periods prior to 1967, internal dose reconstruction is feasible for all applicable years without the need for coworker models

# SC&A Review Approach

- Evaluate a semi-random sample of INL claimants to assess the adequacy and completeness of individual records for the purposes of dose reconstruction
  - Were all relevant workers monitored for FAPs?
  - Were monitored worker records complete?
  - Are coworker models appropriate for areas and time periods other than those already designated?

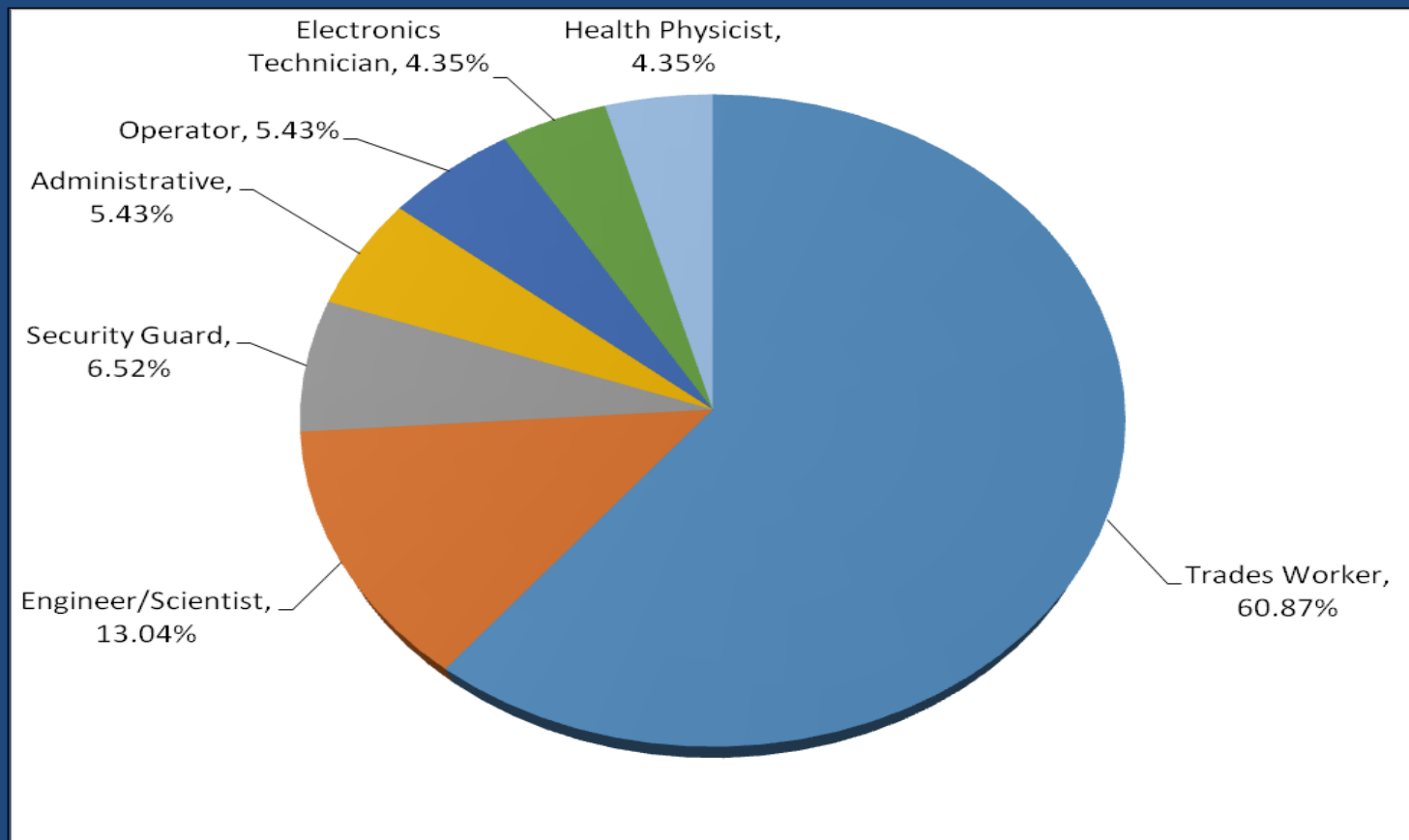
## SC&A Review Approach (continued)

- SC&A determined that there were 973 claimants who had covered employment at INL during the evaluated SEC period (921 claims with SEC employment greater than 90 days)
- SC&A semi-randomly\* selected and reviewed 92 claimants from this population (roughly 10%)
- Note: 9 claims initially selected were ultimately discarded due to employment duration (i.e., SEC employment much less than 90 days) or job duty (attorney who was not badged)

*\*While claim numbers were randomly selected from the NOCTS database, the selection is somewhat biased towards workers with multiple employment periods*

# SC&A Review Approach (continued)

- The breakdown of job titles reviewed in SC&A's sample of 92 workers is as follows:





# SC&A Review Approach (continued)

- Over 60% of the sampled claimants fell into the “Trades Worker” category
- This category included several different professions including (but not limited to):
  - Heavy Equipment Operator
  - Welder/Pipefitter/Plumber
  - Asbestos/Insulation Worker
  - General/Construction Laborer
  - Carpenter
  - Electrician

# SC&A Review Results

An overview of the 92 claimants is shown in the table below:

<b>Total Number of Workers Sampled</b>	<b>92</b>
Average # Years Employed (1949–1970)	8.26
Average # of FAP Samples per Year per Sampled Worker	1.23
Median # of FAP Samples per Year per Sampled Worker	0.81
Average Number of Individual Employment Periods per Worker (1949–1970)	6.12
Median Number of Employment Periods per Worker (1949–1970)	3
Average % of Employment Periods with No Internal Monitoring for FAP	49.1%

- Notably, the average percent of covered employment periods in which the Energy Employee (EE) was not monitored was just under 50% (i.e., On average, half of the employment periods for a sampled worker had no FAP internal monitoring)

## SC&A Review Results (continued)

- SC&A observed several cases in which a change in monitoring frequency occurred in 1967
  - Observed claims were monitored several times per year prior to 1967
  - Starting in 1967, monitoring frequency for these same claimants was changed to bi-annual or longer
- Observation 1: SC&A agrees with NIOSH's assertion that coworker models are necessary for the period of 1967–1970 for each relevant area under consideration.

## Unmonitored Workers

- SC&A observed that a number of claims did not have FAP internal monitoring taken during their covered employment periods within the SEC period
- Sampled claimants may have had FAP bioassay associated with other sites and/or FAP bioassay that was after the evaluated SEC period

# Examples of Unmonitored Workers

- Ironworker/Laborer
  - Computer-Assisted Telephone Interview (CATI) indicates work “with radioactive material or radiation exposure” was “40+ hours a week”
  - From CATI:
    - “[The EE] said they took turns going into the hot cells; they were given a certain time limit on how long they could stay.”
    - “[The EE] said some of the tools they used were taken away and could not be used again because they were contaminated.”
    - “[The EE] said sometimes when they would get contaminated; the monitors would try to use tape to get the contamination off.”
  - EE has location file cards and external dosimetry indicating: MTR, AX, MTX and CX for some years

# Examples of Unmonitored Workers

- Mechanical Engineer
  - CATI interview was declined
  - Location File Cards indicate assignment to TAN, MTR, and CFA during several years of SEC employment
  - Annual monitoring summary indicates external monitoring beginning in 1961
- Electrician
  - CATI interview was declined
  - External monitoring at CPM in the mid 1950s. External monitoring at OX, CPP, MTR, and AX beginning in 1960.
  - First INL FAP bioassay is in 1969 (this was not considered part of the covered employment).

# Observation Concerning Unmonitored Workers

- Observation 2: Based on SC&A's review of sampled claimants, it is not apparent that the lack of internal monitoring data is indicative of a lack of internal exposure potential. Given the uncertainty in establishing work areas, activities, and ultimately exposure potential for claimants (particularly in the early years), it is recommended that coworker models be evaluated and developed for workers who were unmonitored but likely should have been monitored during all periods for which such exposures are possible.

# Partially Monitored Workers

- In addition to the unmonitored worker population, SC&A examined workers who were monitored during the covered employment, but also had unmonitored portions
- As previously shown, sampled workers averaged approximately 6 separate employment periods during the SEC period (the median number was 3)
- On average, approximately 50% of each sampled worker's SEC employment periods did not have FAP bioassay taken during the period



# Examples of Partially Monitored Workers

- Custodian
  - Single Internal monitoring result in 1958.
  - Employment extended over a year past this sample (no other employment). Location File Card and external dosimetry indicates assignment to CPP and SPERT during this latter year.
  - Statements from CATI Report:
    - *“Part of [the EE’s] job was to clean up spills and accidents. [The EE] mentioned working behind lead barriers and liquid was seeping around [the EE].”*
    - *“[The EE] wore cotton overalls, and a mask or respirator. [The EE’s] coveralls were taped at the edges.”*
    - *“[The EE] had mentioned a clean-up job where they went through so many casual laborers that they even burned out the bus drivers.”*

# Examples of Partially Monitored Workers

- Construction/Laborer
  - Last “in-period” internal monitoring result was in 1961; next result did not occur until 1980
  - Claimant has covered employment in 1963–1964 and also 1966–1970
  - External dosimetry and Location File Card indicate assignment to AX, MTR, CPP, TAN, CX and MTX during these latter periods
- From CATI
  - Indicates dosimeter badge was worn “daily”
  - “[The EE] said at Idaho National Engineering Laboratory, [the EE] would work in the cells until [the EE] reached [the EE’s] dose limit and then was removed from the job.”
  - “[The EE] said that when [the EE] went into the cells, [the EE] wore coveralls (with a flap that covered [the EE’s] head), rubber gloves, rubber boots, and a respirator. [The EE] said all of the seams were taped to make sure [the EE’s] skin was not exposed. In addition, [the EE] also wore a head stocking, shoe covers and safety glasses.”

# Examples of Partially Monitored Workers

- Laborer
  - Internal monitoring ends in 1960, covered employment extends through 1970.
  - Location File Card and external monitoring indicate assignment to the following areas during these later years: TAN/ANP, OX, MTR, MTX, CX, and CPP.
  - From CATI with Survivor: “[Survivor] *said there were a couple of times when [the EE] had to take a day off because [the EE] had received too much radiation.*”

# Observation for Partially Monitored Workers

Observation 3: It appears there are credible situations where it would be appropriate and claimant favorable to assign coworker intakes of FAP to account for unmonitored portions of the claimant's work history. Many of these examples predate the period currently identified by NIOSH as requiring coworker evaluations (1967–1970).

## Summary Recommendation

*Based on SC&A's review of 92 randomly selected claimants, it was evident that fission and activation product bioassay is generally available for a wide variety of job titles. Thus, SC&A does not believe there are "completeness" issues with the dataset of fission and activation product bioassay that would preclude its use in developing coworker models. Nor was there any indication that specific job titles were systematically excluded from the internal monitoring program. However, it is SC&A's opinion that FAP coworker models should be evaluated and developed for each relevant INL site area beginning with the start of radiological operations for each individual location.*

**Comments and Questions?**