

National Institute for Occupational Safety and Health

Response to Observations presented in “Evaluation of Internal Monitoring for Fission and Activation Products among INL Claimants (1949-1970), SCA-SEC-2015-0074-E2, Revision 0

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Introduction

The initial Evaluation Report (ER) for Special Exposure Cohort (SEC) Petition 00219 for the Idaho National Laboratory (INL) was issued by the NIOSH's Division of Compensation Analysis and Support (DCAS) on March 12, 2015. DCAS presented the findings of the petition evaluation at the meeting of the Advisory Board on Radiation and Worker Health (ABRWH) in Richland, Washington on March 25, 2015. Subsequent to the this initial presentation a revision was made to the proposed SEC class definition due to the discovery of a change in external dosimetry practices in March 1970 and December 1974 which affected the SEC class definition. The ER was revised, issued on July 21, 2015, and presented at the meeting of the ABRWH in Idaho Falls, Idaho on July 23, 2015. The revised SEC class definition is:

All employees of the Department of Energy, its predecessor agencies and their contractors and subcontractors who worked at the Idaho National Laboratory (INL) in Scoville, Idaho, an (a) who were monitored for external radiation at the Idaho Chemical Processing Plant (CPP) (e.g. at least one film badge or TLD dosimeter from CPP) between January 1, 1963 and February 28, 1970; or (b) who were monitored for external radiation at INL (e.g. at least one film badge or TLD dosimeter between March 1, 1970 and December 31, 1974, 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 in the Special Exposure Cohort.”
(NIOSH 2015)

After the July 2015 meeting in Idaho Falls, Idaho, Sanford Cohen and Associates (SC&A) was tasked by the ABRWH with evaluation of the proposed SEC class definition for INL and to review the feasibility of dose reconstruction for the facilities and time periods evaluated. SCA-SEC-2015-0074-E2, Revision 0 “Evaluation of Internal Monitoring for Fission and Activation Products among INL Claimants (1949-1970)” was issued in October 2015 as part of the evaluation tasking requested by the ABRWH. In the summary section of the report, it states that “specific to internal dose reconstruction based on fission and activation product (FAP) bioassay indicator radionuclides, SC&A identified four major assumptions that form the basis for the determination that internal dose reconstruction is feasible for the relevant areas and time periods at INL that are not already covered by the proposed SEC class.” The four assumptions were:

1. FAP bioassays
2. FAP intakes
3. Actinide intakes
4. Special situations actinides

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The focus of the report was to only evaluate the FAP bioassays “related to the sufficiency of worker bioassay records for reconstructing doses to fission and activation products.” The evaluation produced the following three observations and summary recommendation:

Observation 1: SC&A agrees with NIOSH’s assertion that coworker models should be developed for the period of 1967-1970 for each relevant area under consideration.

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 worker who were unmonitored, but like should have been monitored during all periods for which such exposures are possible.

Observation 3: Based on the examples provided in Table 5, it appears there are credible situations where it would be appropriate and claimant favorable to assign coworker intakes of FAPs and actinides to account for unmonitored portions of the claimants’ work history. Many of these examples predate the period currently identified by NIOSH as requiring a coworker evaluations (1967-1970).

Summary Recommendation: Based on SC&A’s review of 92 randomly selected claimants, it was evident that FAP 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 FAP 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. Though not directly related to FAP internal dose reconstruction, it is especially important to have reliable FAP data, because much of the internal alpha dose from the actinides will be based on Sr-90 or Cs-137 intakes using Tables 5-22 or 5-23, respectively, or ORAUT-TKBS-0007-5 (ORAUT 2010); as well as other FAP intakes based on ORAUT-OTIB-0054 (ORAUT 2015).

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Discussion

In 1966, a joint decision by the Idaho Operations Office and Idaho Nuclear Corporation (prime contractor)¹ was made to transition towards more reliance on *in-vivo* bioassay beginning in 1967. The new *in-vivo* program was a representative counting program such that workers were only counted every four years resulting in a net decrease in the number of *in-vivo* measurements at INL. This can be seen in Figure 1.

<i>In-Vivo</i> Measurements for INL, 1961-1970	
Year	Number of Results
1961	1344
1962	2667
1963	3839
1964	1998
1965	2646
1966	3072
1967	1511
1968	1534
1969	1158
1970	1350

Figure 1: Data from Table 6-2 SEC00219 Evaluation Report²

There was also a significant drop in β/γ *in-vitro* bioassay as a result of this policy change. This is demonstrated in Figure 2 which lists the number of β/γ urinalyses for four separate areas at INL. Except for the Chemical Processing Plant between 1963 and 1974, a data sufficiency issue was not identified during the SEC 00219 Petition evaluation. However it was determined that a bioassay co-worker mode was needed to support reconstructing internal dose post-1966 due to the transition away from *in-vitro* bioassay and a decreased *in-vivo* bioassay frequency.

¹ McCaslin, 1966, *J. W. McCaslin Correspondence 1966*; J. W. McCaslin; SRDB Ref ID 126064

² Findley et.al., SEC Petition 00219 Evaluation Report revision 1, July 21, 2015

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Beta-Gamma Urinalysis by Area and Year at INL				
Year	CPP	TRA	Miscellaneous Reactor Areas	CFA
1953	0	338	0	4
1954	403	668	0	196
1955	1029	1063	3	410
1956	1166	1822	80	386
1957	1729	3272	193	632
1958	1405	2701	291	303
1959	1298	3215	256	953
1960	645	3346	294	1225
1961	729	3286	606	1679
1962	807	3139	428	1277
1963	820	2912	208	1146
1964	998	2989	176	1177
1965	884	2297	142	1299
1966	222	1133	130	330
1967	11	47	0	111
1968	24	26	0	0
1969	19	19	0	0
1970	12	7	0	55

Figure 2: All data from SEC00219 Evaluation Report³: TRA data from Table 7.2, CPP data from Table 7-6, Misc. Reactor Areas from Table 7-11, and CFA from Table 7-14.

In the period after the issuance of the SEC 00219 Evaluation Report, there have been a number of personnel interviews performed by members of the ABRWH, SC&A, NIOSH, and the ORAU team. A couple of these interviews have provided new light on personnel monitoring practices which have caused reconsideration of limiting the INL coworker model for the year's post-1966 (at this time the interview transcripts are not available yet for reference). The first interview was with a long-time health physics technician at INL who described the general practice of when a bioassay would typically be prescribed following work involving radioactive contaminants. In practice, contamination around the entry routes into the body (nose, mouth, wounds, etc.) or potential exposure to airborne radioactivity of concern would be placed on a follow-up "special" bioassay to determine if an intake of radioactive material had occurred and to aid in the

³ Findley et.al., *SEC Petition 00219 Evaluation Report, Revision 1*, July 21, 2015

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determination of the magnitude of the intake, if an intake had occurred. While this practice was typical it does leave open the possibility of a worker with radioactive contaminants on the hands introducing the material into the body inadvertently. This possibility would have existed since the beginning of radiological operations at INL.

A second personnel interview involved a health physicist with responsibilities at the INL Burial Ground. During the interview the personal opinion was expressed that if there was one area that could have been improved upon during the earlier years at INL it would have been that more “biological samples” were taken. It was felt that internal dosimetry was not as well appreciated as external dosimetry at the time which is why there were not as many bioassay samples taken as there could have been.

Conclusion

Based on new information obtained through recent personnel interviews, NIOSH believes it is appropriate to expand the INL coworker model to the beginning of radiological operations for each operational area of the site. This would allow for claimant favorable assignment of coworker intakes of FAPs and actinides to account for unmonitored portions of a claimants’ work history. NIOSH also believes that the existing bioassay would be bounding as it would include analytical data collected as a result of the highest potential intake scenarios. The fission and activation product coworker models would also take into account dose from alpha emitters as much of the internal alpha dose is based on ratios from Sr-90 and Cs-137 intakes.

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