



MEMORANDUM

TO: INL Work Group
FROM: SC&A, Inc.
DATE: July 14, 2016
SUBJECT: SC&A's July 2016 Progress Report: ANL-W Area Monitoring Data Review

As part of the "SC&A Work Plan for Review of the NIOSH Petition Evaluation Report for SEC-00224 (ER SEC-0024), ANL-W," SC&A attempted to determine the change in the completeness and adequacy of the area monitoring data during the period 1951–1957 compared to 1958 going forward, since this is the National Institute for Occupational Safety and Health's (NIOSH's) proposed break point between granting and denying the Special Exposure Cohort (SEC).

The Argonne National Laboratory-West (ANL-W) facilities primarily occupy two main areas on the Idaho National Laboratory (INL) site: the Experimental Breeder Reactor No. I (EBR-I) and the EBR-II complexes. Facilities in the EBR-II complex operated after 1961. EBR-I facilities of concern operated from 1951 to 1970. Based on the proposed 1957–1958 break point, SC&A's review focused on the EBR-I facilities that operated during that time period:

- Experimental Breeder Reactor No. I (EBR-I), August 24, 1951, to December 30, 1963
- Boiling Water Reactor Experiment No. 1 (BORAX-I), May 1953 to July 22, 1954
- Boiling Water Reactor Experiment No. 2 (BORAX-II), October 19, 1954, to March 1955
- Boiling Water Reactor Experiment No. 3 (BORAX-III), June 9, 1955, to December 1956
- Boiling Water Reactor Experiment No. 4 (BORAX-IV), December 3, 1956, to June 1958
- Zero Power Reactor No. 3 (ZPBR-III), October 1955 to November 1970

SC&A began by examining NIOSH's evaluation report (ER) for SEC-00224 (NIOSH 2016; hereafter referred to as "ER SEC-00224") for relevant statements, comments, and citations regarding the availability of area monitoring data. Section 6.3.1 of the ER SEC-00224 provides an overview of the available ANL-W radiological monitoring data for the EBR-I complex.

EBR-I Radiological Data

Relevant statements regarding the radiological monitoring data for EBR-1 are found in Section 6.3.1.1 of ER SEC-00224 and are shown below:

Radiological monitoring in the form of routine survey, smear, and air monitoring was performed at EBR-I from the inception of operations. However, NIOSH found limited quantities and types of monitoring performed during the evaluation period. Many of the records found were located in the personal files of the EBR-I Complex Radiation Protection Manager; although the records were incomplete, they included data from important radiological events. Air monitoring data prior to 1955 were not found. The amount of air monitoring data from 1955 into the early 1960s is limited, after which it was determined to be much more complete and comprehensive. Air samples were counted for beta/gamma and alpha contamination. Contamination and radiation surveys prior to

1959 were limited, but surveys after 1960 are available. NIOSH collected a sampling of survey, smear, and air monitoring data for EBR-I with an emphasis on collecting as much alpha monitoring data as possible.

ER SEC-00224 presents examples of air sample and smear sample data sheets for 1955 and 1961. However, other than the two data sheet examples, NIOSH does not provide any Site Research Database (SRDB) references to verify the completeness and adequacy of the EBR-1 area monitoring data in general or, specifically, to differentiate the periods 1951–1957 and 1958 forward.

ZPBR-III Radiological Data

Relevant statements regarding the radiological monitoring data for ZPBR-III are found in Section 6.3.1.2 of ER SEC-00224 and are shown below:

Since the beginning of operations in 1955, radiological monitoring has been performed at ZPR-III. NIOSH was able to find examples of air monitoring from its initial years of operations (Air Sample Data Sheets, 1956; Air Sample Data Sheets, 1958). More comprehensive air monitoring records were found for later years. Radiation and contamination survey programs were employed from inception due to the handling of uranium fuel plates. This program became more rigorous with the introduction of plutonium fuel plates and the recognized potential for widespread uncontrolled contamination if a fuel plate rupture were to occur. The completion of a radiological monitoring “check sheet” was required each time plutonium fuel plates were handled. Figure 6-8 shows an example check sheet. One of the additional monitoring prerequisites was direct determination of surface alpha activity on all plutonium plates at routine intervals as well as before and after the handling of each plate. This procedure was called “piece counting.” Figure 6-9 shows an example piece-counting sheet. NIOSH was able to collect many examples of “check sheets” and the data associated with the checklists.

ER SEC-00224 presents examples of a plutonium loading check sheet from 1963 and a piece-counting sheet from 1965, and also smear sample data sheets for 1956 and 1959. However, other than the two example sheets and air sampling sheets from 1956 and 1958, NIOSH does not provide any SRDB references to verify the completeness and adequacy of the ZPBR-III area monitoring data in general or, specifically, to differentiate the periods 1955–1957 and 1958 forward.

BORAX I–IV Radiological Data

Relevant statements regarding the radiological monitoring data for ZPBR-III are found in Section 6.3.1.3 of ER SEC-00224 and are shown below:

From the onset of radiological operations through the end of the period under evaluation, health physics groups affiliated with ANL-W conducted air sampling and surveys for dose rate and contamination at the BORAX reactors. However, the degree and amount of radiological monitoring data available to NIOSH is very limited for BORAX-I through Borax-IV. NIOSH has collected a sampling of routine survey, smear, and air monitoring data for BORAX-V through the end of reactor operation and

dismantling. Radiation surveys included measurements of beta/gamma and neutron dose rates. Smears were collected for beta/gamma and alpha contamination while air monitoring filters were counted for fission products and alpha releases. Figure 6-10 shows an example of a radiation survey (Survey Reports, Jun-Aug1963) from the hundreds of pages of radiation surveys available to NIOSH for BORAX-V.

ER SEC-00224 presents examples of data sheets from BORAX V for 1963. However, BORAX V operated from February 1962 to September 1964 and is not relevant to SC&A's inquiry. BORAX I-IV operated from May 1953 through June 1958. NIOSH states, "*the degree and amount of radiological monitoring data available to NIOSH is very limited for BORAX-I through BORAX-IV,*" and does not provide any SRDB references to verify the completeness and adequacy of the BORAX I-IV area monitoring data in general or, specifically, to differentiate the periods 1953-1957 and 1958 forward.

Document Review

SC&A conducted a search of the SRDB for air sampling and contamination survey documents. The document search found 1,090 documents concerning ANL-W air sampling and 387 documents concerning contamination surveys. Table 1 shows the 26 documents relevant to the EBF-I, ZPBR-III, and BORAX I-IV facilities from 1956 to 1960.

Table 1. Air Sample/Survey Documents 1956–1960

SRDB ID	Total Pages	Document Title
60249	15	Air Sample Data Sheets EBR and ZPR 1959
60251	19	Air Sample Data Sheets BORAX IV 1957
138264	20	Air Sample Data Sheets Borax Reactor September 1957
138340	23	Air Sample Data EBR-I July–August 1960
138689	243	Alpha Beta Air Monitoring EBR-1 1955–1958
138685	60	Alpha Beta Gamma Survey May 1958
140394	5	Health Physics Logbook Surveys and Monitors MTR June 1, 1958
140395	7	Health Physics Logbook Surveys and Monitors MTR May 14, 1958
140398	12	Health Physics Logbook Surveys and Monitors MTR April 22, 1958
140400	6	Health Physics Logbook Surveys, Smears and CAM Calibrations MTR April 1, 1958
140439	13	Health Physics Logbook Surveys and CAM Calibrations MTR January 24, 1958
143756	385	Air Sample Data Sheets and Reactor Survey Sheets for EBR-I, ZPR-III, and AFSR April 1959–August 1960
143774	279	Air Sample Data Sheets, Smear Sample Data Sheets, and Radiation Survey Reports ZPR-III, EBR-I, BORAX and AFSR December 1959–December 1960
145085	17	HP Record Logbook Air Samples EBR-I January 17, 1957–October 12, 1960
145089	77	Non-Routine Processing and Routine Survey Log Sheet ALPR October–December 1958
145090	240	Air Sample Data Sheets February 1955–May 1959
145094	5	Air Sample Data Sheet BORAX and ZPR May 1957
145098	4	Radiation Survey Log Sheets BORAX March 1958
145099	3	Survey Sheets BORAX July 23, 1958
145102	9	Survey Sheets BORAX May–August 1957
145104	3	Survey Sheets BORAX January 23, 1956
146418	206	Air Sample Data EBR-I 1960
146428	93	Air Sample Data, Smear Sample Data AFSR January 25, 1960–November 6, 1961
146429	236	Air Sample Data, Building Survey Sheets EBR-I 1960
146438	88	Air Sample Data, Smear Sample Data, AFSR January 16, 1960–November 6, 1961
150017	350	Radiation Survey Log Sheets Nos. 1 - 310 August 7, 1957–December 21, 1957

SC&A conducted a review of each of these documents. The depth of the review depended on the type of document and its contents. For example, less time was spent reviewing five months of survey data in “Radiation Survey Log Sheets Nos. 1-310 August 7, 1957–December 21, 1957” (SRDB Ref. ID 150017), than was spent reviewing three years of air monitoring data in “Alpha Beta Air Monitoring EBR-1 1955–1958” (SRDB Ref. ID 138689).

Summary

SC&A conducted a review of the area monitoring data presented in ER SEC-00224 and documents found on the SRDB for EBR-1 facilities operating during the 1957–1958 timeframe. The purpose was to determine the completeness and adequacy of the area monitoring data for the period 1951–1957, compared to that from 1958 and forward. SC&A concludes that while the air monitoring and survey data may not be complete for each year and facility, SC&A did not find a clear distinction between the completeness and adequacy of the data for any particular year or facility that would validate NIOSH’s proposed SEC cutoff date of 1957.

In Section 7.2 of ER SEC-000224, NIOSH discusses the potential use of the area monitoring data as an alternate method to bound internal doses. However, NIOSH further states that it does not have plans to use this method. Therefore, at this time, SC&A believes it is best to concentrate resources on reviewing actual personnel monitoring results.

Reference

NIOSH 2016. *SEC Petition Evaluation Report, Petition SEC-00224*, National Institute for Occupational Safety and Health. February 18, 2016.