Status Report on the Review of the Santa Susanna Field Laboratory (SSFL) Site Profile, SEC Petition, and SEC Petition Evaluation Report
Prepared for the SSFL work group meeting in Cincinnati, Ohio, April 20, 2010

Prepared by SC&A, Inc.

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In anticipation of the upcoming SSFL working group meeting in Cincinnati, this report presents a summary of the status of issues that are currently under active discussion and investigation for the SSFL site profile, SEC petition, and SEC petition evaluation report. The report also introduces several new issues that have emerged since the last working group meeting on April 17, 2009.

The issues that are under active discussion and investigation are embedded in seven action items that were assigned to NIOSH at the conclusion of the April 2009 working group meeting. That is, each of the seven action items relate to one or more issues contained in the SEC issues resolution matrix for SSFL. Those issues have, to varying levels, been addressed in the latest update to the matrix, which will be available to the Board and working group for the April 20, 2010 meeting.

The NIOSH action items from the last working group meeting include the following:

1. **Start date for nuclear activities [Items 9 (SC&A #1) in issues matrix]** – Review of the activities at Atomics International sites from 1953 - 1955 to establish the start date and update the TBD as needed.

    a. **Status**: NIOSH has cited detailed historical facility descriptions from Sapere and Boeing (2005) in the SSFL issues matrix. A review of Sapere and Boeing (2005) indicates that pre-1955 activities consisted mainly of design and construction operation. Further, there is no indication that radiological operations took place before 1954. Thus, **SC&A believes that this issue is resolved.**

2. **Sodium Reactor Experiment (SRE) incident (Item #1 in issues matrix)** – A contractor will perform an independent review of different release estimates resulting from the SRE incident in 1959 to determine the most scientifically defensible release scenario and, therefore, the extent and the necessity of an exposure model for on-site workers. The TBD is to be revised to contain additional detail of the incident and potential exposure implications.

    a. **Status:** It is our understanding that the 1964 SEC cutoff date and expanded class definition to encompass all workers in Area IV renders the issue of internal exposures from the SRE incident moot. Presumably, the external coworker model would cover non-presumptive claims during the SEC period.

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Inquire into the status of the independent review and TBD update in light of the new cutoff date.

3. **Internal coworker model [Item #10 (SC&A #2) in issues matrix. Impacts issues 4, 6, 10, 11]** – NIOSH is to develop an internal dose coworker model that encompasses certain incidental exposures, such as potential exposures resulting from sodium disposal facility (burn pit) activities.

    a. **Status:** The NIOSH internal coworker model is still under development. NIOSH has provided a justification for the SEC cutoff date of December 31, 1964 that is based principally on limitations of the internal coworker model database for earlier dates (missing positive bioassay results).

4. **Tritium plume [Items 3 and 12(2) in issues matrix]** – This is one aspect of the environmental exposures issue. Workers may have been exposed to drinking water contaminated with tritium from reactor operations. NIOSH was to prepare a white paper describing their model and base data for estimating dose to workers from ingestion of tritium-contaminated drinking water.

    a. **Status:** Information on the tritium plume was initially to be presented in a NIOSH White paper. However, NIOSH instead included the information in its entirety in the issues matrix. Based on more recent well monitoring data and the argument put forth by NIOSH in the issues matrix, **we believe this issue to be resolved.** Specifically, we concur that the NIOSH model for the tritium plume is sufficiently claimant favorable, given the measured contamination levels at the various wells, model assumptions, and the very small likelihood of drinking water aquifer contamination (i.e., up-gradient location of drinking water wells from Building 4010 and remote likelihood of a connection between superficial and deep aquifers). Note that doses are small (nominally 4 mrem/yr from ingesting 2 liters per day at 20,000 pCi/l), but must nonetheless be considered in dose reconstruction.

5. **Lack of information on environmental exposures (Item #12 in issues matrix. Also impacts issue 5)** – NIOSH was to re-evaluate their current approach of back-extrapolating stack emissions data collected from 1971 to 1999 to early periods. Back extrapolation is likely to underestimate stack emissions for years 1954 through 1970 due to the steady reduction in facility operations over time. For example, nuclear reactor programs were essentially phased out in the early 1970s. As of May 2009, TBD-4 was undergoing revision to include new information discovered during SEC research.

    a. Status: NIOSH has indicated that revisions to internal, external and environmental TBDs are in the completion stages but that these revisions were minor and only done to include SEC language. **Inquire into the status of this specific re-evaluation and TBD update**

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6. **External dose coworker model [Item #13(1) (SC&A #5) in issues matrix. Impacts issues 6, 7, 8, 11, 13 (2)]** for all four Atomics International sites to be finalized and released

    a. **Status:** The external coworker model was released on August 3, 2009. See findings from SC&A review of the model and supporting data in the set of new issues since April 2009.

7. **External dose coworker model as regards neutron dose methodology [Item #13(2) (SC&A #5) in issues matrix].** Neutron dose methodology was to be reassessed and the associated TBD revised. In the absence of empirical data involving neutron spectra for reactors and Pu fuel storage facilities, the lack of dosimeter calibration methods, and the relative insensitivity of NTA film to neutrons with less than 500 keV (or as much as 1 MeV), there remains an undefined level of uncertainty for recorded neutron doses.

    a. Status: NIOSH has indicated that a white paper on the NTA film issues is currently being developed and is in the completion stages

The one SC&A action item was to provide NIOSH with excerpts from a notebook from an employee of the Canoga Avenue facility. That document was provided to NIOSH shortly after the April 17 2009 meeting.

New issues that have emerged since the last working group meeting in April 2009 include:

1. Issues identified by SC&A in our review of ORAUT-OTIB-0077 and its supporting data [the NIOSH external dose coworker model for the four Atomics International (AI) sites]. In February 2010, SC&A issued a draft report to the SSFL Work Group, which contained a critical review of NIOSH's proposed external coworker model. Specifically, SC&A's review focused on the **suitability** of the database selected by NIOSH for use in its coworker model. The SC&A review, entitled "*Review of Database Used to Develop ORAUT-OTIB-0077: External Coworker Dosimetry Data for Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility (Vanowen Building), the Downey facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International***"**, will be available at the work group meeting to help facilitate discussion of issues that the Board or the working group might have.

    For its coworker model, NIOSH employed a database that was compiled by Boice et al., (2006) for a retrospective epidemiologic cohort mortality study entitled *Mortality Among Radiation Workers at Rocketdyne (Atomic International) 1948–1999*. This database represented external **lifetime exposures** by year for 5,743 radiation workers who were employed for at least six months at the Rocketdyne (Atomic International (AI)) facilities in the years 1948 to 1999. In behalf of the study's objectives, the

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database included worker exposures at other facilities either before and/or after their employment at Rocketdyne/AI.

As pointed out in our review, while the integration of **pre**-Rocketdyne/AI, Rocketdyne/AI, and **post**-Rocketdyne/AI exposures is technically sound for the epidemiologic mortality worker study that required estimates of **lifetime** occupational doses, use of these data for a SSFL coworker model is inappropriate.

In our draft report, SC&A identified the following five (5) issues/deficiencies that, in its current state, preclude the use of this database for the SSFL coworker model:

Issue #1: NIOSH may have misinterpreted worker dose data labeled "Total External Dose" by Boice et al. to mean the sum of photon and neutron doses. Our review shows that the "Total External Dose" does **not** include neutron exposure. **This deficiency can be corrected.**

Issue #2: Termination dosimetry data was misused. Termination dose data may frequently represent the cumulative dose received over many years and, therefore, cannot be assigned to a **single year**. SC&A identified termination doses in excess of 60 rem that were assigned to a single year for some workers. In many cases, the termination doses were assigned to periods several years before or after the worker's actual period of employment as SSFL. **This deficiency can be corrected.**

Issue #3: NIOSH included annual exposure data associated with multiple/unspecified non-SSFL facilities, which may not comply with the surrogate data criteria specified in OCAS-IG-004. Many or these were termination doses assigned to a single year. **This deficiency can be corrected.**

Issue #4: NIOSH may have misinterpreted "Blanks" in the database resulting in the potential for unaccounted doses for individual workers. **The issue of whether workers with potentially incomplete monitoring data can serve as members of a coworker model that, in turn, provides surrogate data for their incomplete monitoring data may not be readily reconciled.**

Issue #5: Neutron exposures may either have been totally ignored (as alluded to in Issue #1 above) or substantially underrepresented since no attempt was made to account for NTA dosimeter deficiencies and revised neutron quality factors suggested by ICRP-60. **This deficiency can be corrected.**

In addition to the issues regarding the external coworker database, SC&A has identified several issues related to the model itself, which are summarized in an SC&A memorandum dated November 4, 2009, entitled *"Resolution of the SSFL Site Profile and SEC Issues Matrices."* The summary conclusions of SC&A's review of the model are provided below:

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Our review of the SSFL coworker model for the assignment of external dose identified the following potentially significant deficiencies. For select cancer sites, a substantial fraction to the total external dose may involve the contribution of non-penetrating radiation. Currently, Tables 2 and 3 of OTIB-0077 are based solely on dosimetry data that exclude measurements of the shallow dose.

*Another finding involves NIOSH's use of annual worker doses that include neutron exposures. NIOSH's simplified approach of collating the restrictive number of reported worker-neutron doses with the larger number of reported worker-photon doses has the effect of diluting neutron doses for the subset of SSFL worker assigned to reactor, fuel storage, and accelerator facilities. Equally, NIOSH's use of the reported neutron doses at **face-value** fails to account for deficiencies of the NTA neutron dosimeters as explained in bullets 2, 3, 4, and 5 above.*

Finally, NIOSH has recently provided SC&A with the data that was used to develop the coworker model. We are currently working with NIOSH to better understand the data that was used to confirm that it is appropriate for the development of a coworker model. We will continue this review with the approval of the Work Group

As noted above in the summary conclusions, the memorandum was issued **before SC&A conducted a review of the supporting data**. Thus, the statements regarding collated neutron and photon dose do not reflect Finding #1, regarding NIOSH's misinterpretation of "Total External Dose."

2. **Potential impacts of SC&A's findings in behalf of the external coworker model on the 1964 cutoff date for the Area IV and DeSoto SECs**. The cutoff date for the Area IV SEC was extended to the end of 1964 (effective May 5, 2010) based principally on data limitations (missing positive bioassay values) for the years 1961-1964. The same cutoff date is applied to the proposed DeSoto SEC for the same reasons. The findings of our review of the Boice database as applied to the external coworker model may impact this cutoff date, which was based in part on the presumption that the external model and underlying data were robust. Similarly, deficiencies identified for the SSFL external coworker model may also apply to the proposed internal coworker model.

3. **Free movement in and out of Area IV by Rocketdyne personnel.** This topic was discussed at length at the full Board meeting in February 2010 (pp 244 -254). In summary, due to poorly defined boundaries, a lack of administrative control of personnel movement into and out of Area IV, and the potential spread of contamination beyond area IV, some Rocketdyne workers were likely exposed to radionuclides originating in Area IV but were not monitored. Further, available records are not adequate to characterize spatial and temporal exposure parameters for this class of workers for the purpose of dose reconstruction.

   In NIOSH's April 15 update to the work group, they state:

   "Based on discussion during the February board meeting, NIOSH has looked into the issue of site coverage, but has not been able to identify any pertinent

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information that would indicate that DOE related nuclear activities were carried out in areas other than Area IV at Santa Susana Field Laboratory."

This response does not adequately address the concerns voiced at the full Board meeting because the issue is access control to radiological areas inside Area IV and not whether DOE activities took place outside Area IV.

4. **The petition evaluation reports (PER) for the Canoga, Downey and DeSoto facilities**. While SC&A has not been tasked to review these SEC petition evaluation reports, we believe that a discussion of them would be beneficial.

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