Draft White Paper

INCIDENT RECORDS AT SAVANNAH RIVER SITE: DISCUSSION OF THE SPECIAL EXPOSURE COHORT ISSUE NUMBER 12 RELATED TO INCIDENTS

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Prepared by

Arjun Makhijani, PhD
S. Cohen & Associates
1608 Spring Hill Road, Suite 400
Vienna, Virginia 22182

Saliant, Inc.
5579 Catholic Church Road
Jefferson, Maryland 21755

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1. INTRODUCTION

SC&A had raised the issue of the adequacy of incident records for dose reconstruction as part of its review of the Savannah River Site (SRS) Site Profile (SC&A 2005). This issue was carried over to the review of the SRS Special Exposure Cohort Petition (SEC) SEC-00103 as Matrix Issue 12 (SC&A 2009). The petitioners have also raised the issue of insufficient incident records, including in interviews with SC&A personnel and in materials provided to SC&A during the SEC review process. The summary of SC&A worker and petitioner interviews is attached to this report (Attachment A).

The SRS SEC Issues Matrix Item 12 reads as follows:

> *The Special Hazards Investigations list is incomplete. In its Tank Farm Fault Tree Databank, the site acknowledged that many early tank farm area incidents were not recorded (until 1965). NIOSH has not addressed the evidence provided in the SC&A TBD* [technical basis document] *review that there were incidents in the 200-Area tank farms that were not recorded.* [SC&A 2009]

In addition, worker interviews, as well as materials provided by a worker representative ([redacted]), indicate that there were unrecorded incidents and that construction workers often worked without Health Physics (HP) coverage. The Work Group has also asked SC&A to look at the issues raised by this worker representative. While a separate memorandum is being prepared on that, as directed by the Work Group, this report draws on these materials to further illustrate points made by workers in interviews done by SC&A.

2. SPECIAL HAZARDS INVESTIGATIONS (SHI) DATABASE

During the May 5, 2010, Work Group meeting on the SRS Construction Worker SEC, SC&A was asked to prepare a list of SRS incidents at the 200-Area Tank Farms that may be significant for dose reconstruction, but that are not found in the SHI index of incidents. SC&A had already prepared such a list in its review of the SRS TBD (SC&A 2005). The following table is reproduced from SC&A 2005 (pp. 79-80) and contains several significant incidents, some of which are in the SHI index and others that are not.

Comparison of F-Area and H-Area Tank Farm Databank Entries with SHI Log

Date and Area of Databank Entry	Tank Farm Databank Entry Summary	In SHI log?
February 1968, F-Area	Failed tank 1B evaporator pump. "Body exposure ranging to 30R/hr at 18 inches" during replacement. Asphalt also contaminated to 5 rads/hr at 5 inches. "Total estimated exposure was 0.8 R."	No
July 1971, F-Area	Total of 3.4 R worker exposure "while lightening packing glands." "Exposure resulted from high radiation levels in feed pump enclosure."	No
November 20, 1972, F-Area	Exposure during removal of a valve. "Hands, face and personal items contaminated to 2,000 c/m beta-gamma. Bioassay – 13 nCi, Cs-137/1.5 L. Body count = 84 nCi Ru-106, 368 nCi Cs-137."	No

Comparison of F-Area and H-Area Tank Farm Databank Entries with SHI Log

Date and Area of Databank Entry	Tank Farm Databank Entry Summary	In SHI log?
August 21, 1975, F-Area	"Contaminated soil encounted [sic] during excavation around Riser 6 Tank 3. 350 R/hr @ 1 inch from steam supply line to the jet in Tank 3. Probably the result of suckback and leak. Soil contained about 50 Ci 137-Cs."	No
February 1979, F-Area	3 workers exposed to CTS loop. No badges. Exposure estimated 65 mR. Cause accidental removal of a fence.	No
March 14, 1979, F-Area	"Construction worker got 8,000 c/m beta-gamma on gloves. Worked in 241-F regulated area without health physics coverage."	No
February 15, 1961, H-Area	Raising of thermocouple from Tank 16 annulus plug caused contamination of 2 workers "up to 6,000 c/m" and equipment was contaminated "15 r/hr on a riser plug." "Approved procedures" not followed.	No
September 1966, H-Area	"Radiation Exposure, See SHI 243."	Yes
November 1968, H-Area	"Film badge of sep. dept. supv. indicated skin exposure of 14,590 mrads during Oct. exceeding AEC manual quarterly standard of 10 rem….See special hazards investigation 266." Note SHI 266 describes this as in 221-H, not 241-H.	Yes
February 28, 1974, H-Area	1 pint contaminated liquid sprayed from a leak. ". . .grating of catwalk around evaporator cell was contaminated to 8 rads/hr… 2 maintenance mechanics were contaminated by falling droplets. Nasal contamination up to 1,345 d/m. Body contamination 300 mr/hr at 2" from arm, 1st mech. bioassay = 12 nCi; Cs-137/1.5L Chest count = 262 nCi….2nd mech. Bioassay = 64 nCi, Cs-137/1.5L Rec'd (2% MPBB)." Note: NBS 1969 MPBB = 30 µCi. Therefore 2% MPBB 600 nCi.	Yes
February 1, 1977, H-Area	Tank 29, liquid spill during repairs. Exposure rates 150 rads/100R/hr. at 5 cms. "Personal shoes" contaminated.	No
May 1977, H-Area	"High personnel exposures to T&T workers on hot job."	Maybe

Note: SC&A used the Tank Farm databank entries as compiled in Table 1, Part II, of Makhijani et al. 1986, and which contains only a subset of all databank entries. The databank used in Makhijani et al. 1986 only goes up to 1982. Entries for this table were summaries of databank entries, except for the parts that are in quotes, which were taken verbatim. The original databank is no longer available for verification.
Source: Makhijani et al. 1986, Part II, Table 1, "Worker Exposures."

The March 14, 1979, entry in the Tank Farm Fault Tree Databank, shown in the table above, corroborates a statement in construction worker interviews done by SC&A that work done by construction workers did not always have HP coverage.

SC&A understands that not all incidents were entered into the SHI database. The limited nature of this database in relation to other records is described in a documented telephone conversation with [**Redacted**] of SRS to NIOSH ([**Redacted**] 2008):[1]

[1] The name "[**Redact**]" in this email should be "[**Redact**]."

> *The SRS Incident database was… compiled for safety analysis report purposes, was a comprehensive record of major and minor incidents that were recorded in shift logbooks. Mr.* [**Redacted**] *consistently read the logbooks and copied materials he deemed notable. He then entered the information in the database. This database has proven to be a valuable DOE asset because it has been used as the basis for mean time between failure information for safety equipment. After Mr.* [**Redacted**] *retired the database was transferred to a group that eventually became Westinghouse Safety Management Systems. For the processes the* [sic] *Mr.* [**Redacted**] *focused on, especially the reactor and separation systems, the database is comprehensive and complete.*
>
> *Since the inception of SRS the site has operated in accordance with strict Policies and Procedures documents. DPSOP40 "Radiological Controls" has been in effect since the earliest operations involving radioactive materials. It has been routinely revised and updated. DPSOP40 provided detailed monitoring criteria and defined monitoring methods. Monitoring was based exclusively on what work a person did and where they did it. The monitoring criteria were the same regardless of who the person worked for or what Roll number he was assigned to. Thus monitoring decisions for transient construction workers were based on the same criteria as permanent DuPont workers. No incident data is stored in the dosimetry databases. But incident data may be found in an individual's personal dosimetry record. There is no registry or other kind of "roadmap" that would link incidents to individual doses. But there are some sources of information that may be useful. The Special Hazard Investigation database is one of them.*
>
> *For incidents that seemed significant at the time a Special Hazard Investigation was created.* [**Redacted**] *is in charge of this database. There are about 90 investigations in this database.*

The practice of transferring incidents that only seemed "notable" to the SRS Incident database, noted above, finds corroboration in the tank farm databank:

> *Prior to 1965 information on instrument failure, pump failure, leaks in the waste tank system are not recorded unless the individual occurrence is of particular interest.* [as quoted in Makhijani et al. 1986, p. 20].

Furthermore, the frequency of incidents entered into the tank farm databank increased greatly over time, from about 4 entries per year in the 1950s to 55 per year in the 1960s, to about 290 per year during 1970 to 1976 to about 1,800 per year from 1977 to 1982, which was the last year of entries in the databank analyzed in Makhijani et al. 1986. The fault tree databanks began to be compiled in 1973. The compilers did go back and collect information on incidents prior to that date (Townsend et al. 1994). However, as the increasing frequency of recorded incidents shows, there are likely to be many gaps for the period prior to 1973.

The Fault Tree Databank does corroborate the view in [**Redacted**] 2008 that the SHI index is only a limited dataset. In comparing the criteria for hazard investigations with some of the

contamination and exposure incidents not found in the SHI index, but that were in the F-Area and H-Area tank farm databanks, SC&A had previously concluded that the "log of Special Hazard Investigations (DuPont 1990) is incomplete…." (SC&A 2005, p. 78).

3. POTENTIAL FOR UNRECORDED INCIDENTS

Workers have stated in interviews that there were contamination events that were not considered incidents. In such cases, "[i]f workers made a mess, they cleaned it up" [Interview Summary 2010, p. 12 (see p. 17 of this report)]. In addition, workers may not have been aware of the procedure for recording incidents. Interviews also indicated that the recording practices may have been shift-dependent:

> *An interviewee was not aware of a procedure for documenting incidents [prior to the mid-1980s]. There was a big paper trail when there was a recorded incident. If supervisors did not have to report it to upper management, then there was no paper trail. In the mid to late 1980s, they started the emergency operations center. In the late 1980s, they started [defining] reportable items; any contamination greater than a certain level had to be logged in. Before that, workers did not report anything that did not have to be reported. If you look at incident reports, the incidents are mostly during the daytime. Operations would just clean up other spills at night, and a lot of stuff never got reported. There were a lot of times when workers got crapped up when there was no HP. In some cases, workers deconned themselves.* [Interview Summary 2010, p. 17 (see p. 22 of this report)]

The Interview Summary is attached to this report for convenience.

An individual's statement provided by [**redacted**] is also along similar lines:

> *While removing plastic covers from a hot railroad car, a lot of spilled water on the plastic, completely wet my work clothes. There was no Health Physics or supervision at the job site. As usual most jobs were done without supervisors or health physics personal [sic] and no records were recorded.*
>
> *I worked on shift work having rotation hours each week. Day shift was always full of supervisors, except (Sat. or Sun.). On shift work of odd hours, only a few people were working, with many hours not seeing anyone. Many Saturday & Sunday's we did not have film badges to wear.* [[**redacted**] 2007]

4. CONCLUSIONS

It appears possible that in some cases, the incidents may not be recorded anywhere, including in the worker's individual dose record or any databank. In other cases, incidents may not be in the SHI index, but may be in other databases, such as fault-tree databanks, or in logbooks. There is a distinct possibility of unrecorded incidents that may be shift-dependent.

NIOSH has not yet addressed the issue of incomplete incident records in SRS dose reconstructions. The issue of incident-related doses becomes even more complex in the context of coworker models. This is both a general matter for non-construction and construction workers, as well as a specific issue specifically for construction workers to be considered in the context of the SRS construction worker SEC.

5. REFERENCES

[**Redacted**] 2008. *Documented Communication with* [**redacted**] *on SRS Incident Database, Special Hazards Investigations Database, HPAREH Database and Intake Registry*, telephone communication between [**redacted**] (SRS) and Gene Potter (ORAUT) dated April 3, 2008. SRDB 45062.

DuPont 1990. *Dosimetry Special Hazards Investigation Index*, FE5300-2000-2004-044-P001, E.I. DuPont de Nemours and Company, Aiken, South Carolina, 1990. SRDB 45100.

Interview Summary 2010. *Preliminary Draft: Master Interview Summary for the Savannah River Site Constructions Trade Workers Special Exposures Cohort Review*, interviews conducted by SC&A in January 2009 and posted on the O Drive in 2010.

Arjun Makhijani, A., R. Alvarez, and B. Blackwelder, 1986. *Deadly Crop in Tank Farm, An Assessment of the Management of High-Level Radioactive Wastes in the Savannah River Plant Tank Farm, Based on Official Documents*, Environmental Policy Institute, Washington, DC, July 1986. SRDB 33225.

SC&A 2005. *Review of NIOSH Site Profile for Savannah River Site,* SCA-TR-TASK1-0003, S. Cohen & Associates, McLean, Virginia, and Saliant, Inc., Jefferson, Maryland. March 21, 2005.

SC&A 2009. Issues List for the Savannah River Site SEC Petition and Petition Evaluation Report, Sanford Cohen & Associates, Vienna, Virginia, and Saliant, Inc., Jefferson, Maryland. September 2009.

Townsend, C.S., W.S. Durant, and D.F. Baughman, 1994. *Risk Assessment Databanks at Savannah River Site*, WSRC-MS-93-168, Westinghouse Savannah River Company, 1994. SRDB 46015.

[**redacted**] 2007. Statement of [**redacted**] sent to SC&A in 2010, Statement dated July 31, 2007.

ATTACHMENT A: PRELIMINARY DRAFT – MASTER INTERVIEW SUMMARY FOR THE SAVANNAH RIVER SITE CONSTRUCTIONS TRADES WORKERS SPECIAL EXPOSURE COHORT REVIEW

INTRODUCTION

As a technical support contractor supporting the Advisory Board on Radiation and Worker Health (Advisory Board), S. Cohen & Associates (SC&A) has been tasked with reviewing NIOSH's Evaluation Report on the Special Exposure Cohort (SEC) Petition for Savannah River Site (SRS) construction workers. One component of SC&A's review is a series of interviews with site experts, including current site workers, former site workers, and worker representatives. The purpose of these interviews was to hear first-hand accounts of past radiological control and personnel monitoring practices, and to better understand how operations and safety programs were implemented at the site over time. Interviewees were identified through available site reports, public meeting transcripts, local advocates, and other interviewees. This report summarizes the results of those interviews that were reviewed and accepted by the interviewees.

A team of SC&A interviewers, Arjun Makhijani, Kathryn Robertson-DeMers, Harry Pettengill, and Abe Zeitoun, conducted interviews in Augusta, Georgia, between January 25 and January 28, 2009. One participant was interviewed by phone on July 9, 2009. All of these interviews were attended by Advisory Board member Bradley Clawson. In addition, two site experts were interviewed in Columbia, South Carolina, and one was interviewed by phone. A total of 19 site experts participated in these interviews.

The workers whose interviews are summarized below represent the time period from 1952 through the present (2009). They worked in the 100, 200, 300, and 400 Areas, and at Savannah River National Laboratory (SRNL). Their work took them to reactors, canyons, tank farms, production lines, maintenance shops, offices, the tritium facility, M Area waste plant, the Defense Waste Processing Facility (DWPF), and the Naval Reactor Fuels facility. Several individuals worked throughout the site. Interviewees participated in new construction; maintenance and repair; production; demolition; and remodeling activities. Some participants have assisted other workers with medical issues, claims, and/or petitions. The worker categories represented by the interviewees include the following:

- Administration
- Construction Engineering
- Construction Maintenance and Crafts (Electrical, Iron Work, Supervision, etc.)
- Crane Operations
- Decontamination and Process Operations
- External Dosimetry
- Foreman/Supervisor
- Laboratory Technical Support
- Materials Accountability
- Project Management
- Quality Control Inspection
- Quality Control Engineering

- Risk Analysis/Risk Assessment
- Tank Farm Operations
- Transportation
- Union Representation

SC&A explained that the interviews were being conducted on behalf of the Advisory Board as part of their review of NIOSH's SEC Petition Evaluation Report. Participants were told that the interviews were unclassified, and that they should not disclose any classified information. Summaries from each interview set were prepared and provided to the interviewees for review. Approximately 33% of the participants did not respond to the request for review; the information obtained from non-responders has been withheld from this master summary.

The information provided by the workers and site experts is invaluable in helping SC&A to better understand the operations at SRS. This summary report is not a verbatim presentation of the material contained in the interview notes, nor is it a statement of SC&A findings or opinions—it is a consolidated summary of statements, opinions, observations, and comments that the interviewees communicated to SC&A. The sole intent of this summary is to communicate to the work group, the Advisory Board, and other interested parties information acquired by SC&A during these interviews. ***Comments are included in brackets where SC&A has provided clarification on a statement.***

Information provided by the interviewees is based entirely on their personal experience at SRS. The site experts' recollections and statements may need to be further substantiated; however, they stand as critical operational feedback and reality reference checks. These interview summaries are provided in that context. Key issues raised by site experts are similarly reflected in our discussion, either directly or indirectly. Interviews from all workers who reviewed and approved their individual interview summaries were consolidated into a single summary document. The information has been categorized into topical areas related to construction practices, site operations, material accountability, shipping and receiving, radiological controls and monitoring, incidents and accidents, medical procedures, radiological records, environmental monitoring and impact, comments on the technical basis document and/or petition, and miscellaneous comments. Where conflicting observations and statements have been received, both perspectives have been retained in this summary report.

With the preceding qualifications in mind, this summary has contributed to SC&A's understanding of issues raised in the petition review report.

CONSTRUCTION, MAINTENANCE, AND CONSTRUCTION TRADES

[The interviewees involved with the construction and maintenance, collectively, provided a description of the maintenance structure at SRS, a description of job responsibilities of Construction Trade Workers (CTWs) and DuPont Construction, areas of the site where jobs were performed, and examples of CTW tasks.]

[There were two maintenance organizations supporting SRS: in-house personnel employed by SRS and the CTWs.]

DuPont Construction hired carpenters, laborers, iron workers, and painters through the unions. Miller Dunn Electric, B.F. Shaw, J.A. Jones, M.K. Ferguson, and Norton Brothers were subcontractors to DuPont Construction. In more recent years, Bechtel Savannah River Company has brought in CTWs. When there were not enough in-house maintenance workers, they called in CTWs. SRS had in-house maintenance crews in every building who were primarily responsible for maintaining existing equipment. They did everything that could be done. CTWs filled in when they did not have enough people, or when heavy equipment was involved. If an in-house foreman could not get a maintenance crew, he would bring in CTWs to get the job done. A Construction Liaison served as a go-between. For example, say a foreman wanted to pull filters on Tank 33. The foreman would ask the Construction Liaison for resources. The Construction Liaison did the paperwork. Once he had the funds assigned, then he and the foreman worked together to get the job done, like changing the filter and taking [the old one] to the burial ground. There was a lot of overlap in job descriptions. For example, painters were available in-house and through the construction trades.

At SRS, the only union workers were the CTWs. The production workers were not part of a union at SRS, and did not have a voice like a union did. DOE does not have anyone to oversee former workers' concerns.

When there was new construction that was the responsibility of CTWs. When it came to new equipment, or if bigger cranes were needed, then CTWs would be involved. Some of the big radiation jobs at SRS would be done by CTWs. New equipment does not mean clean. It could be highly radioactive work, unless they were building something new. They might be taking out a contaminated gang valve and installing a new one, or installing an automatic gang valve in place of a manual valve. CTWs were in radiological areas on a daily basis.

Whereas, those involved in production work were employed by SRS, no construction worker is hired full time. Construction workers go out with the belief that they will be there for a short period of time. Some people went to SRS and stayed out there for many years. Some went in and out like a swinging door. Some interviewees worked on specific projects for several months to a year or two. Most people have been laid off at some time. It was the luck of the draw, and if someone got into supervision, then that person would not get laid off. In lean times, supervisors might work with their hands and go back to supervision when there were more workers. One interviewee worked at SRS for [redacted] years, then worked at another DOE site until the latter part of the following year. He came back and worked at SRS for [redacted] years. The interviewee worked on and off for a subcontractor for several years. A lot of individuals bounced between different DOE sites. Some have worked all over the place. It would be hard to give a percentage, but some move around, some do not.

There is a $2,500 floor for federal contracting rules to kick in. Under the Davis Bacon Act, the prevailing wages are set by the federal government. That is designed so that the Feds should not undercut local wages. So federal contractors should not bring in workers from low-wage areas and undercut the local workforce. It is to ensure that local contractors would pay fair wages. But contracts under $2,500 were exempt. So SRS operations would break it down into less than $2,500 jobs and give it to their people. There are rules that make Davis Bacon applicable. If it is building up or tearing down, then it applies. If it is routine maintenance, it is not Davis Bacon.

There were about 8,000 people at SRS in 1982. There were a lot of people at SRS from 1983 to 1990, and then they started to have major layoffs and voluntary retirements. Construction trades experienced a peak employment period when they were working on DWPF and reworking the reactors at the same time. At that time, the electricians alone numbered over 1,000.

[CTWs interviewed described the work responsibilities of various crafts.]

- Iron Workers were part of the construction trades, working through the union. They worked with heavy metals—anything heavier than sheet metal would be handled by the Iron Workers. Iron Workers at SRS did mainly maintenance work. In the early 1990s, they would remove the lead shielding from in front of the cabinets (i.e., gloveboxes or fume hoods), modify the handles and whatever was supporting the shielding, and go back in to install the shielding, so operators could come back and use the gloveboxes. In the 100 Areas, Iron Workers were involved in installing and removing heat exchangers from the minus 20 (-20) level, butting out concrete, installing rebar and steel, welding, drilling holes, and so on. Iron Workers were also involved in constructing new buildings.

- Boilermakers were tradesmen who worked on heat exchangers and other metal components with water inside. In the 1980s, Boilermakers and Iron Workers worked together on removal, refurbishment, repair, and re-installation of reactor heat exchangers.

- Electricians did all sorts of jobs, like installing conduit, conduit supports, cables, terminations, installation of temporary lighting, instrumentation and motor change outs, and electrical equipment. They worked in stainless steel hoods with glove ports in B-line, including dismantling and removing the gloveboxes. Supervision may be involved in going out and pre-scoping jobs, laying out work for the electricians, conducting walkdowns, and safety inspections. In the early 1990s, electricians were working with the safeguards and security group at the reactors to install security alarms. They were redoing all the reactors at the time, and [a superintendent] had about 100 electricians working the job.

- Heavy Equipment Operations operated cranes, elevators, and sometimes other equipment like fork lifts. Crane operators commonly worked in radioactively controlled areas, including tank farms, separations, and tritium areas. Cranes were used in various areas, including the separations area and the S Area. They worked in the F Area, working the elevator inside the separations buildings. They ran overhead cranes in the S Area. Crane operators used 1400s, Grove Cranes, and Cherry Pickers. A Class A crane operator can run all sizes and types of cranes. An operator test was required to qualify for Class A. There was also equipment in the Naval Reactor Fuels building. This was a mockup building where they did the jumpers. There was also work with stainless steel and welding.

- A Quality Control Inspector did QA/QC inspection of electrical construction and equipment. An inspector went everywhere the electricians went.

A job steward had responsibility for a particular craft's workers across the whole site. One job steward had as many as 1,100 electricians at SRS at one time. A steward covered the whole site. If a person needed to talk to the job steward, he had to go to them. A job steward was in every area, sometimes 8 or 10 times a day. He was in the central shops area a fair amount, because construction workers were based there. He went out from there as needed. The job steward was "a priest one day and a devil the next." Sometimes he could go and take care of a personal problem workers may have with families, and other times he was trying to prevent someone from being fired. The job steward defends the contract. Sometimes workers are at fault or the management is at fault, so someone is going to be mad at him every time.

Laborers were one of the craft unions. There are also production laborers, but there is no occupational classification for that. There are only construction laborers at SRS [as a job classification]. This is specific to SRS; it may be different at other sites.

[Examples of locations where CTWs were involved in work included:]

- Burial Grounds
- Central Shops
- Reactor buildings (C, L, K, P, R)
- F and H Canyons
- F Tank Farms
- H Tank Farms
- Tritium facilities in H Area
- Mock-up facility (~1980)
- Defense Waste Processing Facility (Mock-up)
- Naval Reactor Fuels

[Interviewees provided many examples of the specific job activities CTWs were involved in at SRS.]

- Painting every pipe in the Tank Farms.

- Electricians installed temporary lighting, including in the huts [at F Tank Farms]. They had explosion-proof lights that they put down in certain areas around the tanks. Sometimes, lighting was put inside the tanks for inspection purposes.

- Electricians worked on tank tops and changed out instrumentation and motors. They had to take out conduits sometimes.

- Crews would have to work during an outage to do things before a reactor could be started up. They worked at the -20 and -40 levels in the 105 buildings, where pumps and other equipment are located.

- In the 1980s, Iron Workers and Boilermakers removed heat exchangers from the 100 Areas, refurbished and repaired them at the Central Shops, and returned to re-install them in the reactor buildings.

- CTWs worked on the huge HEPA [High Efficiency Particulate Air] filter pots (i.e., teapots) at the tank farms. They were building the structure that went out on the tank so they could start emptying the tanks.

- Crane operators ran cherry pickers up at H Area and F Area tank farms up on the Hill. During one job, they had to move lead shielding. They ran the crane, set jumpers, worked down in the cells, moved the covers off the cells, and worked with the diversion boxes. This was like a pumping station for high-level waste. Diversion boxes were in the tank farm and a crane would come in and lift the covers off. They would run a camera remotely from inside the crane.

- In March 1997 through November 1997, wiremen in the M Area were involved in building a melter for low-level waste (LLW) to put it in a glass medallion about the size of a half dollar.

- In the 200 F Area, electricians were tearing down conduit and removing asbestos. The workers would drill holes in asbestos-containing transite and put conduit through the holes. It was a demolition activity. The workers received training to remove the asbestos.

- During the Waste Remediation Program, drums from the B-line were opened in gloveboxes, the trash was sorted, and the drums were repackaged.

Workers entered normally unoccupied areas. For example, workers would go inside tanks in the F Areas. In areas where they moved the slurry pumps, the tank top would be open. Electricians were up in the ceilings or moving around equipment where there was residue material everywhere.

SITE OPERATIONS

[The interviewees directly employed by SRS in operations and supervision, collectively, provided a description of site activities they were involved with, and the interaction they had with, the CTWs.]

[SRS has two separations facilities.] The HB-line produced Pu-238 for the space program. The FB-line produced material for weapons. The materials looked different. Loading of fuel in the canyon was under water. They would put the fuel in the canyon and dissolve it in the dissolver. Other activities at the B-lines included pulling samples. The needle on the sample holder punctured a diaphragm, and the product would go into the "peanut." A lot of the times, the sample would not pull if there was a pig in there. Workers had to open the air valve and get it to pull enough vacuum—that was called milking it. This was an unmentioned habit. It was a no-

no, because a worker's hand was exposed to the needles with the waste in them. If workers said they were milking a sample, they would be fired. It had to be done, but they did not say so.

There were a variety of jobs and skill levels within Operations; workers might get in at a low-paying position and advance from there. One low-paying job was Laundry Truck Helper; these workers went to every area of the plant, loading laundry bags on and off the truck.

Riggers were usually DuPont workers, but they were mobile. They were a part of the Transportation and Traffic (T&T) group. DuPont Riggers were treated similarly to the CTWs; they worked the whole plant. They would haul B-25 boxes (metal boxes introduced in 1983 to start cleaning up the plant) to fill with nuclear waste. These boxes were around 4 ft by 6 ft by 4 ft deep. The workers would fill the boxes, stake down the metal lids, put radiation stickers on it after HP [Health Physics] had surveyed it, and send the box to the burial ground.

Operations workers at the tank farms included Control Room Operators and Field Operators. These were decent money jobs. Workers in the canyon loaded fuel in the canyon and dissolved it in the dissolver. In F Canyon, Decon and Process Operators could get radiation overtime or process overtime. They had to get process-qualified in order to work process overtime. When overtime lists came around, a lot of employees refused radiation overtime, like decon work in the gang valve.

[At the tank farms] in late 1980s and early 1990s, there was probably a 50% mix of production and construction workers. Construction was cleaning out the 20 series of tanks (i.e., Tanks 25 and 29) and cleaning out Tank 17 down in the hole. Production was digging up lines and running new lines. Operations did line breaks. Construction would put up its own tents. Construction would not break a line. They would build the hut, but operations would break the line. That could lead to incidents inside the hut. Most foremen who were supervisors did the line break. Usually they had maintenance men as well. The production foremen would drill into the line, but the construction trades may be on the line.

Once a month, the supervisor received a tickler to do a required work procedure. These were work procedures that must be routinely done by a specified period. For example, the tickler would say to inspect 40 series tanks, to take delta P readings, or to take a dip sample.

Dip samples at the tank farms were taken from an 8-inch opening in the riser. The proper way to do it is to build a hut around the area and lay plastic down on the floor, and the operator would manually lift the port. The operator would take a rope with a valve and pull the dip sample out of the opening. The workers pulled two dip samples from every tank, and then they would walk from one tank to another. It was very physical work, and workers were saturated with sweat in their protective clothing.

SRS did a mock-up of DWPF within a million-gallon tank. There was a new heel evaporator control room. The system was designed to process salt. The design was a tank within a tank. As it would process, the waste would go through the filters in 680-gallon tanks. Workers would fill them with light stuff. They would fill the tanks, and the rest went back to the bottom of the tank. Then they had to pull dip samples as part of the job. They pulled 1-liter samples out of

this tank. Workers involved had low radiation [to date] and were good at working at the tanks. There were 12 or 20 inches of stuff at the bottom of the tanks, and the dip samples were very hot—as hot as it gets. One person held the sample and another cut the string.

Shipment of nuclear material included natural and enriched uranium. There were a couple of plutonium shipments from the 300 Area. Tritium inventories maintained for the Manufacturing Building included the material, the quantity, and where the shipment was going. WIPP [Waste Isolation Pilot Plant] refused to accept some waste from SRS because it had too much TRU [transuranic].

WORK LOGISTICS

[The interviewees, collectively, provided a description of how jobs at SRS were completed with SRS staff and CTWs working side by side.]

CTWs worked side by side with site operations personnel on the same jobs. Typically, there was a mix of in-house and CTW personnel. For example, sometimes they had to pull out a heat exchanger weighing a hundred tons. There was a feed pump job on Tank 13 in H Area. The pump was about 20 ft long, 3 ft in diameter, and it sent high-level waste to the evaporator. It could be a rigger crane that pulled the pump, or CTW could do it. There was a spill. Workers had to dig up the pavement around the tanks, with CTW and operations working side by side. At other times, riggers were handling fuel rods that would be blue under the water. Everyone was being exposed. On a shutdown in B-line, there would be 100 pipefitters (construction workers) and 15 operators building huts and doing standby (assistance) for Construction. Site operators got to know the construction workers pretty good, because they worked as a team.

Production workers in a given area stayed there. But this was not the case with maintenance workers, who went everywhere. There were mobile maintenance crews (e.g., painters) on the SRS site that would go to any area as needed. In the 100 Area, there was an operations crane crew. When any reactor went down, the crew went there to provide services. There were also CTWs working there at the same time.

Maintenance [in-house and CTWs] worked site-wide out of the Central Shops in the early 1970s. Workers from the Central Maintenance Shops were assigned to various areas. They retrieved equipment from the field and brought it back to the Central Shop. They went to a lot of the areas to retrieve equipment, such as welding machines. CTWs worked in the same area while production was going on. A lot of times, the operations people did not have the skills to do their jobs. A lot of times, CTWs would be straightening out their mess.

DuPont Construction also employed non-construction workers (e.g., administrative and payroll staff), whose job responsibility took the worker all over the site, including entering radiological areas. Individuals based in Building 773 went from one area to another to do inventories of nuclear material. At least two workers were present when they went out to do these inventories.

WORKER STATUS

[The interviewees representing the CTWs, collectively, provided a description of the attitude toward CTWs at SRS.]

Interviewees indicated that the CTWs were treated as second-class citizens, and that CTWs were called in particularly when they had nasty work to be done. Even in recent years, interviewees reported not being treated the same as Bechtel workers. In fact, in places that were very hot, CTWs were often sent there because operations people did not want to go. If the in-house foreman had two jobs to be done, he would give the nastier job to the CTWs. These jobs were not just radiation work, but included working in suits, at high or low temperatures, or working at heights. They did not call the union hall just to get people to do the dirty work, but used CTWs already on the site. They would use them for the nasty job and send them back to the same place they were before. Construction workers were eager, because they needed the work and wanted to get paid. Whatever CTWs needed to do they did when the supervisor asked them to. The production side was cherry-picking the work. Production workers got their share of nasty jobs, but they gave a lot away to CTWs. Production workers were also asked to help CTWs on overtime jobs.

[Interviewees gave examples of how construction workers were treated.] Production workers had their own kitchens, microwaves, luxuries of life, and cookouts. Construction workers—if they did not take their own food, they did not eat. Construction workers were not even allowed to have hot lunches. Production workers had showers and lockers. Construction workers were not allowed to use those; they had to take the muck home. Construction workers could not use bathrooms, but had to use porta-potties. Construction workers were always in the farthest parking lots. They would have to step aside for operations people to check in, and that would often make CTWs late. These details may seem irrelevant, but job stewards got pulled into many battles over such matters. [**Redacted**] once got locked into the H Area tank farm and waited out the day (and into the night) in a shack.

In the 1980s and 1990s, there was no difference in treatment of minorities. This is the South. There was a hierarchy in work assignments in early years. Older black gentlemen were put where they shouldn't have been. For example, a maintenance supervisor assigned some uneducated black gentlemen (a plant painting crew) to paint a contaminated gang valve corridor. In F Canyon hot gang valve corridor, they wanted to decon it so the plant manager could walk there in his street clothes. The workers chipped, chiseled, and filed anything contaminated. They rolled the whole gang valve corridor, everywhere they thought the plant manager would be going.

They had no minorities in the locals until the 1970s, and then they were let in. So there was no discrimination from that point on. Prior to that, the only crafts that had minorities were the laborers and bricklayers. The CTW union made a special effort not to let discrimination happen, once minorities were in the union.

RADIOLOGICAL CONTROL

[The interviewees, collectively, provided their characterization of the radiation protection processes in place at various onsite facilities, as follows.]

Production and HP [Health Physics] had a love-hate relationship. Workers tried to do most jobs without HP. Production wanted to do whatever had to be done. Day shift did not attend to maintenance that often. Much of it was done at night. Operations spent time avoiding HP, and HPs tried to avoid them. Operations had work to do, and HPs' attitude was not conducive to getting the job done. It could take days to get the job done if HP was involved. The production side tried to avoid HP.

Some of the HP techs worked more like operators; they would work with you. If an HP trusted you, he would not go with you. For example, operations would know that there were some things to be done at the first of the month. They would get the ticklers, go get an HP, and get the job done. If a worker was an old-school person, and if they could go without HP, they would do it. In the early days, a supervisor would manipulate HP to get the work done. Workers who were more production- and work-oriented leaned on HPs, so they could get the work done.

On the shift, there was only one HP, and it is not like the HP could cover the area. Also, the HPs would take their breaks, and then there was no one there. Eventually, they did put an HP manager on shift. This was part of the change in the late 1980s—it started with the quality assurance, and it took some time.

HP couldn't cover everything at the tank farms, because there were not enough personnel. In the early 1980s, there were 6–7 [HP] people on the day shift, covering a couple hundred workers. One HP would stay in the trailer. They were short-staffed all the time. The HPs didn't come out several times when some CTWs worked with radiation. For example, workers at the tank farms would commonly load the cars and take things from H Area to F Area without an HP.

At the tank farms, a maintenance crew worked about 50% of the time without an HP. You would not take an HP when you were going to do things your way. The DuPont procedures did not have sign-off steps in them, and workers could use the procedures the way they wanted them. Before workers needed a sign-off, the boss told the worker what was to be done and the worker could decide how they were going to do it. If, for instance, a worker was asked to decontaminate a sample box, he might go down himself and take permanganate or trichloroethylene (TCE) and do it himself. If the worker could get the contamination down, they would call HP for a survey. The workers were trying to get contamination down so they could work in lab clothes. If they could not get the contamination down, then they may not bother calling HP.

One interviewee did a job that they had a safety complaint on. Before you can put [in] a jet or sparge, you have to put in well-drilling equipment. There were complaints that it was too hard because of the physical work. Workers dropped a piece of the pipe into the tank. RadCon people were around to survey the area workers were getting into.

In 1989, Westinghouse brought in Rent-a-techs who were not experienced or trained. For a period in the early 1990s, workers didn't feel protected. With DuPont, the RadCon technicians were more experienced.

Operating engineers on the construction side were considered support crafts, and they did not have procedures. When PAAA [Price Anderson Amendment Act] came out, DuPont left and Westinghouse came in. Westinghouse did things better in many ways and started Quality Assurance (QA). Only under Westinghouse did they begin to have procedures that required written sign-offs. The site did not get going on RWPs [Radiation Work Permits] until Westinghouse was well established. A construction worker stated that they never had classes until Bechtel came on site.

In the late 1980s and early 1990s, there were people who were fired, because they were doing things in the old ways. They were high-performing people, but they could not change and adapt to the new ways. Westinghouse did literacy tests, and older foremen could not pass, because they were not good at taking tests, and they were humiliated and they retired. A lot of them left; it was humiliating for them not to be the shift supervisor. During the transition, [a supervisor] had to pull more prints and create more computer-generated reports. Many workers couldn't or wouldn't do it. The subcontractors have changed several times since then.

Radiological Hazards/Contamination Control

Radiation conditions in the tank farms and canyons were not always well documented. Surveys were taken near the entrance to areas, but not where the workers were. H Area was a little more lackadaisical than F Area, and was worse as far as monitoring.

If you were not working in your primary facility, you were more susceptible to higher radiation that you did not know about. The new people learned from the old timers. Going into an unfamiliar area without a buddy who knew what was going on was asking for trouble. Workers protected their own group by word of mouth. They were told to stay away from this or that area because it was hot. Some contaminated areas did not get roped off. For example, a worker was aware of a contaminated crane at the Silver Springs lay down yard in an area that didn't have a rope around it. Sometimes they would be working in an area that was not marked, and someone would inform them that the area was contaminated. For example, electricians once went out to investigate the diversion boxes to prepare for a job. An HP came along and told them to get out of the area, because they were about ready to do a tank transfer. The workers were lucky he had come along. A mobile worker with a radio could find out about work conditions in the middle of the day, but not everyone had radios on the job.

[Between 1984 and 1986, a building addition was constructed above the FB-line.] There was an extra floor added to the top of the building. The original building is concrete, but the additions were made out of blue metals. There were hundreds of construction workers, all crafts, working on that addition. It was considered new construction and the area was considered a clean area. There were no radiological postings and the workers were not monitored. Although it was considered a clean area, there was hot air coming out of the stacks of the FB-line. The chutes coming out of the FB-line (a tremendously hot area) were opened periodically to the vents. All

the air in the hot canyon area came out on the ladders right next to the vents. There were all kinds of construction workers that worked out there that received doses that were not monitored.

The Central Shop itself was not considered a hot shop. There were several portions that were contamination areas for a limited time. The equipment sent to the Central Shops for servicing came out of the hot buildings.

The reactor heat exchanger refurbishment project (in the 1980s) was a very hot job involving a tremendous amount of contamination. At the Central Shops, repair and refurbishment was performed in a separate building that wasn't being used at the time (690G). The building got so crapped up from this project that it was roped off afterwards—no one was allowed back in it for several years.

Huts were commonly used at the tank farms. For example, they used huts when pulling dip samples, replacing an air sparge, and working on the lines. When they would take the huts down, the alpha contamination sometimes escaped. There were contaminated areas in the huts and outside the huts. The contamination areas were marked with a rope boundary.

When pulling dip samples at the tank farms, workers had to put a cap on the sample while wearing gloves. The cap had coarse threads. It was not unusual to drop a cap in the tank or drop the cap and contaminate a riser with high-level waste. Old-school people would come and clean up. This was not thought of as an incident. If workers made a mess, they cleaned it up. That was the way they worked.

The people who worked in the HB-line would approach the 2.0 R [dose limit]. There were four operators who usually worked in the hood. Once they had received 2.0 R, newer, less experienced operators were brought in. On the last day of the month, they could burn you up. The next day, you were right back in. They would move people from other areas of the site to receive the dose. When less-experienced operators were brought in, this is when the Construction workers' uptakes would go up because of lack of experience of the operators.

Personal Protective Equipment (PPE)

In F Tank Farm, workers wore protective clothing made of cotton. The site did their own cleaning and washing. Laundry Helpers, who went to all areas of the site and loaded laundry bags on and off trucks, dressed in a lab coat and street clothes.

CTWs learned to check their clothing, because a lot of it was hot before they put it on. It came back from the laundry that way. So the workers learned to run a hand monitor over the clothes, especially gloves, which were often contaminated [after laundering]. The workers did not have their own monitoring instruments. The areas where they worked and dressed out had the equipment. The portable monitors were there. The workers picked one up and used it.

Sometimes workers had to dress out when they went into a Radiation Danger Zone (RDZ). CTWs had to dress out to work with heat exchangers (removal, refurbishment, repair, and installation). For work on the HEPA filter pots, workers wore one pair of protective clothing,

unless they were working on the tank itself. Pipefitters would be in the hut with supplied air and they were burned out after two minutes for the whole month. But electricians were not in the huts so often. Sometime between the mid-1980s and early 1990s, when lifting covers off diversion boxes at the tank farm, crane operators dressed out and worked under a time limit. Some of the filter houses were very hot—workers could only stay in there one minute.

At the B-line, SRS was more concerned with contamination, rather than radiation. In the RDZ on B-line, workers wore a plastic suit and/or hood on a daily basis. Work in the warm canyon maintenance cell in H Canyon was all bubble (plastic) suit work. Bubble suits were also used on top of the reactor in the 100 Area. In the F Area, workers moved the slurry pumps with the tank top open while various workers were present in the general area. Direct hands-on workers were in plastic suits, but individuals outside the rope were not suited up.

Workers wore lead aprons in the 200 Area in the 235 Building. When electricians worked in gloveboxes in certain areas, they had to dress out and sometimes wear a lead apron. Sometimes jobs on the hot gang valve corridor at the canyons required use of lead aprons. The equipment did not fully shield your entire body.

Egress

At SRNL, CTWs were up in the ceilings and around the equipment, and residue material was everywhere. These were areas that were not normally occupied. There was self-monitoring in this building, but workers had to go elsewhere to monitor, because it was hot. There was no one telling them to go monitor.

In the HP monitoring building in F Tank Farm area, it was possible to go through the radiation zone and come out unmonitored, because of the way the entrances were placed.

Alarms

There were nuclear incident monitoring [radiation] alarms and criticality alarms. Workers were involved in situations where alarms were going off. Some alarms were drills or false alarms, but others were the real thing. When there was an evacuation, workers had to gather in the parking lot. They were not told what it was all about. At the time, you just had to leave; but then they never told you anything about it. When there was a shift change and the alarm went off, workers just went home. Workers were normally not told why the alarms would go off. They would call HP as they were leaving. Sometimes [HP] would come and check; a lot of times, they said it must be radon. These alarms were not specific to any area, but the waste areas were bad. They never said where the radon was coming from.

An interviewee recalled a couple of dozen alarms over the course of his employment. One of the worst areas for alarms was H Area waste. A number of times when the interviewee was there, workers would have to seek shelter because the alarms were going off. In the H Canyon, the alarms would go off because of air reversals about every month or two.

When CTWs removed the teapots (huge HEPA filter pots) and the alarms would go off throughout the tank farms, HP told them to just keep working. They didn't want to slow them down one bit.

In about 1994 or 1995, construction electricians were digging outside (to put in telephone lines) and the CAMs [Continuous Air Monitors] outside would go off. After further research, they found that the whole area had high readings. They found out why after they interviewed old timers. There were 55-gallon drums stacked up on the asphalt that had gotten contaminated during the early heavy production days. The shipments out on the pad were leaking. The electricians were wearing just one pair [of protective clothing] and no respiratory equipment. The area is a CERCLA area now and it is contaminated.

When a worker went out of a zone and a worker set off a PCM 1 [Personnel Contamination Monitor], RadCon was supposed to come out and survey you. Sometimes RadCon would not come and would say it is radon, or that the background is high. In one case, a worker insisted that they come and found that [the worker's] [redacted] were contaminated. A CTW who set off alarms on the hand and foot counters at the FB-line had to bring in all kinds of samples. When a machine went off, workers were also told the machine was not properly calibrated.

Environmental

SRS did not have self-boiling tanks like other locations. They always had open holes that had a high waste transfer line. The operators would get exposed when they went by them. There were some feral cats and skunks in the area. DuPont patrols would try to catch them and shoot them. The animals would go in the huts to keep warm.

SRS is federally controlled property. An interviewee was not aware if South Carolina and Georgia have done any sampling onsite. But [the states] have complained about it.

EXTERNAL MONITORING

[The interviewees, collectively, provided their characterization of how external monitoring was performed historically at SRS, as follows.]

[External monitoring reported by interviewees was variable.] Workers who were not expected to encounter radiation hazards did not have routine dosimetry. If an area was considered a clean area, workers may not be badged. In the 1950s, a worker with new construction was not assigned a dosimeter. Workers who worked outages in the 100 Areas (reactors and reactor controls) had a badge and a pencil [dosimeter]. On the B-line, workers had to wear a regular TLD, a pencil [dosimeter], and a neutron button. Those required to dress-out in the Central Shops recalled having TLDs. In the mid-1970s, workers had TLDs.

Belly button [neutron] dosimeters were assigned to those who worked in the HB-line. This included those who worked in the hoods (i.e., stainless steel hoods with glove ports), dismantled or removed gloveboxes, entered the vaults where they stored fissile material, or entered rooms that were on respiratory protection. Belly button dosimeters were worn at the belt. HP used to

exchange them by the month. One interviewee who [redacted] in mid- to late-1980s] did not have a belly button badge. Workers in the HB-line had a criticality dosimeter that they kept on their lanyards. In the earlier badges, there was a "dead man's chip;" they were read only if a criticality accident occurred.

People generally wore badges when required, but there were lots of exceptions. It is not unheard of for someone to pick up another worker's badge, because workers would not get overtime if they had overexposure. There were several examples of situations where people did not wear TLD badges where they should have them.

- While working for DuPont – Construction, a worker was not on a routine program for external dosimetry, although the individual conducted work at 100R after it was up and running and in 400 Area. The same worker was routinely monitored after transferring to DuPont – Operations.
- When new CTWs went looking for materials, like in R Area, where they scavenged parts, they did not wear TLDs.
- There was a crane in the woods and workers would prop up against the crane. They went there to get out of the sun, and then one day, there were radiation signs all over there. And these guys previously did not have TLDs.

Riggers reported not being badged for a period of time.

Workers knew how to work around radiation—putting badges on the waist or on the other side of the chest [away from the source]. Workers could keep their badges out of the shine when they were working at a tank and in the canyons, also. The lead door of the sample box would shield part of the body, and a worker would put the badge there if they were trying to keep their radiation down to shield the TLD.

The workers stored their badge or TLD in a badge rack. In the F Area, the TLDs were stored inside the badge house. The H Area badge house was real small and there were no sides. It was an aluminum shed with a roof and no walls. The TLDs were exposed to the weather. [Also at tank farms], there were always trucks leaking radioactive liquids. The trucks would pass the badge racks and wipe out the TLD badges. When workers went to H Area from F Area, they picked up a temporary badge. They had a row of leftover badges. No one signed out the badges.

Health Physics had a truck equipped for changing films and preparing film badges. The technicians assigned to this task traveled around the site in this truck to change badges (including neutron films). All films, including all neutron films, were read. TLD badges were supposed to be changed every month. Day people changed out the badges. If the month ended on the weekend, then there may be confusion, and a worker may not even pick up a badge.

Pencil dosimeters were used in some areas, in addition to the regular film or TLD badge. A single Personal Ionization Chamber (PIC) was worn at the pocket level. These dosimeters were the kind that you zeroed before you go on the job. If the pencil [dosimeter] read more than a certain amount, a worker would have to come out of the area. Workers filled in a daily form that

had a place to record a date and a dose. These forms were used as far back as 1975 at F Canyon. Other areas, such as when CTWs worked reactor outages in the 100 Areas (prior to 1965), did not use forms. Some comparison studies between pencil dosimeters and TLDs may have been done during the French Fuel job.

Pencil dosimeters would go off-scale. For example, when an interviewee worked on hot crane maintenance, the pencil dosimeter would peg out. When workers were changing anything out in the tank farms, they would run up the pencil [dosimeter] very quick. Workers were told, "If you get radiation, you're going to get your foreman in trouble." An interviewee received a [**redacted**] that was off-scale. The HP asked: "Did you drop it?" The individual said, "No, you just gave it to me." The HP told the individual to go to work and he would bring another one. He did not return.

Workers were told to wear the badge on the chest, but the source is not directly in front of the badge. For example, someone working on the crane bay would have his back towards the open canyon and his back would be exposed, in contrast to other times when his front is exposed. There were situations where hands were exposed to radiation. Finger rings and multiple dosimetry were worn for collecting hot dip samples at DWPF. The practice of "milking" samples in HB- and FB-lines exposed the hands to radiation from hot needles with waste in them. Individuals did not have ring dosimeters, because this practice was a no-no. They knew a lot of this was going on and they allowed it to go on. It was carelessness with workers' bodies and lives. Many other interviewees reported not wearing finger rings.

INTERNAL MONITORING

[The interviewees, collectively, provided their characterization of how internal monitoring was performed historically at SRS, as follows.]

Several interviewees were concerned about "clean" areas that were suddenly posted as radiological areas. A lot of times, they were supposed to be working in clean areas and all of the sudden the area was hot.

Over the period of coverage by the interviewees, they reported routine, special, and job-specific bioassay participation. If there was a special job, samples were collected for the day of the job. Workers reported giving routine bioassay samples during their work in the tritium and reactor areas. Routine bioassay samples were collected in the tritium area. The frequency was weekly, but daily if they went into the facility. If the result was greater than 1 μCi/ml, the worker was told to drink liquid. Samples were submitted monthly or every 3 months for reactor area workers in the late 1980s/early 1990s for about 3 to 4 years. In the 100 Areas, individuals submitted tritium samples when they worked at the minus -40 (-40) level or when they suited up. Individuals in the 100 Areas who were not in a tritium-specific area would leave weekly bioassay samples. There were also samples collected from personnel who worked at ETF [Effluent Treatment Facility]. Some individuals reported routine monitoring in the 200 Areas, while others did not remember giving samples while at the tank farms, the canyons, and even the B-line. If an individual was on a routine program, they left a sample approximately monthly. When air reversals occurred in the canyon, bioassay samples were left. There were also areas in

772F where samples were left daily, and workers had to take a shower when they left. Although a worker entered radiological areas, they were not on a routine bioassay program when working for DuPont – Construction.

An interviewee was working in the [redacted] and came up positive for [redacted]. The technician attributed it to [redacted]. The worker was sent home as a result.

The whole-body counts started up later [with variable frequencies reported by interviewees.] One individual reported having a baseline chest count and another count after he quit and returned to SRS. Today, if an individual has worked under an RWP, there is a quick scan. Workers reported having initial chest counts in the late-1970s and 1980s. Some interviewees reported receiving annual counts, while others reported only a few counts were done. Whole-body counts started up later. In one case, one interviewee did not have a whole-body count until 1990. Extra counts were sometimes performed when workers were assigned to hot areas. CTWs were supposed to have a count when they quit, but that didn't always happen. Whole-body counts were reported after medical treatment in one case.

Several interviewees reported that they didn't wear personal air samplers.

INCIDENTS AND ACCIDENTS

[The interviewees, collectively, provided their recollection and understanding of what incidents occurred at SRS, and how they were handled and documented, as follows.]

An interviewee was not aware of a procedure for documenting incidents [prior to the mid-1980s]. There was a big paper trail when there was a recorded incident. If supervisors did not have to report it to upper management, then there was no paper trail. In the mid to late 1980s, they started the emergency operations center. In the late 1980s, they started [defining] reportable items; any contamination greater than a certain level had to be logged in. Before that, workers did not report anything that did not have to be reported. If you look at incident reports, the incidents are mostly during the daytime. Operations would just clean up other spills at night, and a lot of stuff never got reported. There were a lot of times when workers got crapped up when there was no HP. In some cases, workers deconned themselves.

Workers might know about the incidents and they might not. Sometimes they found out after the fact. For example, in approximately 1979, [an interviewee's] wife was at home watching CNN. All day, CNN had been running the news that Savannah River Site (SRS) had just had the largest tritium release in the history of the site from the Manufacturing Facility. The interviewee was working [redacted] at the time, and the site did not notify him of this release, but had to learn the details from TV and the newspaper. There was no bioassay sample requested as a result of this occurrence. In about 1989, another interviewee was working in the [redacted]. He came home and his wife asked if he had heard about a release at SRS. There was a sand filter release in the F Area. They did some sort of investigation.

[Interviewees provided several examples of incidents and unusual occurrences at SRS.]

- There were radiation conditions in the tank farms and canyons that were not documented. One interviewee requested [redacted] to see if there were incidents included. Once there was an increase in the tank level when they were not transferring anything. The stuff from the canyon, still in the acidic state, was sent by mistake to the tank farm. The interviewee [redacted], which was made of stainless steel. This was just after the releases of tritium that affected the place all the way down to [the city of] Savannah. When he [redacted], the interviewee got [redacted], and even that incident wasn't in his personnel file. When asked if he had told NIOSH about this incident during his interview, the interviewee could not remember. He did not know what they were looking for in the interview. A [redacted] has requested records, including incidents, on behalf of workers. He has noted that in hundreds of cases, he has not gotten them.
- Air reversals occurred in some areas, most commonly in the B-lines. In the H Canyon, the alarms would go off because of air reversals. This occurred about every month or two and should be documented in the Operations Shift Log. The B-lines had more of a tendency to produce air reversals. This was because there was more air turnover in this area. They were trying to keep one room under positive pressure and the next under a vacuum. An air reversal would bring radioactive material into the room, causing it to get blown around, so there was more of a potential for contamination. When an air reversal occurred, workers had to exit the buildings. [RadCon] sent a decon crew into the area. The length of the evacuation was different at different times. Once, the workers could not go back in until the next day, because their clothing got contaminated.
- There was an incident in 1979 or 1980, where there was an air reversal on the [redacted]. The interviewee was working in [redacted]. There were some newer operators who opened the doors before they had reached a certain point in the process. The inexperienced people didn't call the B-line before opening the crane door. There was an air reversal when they opened up the door. The people packaging were in respiratory protection. [Redacted] came in with a respirator on and told them to get the hell out of there, so [redacted] evacuated the building. They learned that there had been an air reversal when the door was opened, resulting in plutonium being drawn from the gloveboxes and spreading to [redacted]. [Redacted] did not have respirators. [An [redacted]] called them in a few hours later and did [redacted]. One of the men had [redacted]. The interviewee was not asked to submit a bioassay sample. The HP who warned them earlier started [redacted]. The [redacted] said he didn't want him to write the incident up, because it would look bad, but the individual logged it anyway. The [redacted] logging the incident had to go to the [redacted]. During this time, his [redacted].
- In the older tanks in the F Area Tank Farm, there is one tank that has a hole 40 inches down, and liquid can't be put in the tanks above that level. There was an extraordinary rain. The storm waste-water drains were blocked with materials. Water did not run into drains, water ran off the parking lot into the F Area Tank Farm. Some of the storm drains were covered with pallets, and it was actually going into the tanks. Operations foremen got every pump they could find in the tank farm to move that water. Operators were in the water while they were pumping.

- Workers changed out a jet or sparge on a high-heat waste tank. A [redacted] went on overtime to change out the air sparge with the new Health Protection and Production foremen. The air sparge was put in to cool the tank temperature-wise. They built a hut and had a crane lined up. Workers built a pipe sleeve on top of the riser, and the man inside would pull the plug and pull the pipe sleeve close to the riser, pulling the air sparge through the sleeve. In the procedure, it said to swipe the bottom of the air sparge and let it drip for 5 minutes. Workers were required to get rid of all liquid in equipment before sending it to the burial ground. In this tank, the temperature was much greater than outside, especially on a cool night. The [redacted] bagged it up without letting it drip for 5 minutes. The [redacted] came in and insisted that it needed to drip for 5 minutes according to the procedure. They opened the riser back up and let it drip. This crapped up the sleeve, the [redacted], the tank, the hut, and the area outside the hut.
- In [redacted] around [redacted], two [redacted] were core drilling. Workers cut a hole through concrete wall. They had to keep the bit cool with liquid. A [redacted] was asked to get some water and returned with a bucket, and it was heavy water. It became a major incident and everyone on the plant heard about it.
- At DWPF, there were some line breaks and some bad incidents; sometimes they could not re-enter the facility for a week.
- On the HB-line, there was a leak in an expansion joint. They had to paint it every couple of years to keep the dose down.
- An incident occurred with a [redacted] on shift. He tried to lift a jumper in the canyon without undoing the jumper and it caused a leak. The [redacted] ripped the pipe in the riser loose.
- In the P Area, they discovered a neutron beam. Operations had an E & I [Electrical and Instrumentation] shop on the other side of the hall.
- One interviewee heard that Little Hector (a test reactor) went critical. It had a crack in the core, and they had to shut it down.
- There was a meltdown in 105 K that is not mentioned in the evaluation report. A fuel rod melted down. An interviewee who was present said the reactor shut down. The incident was during scramming of the reactor. Workers never received any more information about the 105 K incident.
- R Area was contaminated and shut down due to a major incident in the 1960s. People said it was a reactor meltdown, but the interviewee cannot verify the story. Even 10 years ago, they still had radiation contamination signs posted there.

An interviewee had worked with an [redacted] who got [redacted] out there. He was hurt by a [redacted] and could only see [redacted]. They said they had not seen eye damage like that except for Japanese bomb blasts and long-term welders. There were no records of the incident.

Databanks and Database

In about [redacted], an individual with a background in [redacted] for the [SRS] reactors was asked to head up a group of [redacted] people to do risk assessment for the other facilities at Savannah River Plant (SRP, later called Savannah River Site). The group needed to compile failure and accident data, which is necessary for viable risk assessment studies. [This work led to the development of fault tree databanks.] The 200 Area Fault Tree Databank was originally put together as a research project under SRL. Safety analysis was later moved under the Engineering Department, and eventually to WSMS [Westinghouse Safety Management Solutions], along with the databanks.

The WSMS database [along with its predecessor/component databanks] was used for many purposes, primarily [to evaluate the] frequency and consequences of events for use in safety analyses. You could do a lot of statistics with the databank. There was a thesaurus of similar words that it would recognize (i.e., plug, plugged, clogged, etc.) Based on the data, you could determine the frequency, consequences, and recovery time based on a proper sort and analysis of the data. The database also generated error factors. The risk assessors looked at the minimum, maximum, and average numbers associated with consequences of the events. [The data were used for other purposes as well.] It was used in verifying claims that individuals were involved in specific incidents. The database could be used to look up the incident if they knew when and where. The [redacted] worked very closely with the lawyers on individual cases claiming incident involvement. The [redacted] never found a case where [the database verified the individual's claim]. Another use of the databank was to try to prevent accidents from occurring. For example, operations would call up and say that steam was coming out from around a cell cover. The databank could be used to indicate the probable causes (e.g., plugged equipment) and the situation could be remedied before it became a major failure. [The data were also used for] trend analysis and to aid designers in improving equipment stability. The developers shared the databank with anyone who wanted to have the data, including individuals at other DOE facilities and even anti-nuclear interveners.

When the group started the 200 Area Fault Tree Databank, they searched primarily published information (i.e., daily teletypes, incident reports, fire records, monthly reports, Works Technical reports, Health Protection reports, etc.). They found that the detail in the published report was frequently too general to use for analysis; the reports talked about single major failures, and most events are caused by a series of minor failures. At this point, the group started to review the shift turnover logbooks, which were handwritten logbooks prepared by shift supervisors. They read through the logbooks, filled out a datasheet, and initially put the information on punch cards. There were about a million of these punch cards. Later, they started to enter the data into a mainframe computer via personal computers.

The incidents in the databank ranged from minor leaks, which could lead to safety failures, to major incidents. Each incident was assigned codes, which included a source of data code, the date of the incident, the area, the facility (e.g., canyon, tank farms, burial ground, etc.), the unit operations, and keywords (e.g., leaks, explosions, fires, etc.). They assigned these codes to make the data more easily retrievable. When they entered an event, they tried to combine all input

(e.g., operations, engineering, health protection) into a single entry to gain everyone's perspective and to eliminate duplication.

[Several databanks were developed for various areas and facilities at SRS.] Each of the databanks is structured the same way. The 200 Area Fault Tree Databank includes data for the separations facilities, tank farms, outside facilities, A-line, burial grounds, and support facilities. It does not include data for the tritium facilities in 200 H area. There are separate databanks for Fuel Fabrication (300 Area Fault Tree Databank), Tritium, and SRL. Waste Management events were entered as the facility "W" in the fault tree databanks for both F and H area. Major incident reports should all be in there. There was no fault tree databank for the reactors, but there was a collection of incidents for the reactor areas. This [reactor incident collection] would include only major incidents.

The information in the 200-Area databank goes back to the startup of the facilities. [The number of incidents per year increased in the mid-1970s. For example, there were 590 entries in the database for 1960, whereas there were 18,708 entries for 1980. The increase in the number of incidents was related to changes in information sources.] Data from 1954–1973 were based primarily on published reports [generally limited to major incidents, as described above]. Data from 1973 to 1995 were based on all sorts of data types, but primarily came from logbooks. The use of logbooks increased the number of minor events put into the database. They tried to go back and get a couple of years of old logbooks, but many of them were already transferred to archives. When the interviewee left in [redacted], data continued to be added to the databank for at least 2 years. The last entries after [redacted] may not be well edited.

Some superintendents were more prone to issue formal incident reports than others, but information was available from other sources. There are several incident reports generated on an incident (i.e., operations, health protection, fire protection, etc.). Generally, the shift supervisors were extremely honest and did not cover up anything. The logbooks in general were fairly consistent. Some areas had more facilities in the area. F Area had the A-line and the burial grounds. Tritium facility in H Area was a separate database. This could explain why F Area has more entries than H Area.

Routine external radiation exposures will not be listed in the databank, but they did try to account for all the internal uptakes. The database included Health Protection department data, although individuals' names were not used. The entry always contained a reference to the incident report from which individuals could be identified. By doing this, and by not putting the blame on anyone, they got an extreme amount of cooperation from operations. The [redacted] best recommendation for locating radiation-related incidents is to run searches for keywords, such as ingestion, inhalation, uptake, etc.

The group issued annual reports on the databanks for the benefit of the production people. The Safety Analysis Reports and the Systems Analysis Reports would be a source of information. The Systems Analysis Reports were non-legal documents that contained a lot of detail. The Safety Analysis Reports contained only what information the DOE requested. The SAR for the canyon facility started out as one volume, but with comments from DOE ended up being 15

volumes. The 15-volume version was rejected, because it cost too much to generate, even though it contained the information DOE requested.

MEDICAL

[The interviewees, collectively, provided their characterization of how medical monitoring was performed historically at SRS, as follows.]

Up to 1985, subcontractors had to go through Medical. After this, the subcontractor was responsible for the physical. Direct hires still used the onsite Medical Facility. Since then there were no onsite physicals, just referrals to a public hospital to get a certificate that you are physically able to do work. Even at offsite medical clinics, the doctor does not give you a physical. Parsons requires a fitness-for-duty check if you work at Salt Waste Processing Facility (SWPF).

There was a lax process [for documenting incidents] on the part of the Medical department. An interviewee explained that the safety record was a big deal at SRS. "You didn't want to hurt yourself on the job." A [**redacted**] was injured on the job and [**redacted**]. The worker was [**redacted**]. [**redacted**]. So long as you reported to work, they did not record the injury.

RADIOLOGICAL AND MEDICAL RECORDS

[The interviewees, collectively, provided knowledge of their understanding of the completeness and adequacy of radiological and medical records, as follows.]

Workers had to fill out all security clearance forms to obtain security clearance. Every contractor, no matter how small, had to go through Medical and Security. Workers all got assigned a number when they came on site. Each craft had a specific prefix (25 – Electrician, 21 – Sheetmetal Worker, etc.). They also had a user ID when Bechtel came on site, which was used to check training records. An interviewee had [**redacted**] for a while. When he went back out after a break in employment, they assigned him [**redacted**]. The worker told them this was not the right [**redacted**]. They said they couldn't find the original [**redacted**], so he had to use this new one. This was not an isolated case.

A [**redacted**] has sent hundreds of records requests to SRS on behalf of workers. When they would get the records, they would see there were gaps in the records. They would get a summary, but wouldn't see the details. There would be an indication that a sample was given, but nothing in the records as to the result. NIOSH has requested records, and they have more records than are made available to the claimants, but they are still not complete. Even now, people who worked for the contractors have no records of employment out there, because they worked for DuPont. They want to know how they can verify that they worked there. Some of them have income tax records, or they can get signed affidavits from someone who knew that they worked out there. In one case, an individual was at [**redacted**] off and on from the [**redacted**]. When he returned to SRS, they did not seem to have records of where he had worked. They said they could not find when he was there.

[SC&A observed that one [redacted] DOE records (collected by NIOSH) did not include any data for several years scattered over a 15-year period while the worker was employed at SRS ([redacted]).] The worker reported no significant changes in work activities that would explain these gaps. The interviewee was still entering radiological areas during these years, and does not know why there are no data. Worker representatives are concerned that NIOSH does not have all the records. If they do have all the records, then the monitoring information is incomplete.

Westinghouse at one time had retrieved logbooks and they were stored at the cotton warehouse. As a result of an incident requiring medical treatment, an individual requested logbooks from the site to prove an incident had occurred. These logbooks were from the F Area canyon and the tank farms for certain years. There are inconsistencies between records. If you were to take a canyon control operations logbook, the HP office logbook, a lab area logbook, and the DOE morning report, that would tell you everything that happened in the area. If you were to try to match them, there would be discrepancies, for instance, in the number of the samples. To say that HP was on every job is not right.

There were all kinds of records destroyed from the offices of subcontractors after they left the plant. In 1989, the subcontractors started leaving the job as their contracts expired. The personnel were transferred to BSRC [Bechtel Savannah River Company]. The crafts were transferred at various times starting in September 1989. In 1989, the electricians changed from Miller Dunn to BSRC. In the early 1990s, the fitters changed to Bechtel. Some time in the early 1990s, crews of 6–8 laborers went around to the office buildings that the general contractors had left. It was the records in their offices that were destroyed. Laborers went in and shredded the records; they loaded the stuff on pickup trucks and left. The interviewee is not sure whose laborers were doing the shredding; they were either DuPont construction laborers or Bechtel construction laborers. They shredded all kinds of records (e.g., monitoring records, time cards) after the subcontractors left the plant. The interviewee observed this when he had a [redacted] out there to [redacted] for the building. He went out to see why the [redacted]. There were laborers in there cleaning out file drawers to be shredded. If the interviewee is not mistaken, it was the heavy equipment office [where he observed this occurring], but he is not positive. The interviewee asked the laborers what they were doing, and they said they were shredding records.

[In the 1980s,] every day they would print out radiation reports, so they could prevent people from getting overexposed. That would be the monthly reports. The supervisor would assign a job based on the radiation levels. Supervision would come up and talk to workers about their dose.

Annual radiation reports were provided some interviewees, particularly in the last few years. Others recalled getting a report when they left the site. Annual exposure reports were not reviewed with, or explained to, the workers. Although they received annual reports, some workers do not believe the numbers report on them.

One worker stated that a lot of things are missing from the Medical file. He once had an incident where he was [redacted] while working in the [redacted]. They thought he was having a [redacted]. This was [redacted], and they were working on the [redacted] all night. They were doing a transfer. The worker called the [redacted] and said he was going to Medical, including the route he was taking. He called the [redacted] when he reached Medical. The nurse treated

him for [redacted]. The worker went to a private doctor, because he developed and had a [redacted]. This incident wasn't in the medical records. This was a unique exposure that required a visit to the infirmary. There was no triage in the file. The safety record was a big deal at SRS. A worker didn't want to hurt himself on the job.

SEC PETITION AND PROCESS COMMENTS

The petition went in for construction workers and all other workers, but NIOSH narrowed it to construction workers. The petitioners defined the class to include all workers who worked at SRS from 1951–2007. Two of the three petitioners were from operations, not construction. NIOSH's initial letter to the petitioner indicated that supporting documentation was available for qualifying SRS construction workers; however, no supporting documentation was provided or identified by NIOSH to qualify SRS non-construction workers. The letter stated, "We have completed the evaluation process," and that the class definition was narrowed to all construction workers. This decision was provided in March 2008.

Petitioners claim that there is inadequate monitoring. There were numerous occasions when people were not properly monitored. A lot of times, a worker was supposed to work in clean areas and all of the sudden, the area was hot. There were tons of times when records were inaccurate or not kept properly. SRS would give workers a 6-month or quarterly report on how many rems they received. It was never right. People would get more in one session than they were told they got in the quarterly report. For example, a [redacted] working on the [redacted] got more rems in one day than the report says he got in the quarter. He knew this, because he read his self-reading pencil [dosimeter]. NIOSH just took the dose records as is.

NIOSH said that the production workers were in a set area. There were monitors in the area. They didn't move around. This was absolutely false. There were affidavits signed by production personnel where the men worked all over the plant on the weekends. There were not any monitors to go around. There was no supervision around. Another said they were not monitored on the weekends.

In [redacted], one [redacted] and his representative requested an [redacted]. Before issuing a proposed finding that non-construction workers failed to meet the specific requirements needed to qualify for evaluation, it was the responsibility of NIOSH according to its Petition Evaluation Plan (Plan) to provide a fair, science-based determination of whether it is feasible to estimate with sufficient accuracy the radiation doses of the class of employees through NIOSH dose reconstructions. NIOSH was obligated to review available data, including documents and information, which supported the basis of the petition, and in fact, NIOSH solicited additional information at outreach meetings in May 2008.

If a review has been requested, three HHS personnel appointed by the Director of NIOSH, who were not involved in developing the proposed finding, will complete the reviews and report to the Director. The Director of NIOSH will consider the results of the review and then make a final decision as to whether the submission satisfies the requirements for evaluation.

The [redacted] received a letter from Dr. Howard stating that a panel of three had presented findings and said the [redacted] did not provide sufficient information to extend the class definition. The [redacted] requested another review, because it was obvious that NIOSH had not complied with the requirements of its own Plan and the requirements set out in the regulations for the first review. For example, the 29 pages of minutes of the May 2008 meetings were not available to the panel, as far as the [redacted] was able to ascertain. Also, there is no credible evidence in the FOIA [Freedom of Information Act] material [provided to the [redacted]] that NIOSH found a way to make an independent determination about which hazards employees were most likely to be exposed to during their employment at SRS, because of the uncertainty and gaps in the monitoring data, as mentioned in the assessment.

In order to view what materials were reviewed by the panel, the [redacted] requested that he be given the material relating to the decision of the panel, including a copy of the panel's report to Dr. Howard. There were no panel findings, reports, or recommendations contained in the material. There are also no records of the workers who gave information at the May 22, 2008, meeting. Because the Director withheld four pages of information that was presented to him from the panel, the [redacted] has been prevented from determining whether or not the panel complied with regulations.

WORKER OUTREACH

[The interviewees, collectively, provided comments on their experiences with worker outreach meetings, as follows.]

At the November 2003 meeting, NIOSH was soliciting information to write the site profile. An interviewee never did understand what NIOSH's purpose was. Workers thought they were here to help, but they were disappointed. The Building Trades Council (BTC) had been screening and found out that the guys were exposed to beryllium. SRS said that there was no beryllium onsite. The BTC wanted to protect its workers. When [the meeting was over], this was the last the participants heard from NIOSH. The BTC never got any minutes of the meeting.

A NIOSH representative indicated to the [redacted] they had been able to obtain all the records they needed to prove electricians were monitored adequately. During a worker outreach workshop in Cincinnati, Ohio, one individual said DOE had agreed to furnish the records. DOE said the records would not be complete. If the records are incomplete, why doesn't NIOSH approve the petition? One of NIOSH's people said they had to go through the records. The [redacted] was also told that NIOSH doesn't determine the SEC status. At the time, it sounded like NIOSH was going to approve the petition. It was an about-face when the [redacted] got the letter.

In May 2008, NIOSH held a meeting to get information about construction and other workers, and to get information about missing monitoring data. Information was read into the transcript of testimony from a responder. They provided statements concerning surveyors. A participant at the meeting also talked about going out on the site without a badge. All of this information was there. They said, "present information to get these people [operations workers] back." The [redacted] and others did provide the information. NIOSH did not consider any of the other

evidence that was presented, and they did not do any follow-up on what workers and representatives said.

At the meeting, the attendees cited the TBD and individuals working at SRS when badges were not worn on weekends. When participants gave the information at the May 2008 meeting, they showed names redacted, but they gave NIOSH tracking numbers for each one of these people, in order to get the records. The cases included someone who had been sent home [**redacted**], and those records are not in his dose reconstruction. The interviewee expected that NIOSH would ask for the records of the people who spoke. In December 2008, NIOSH said that they had not requested the records, because they had other records that they said were sufficient.

NIOSH did not contact the [**redacted**] about the Evaluation Report. NIOSH hasn't paid attention to what workers say in the meetings. They never gave participants responses to their individual comments. The interviewees never saw anything that NIOSH incorporated into the site profile.

CPWR COMMENTS

[Interviewees working with the Medical Surveillance Program, collectively, provided information on their involvement in EEOICPA, information they have gained on SRS, their understanding of the NIOSH analysis of CTW dose, and the difficulties associated with determining CTW dose, as follows.]

The Center for the Protection of Worker Rights (CPWR) has a contract with the DOL [Department of Labor] to verify employment for construction workers when a DOE site doesn't have any records. It is not unusual that the DOE not only has no information on the worker, but also no information on the contractor. It is not unusual for the DOL to not be able to identify the company. Presumably, the central records database can be found from Atlanta. CPWR has established a database of contactors and subcontractors for the DOL. They can verify the name of the contractor, the contractor's presence at the specific site, and the time period when that contractor was at the site. They have various ways in which to verify employment, like dispatch records, health records, and so on. CPWR can usually get verification for 80% of the requests. For SRS, they have 399 specific verifications.

CPWR conducts interviews as the first part of a health-screening program to see if a worker is eligible for a medical examination, and to tailor the examination to the needs of that worker. This is a screening calculation to identify if they have a significant risk, and to try to help them medically. All interviewers are workers who know these sites in and out. This is done at every site. It is important for retired workers to do these interviews. It is proving to be a very good approach.

CPWR's computer program can calculate the exposures that workers were getting from their work place, say to asbestos, or as a bystander near others working nearby. They have modules for beryllium, mercury, lead, asbestos, and silica exposure. Nearly everyone has asbestos exposure, and so essentially everyone gets to go for a medical screening. They pick the chemicals up with blood tests and other tests. They don't have a radiation module, because there is nothing they can do for a radiation cancer that makes it unique. This is not a research project,

so CPWR does not go into details about radiation. They go into details about trade, employer, period, areas, tasks, materials, and exposure incidents. They have identified 50-odd high-risk work tasks. For most of these things, they consider how much is the worker's own work and how much from people working around them. They have a five-point scale for exposure.

When asked if self-reported exposure information is reliable, a CPWR representative stated that they have done a lot of work on this. Workers do report low exposures to hazards. Electricians, for instance, will say "one" for silica or "zero" for beryllium. Ten years ago, 99% did not know what beryllium was. An interviewer can tell when a worker is not telling the truth. They have been provided with training. If an electrician says he was doing sandblasting, then the interviewer knows it is not right. But if he says he was near someone who did and says a "two" for silica exposure, then the interviewer's judgment is that it is right. Ninety percent (90%) of the people give you accurate information. CPWR interviewers do not question what the workers say in terms of writing it down. CPWR works with a doctor who looks at the statistical reliability of the data. Two epidemiologists are a part of the CPWR team serving as epi[demiological] advisors.

CPWR has supplied 83 significant site history documents to NIOSH, as was communicated in Attachment A of the petition. They have a repository of site history at the University of Cincinnati, which was developed so that interviewers would have an understanding of the sites for their interviews. CPWR has done 3,300 worker interviews at SRS. From the interviews, they have learned an awful lot about the site. They identified a list of additional radionuclides for NIOSH in 2003. They have given NIOSH everything they asked for. Cooperation with NIOSH is very tense, because CPWR keeps pushing the differences that construction workers have with operations workers.

A CPWR representative does not think anything they've given to NIOSH was incorporated into the SRS site profile with regards to the construction workers. This is part of CPWR's problem. CPWR raises an issue and NIOSH says, "we are working on it" or "we are developing a model." So CPWR is fighting a moving target, and it is impossible for us to keep track of all the changes. The interviewee has no idea as to whether NIOSH applies those changes to the cases and goes back to rework them. One group from NIOSH is going around telling workers to file SECs, while another part of NIOSH is saying they can do dose reconstruction.

NIOSH says if persons were not wearing monitoring in radiologically controlled areas, they were in violation of the procedures. This issue does not place a barrier on NIOSH to bound dose (pg. 69 of the ER). NIOSH says they are evaluating a coworker model on pg. 70 of the ER. [Several questions and concerns were raised about this coworker model.] How do you define a coworker? NIOSH is very vague about how they define a coworker for dose reconstruction. There have been more construction workers than production workers. One of the critical failures of NIOSH's approach is not to classify people by occupation. When they have to identify workers as construction workers, they do a text search to determine that. It is hard to understand how they can exclude production workers from the SEC petition, because they themselves decided not to go through and identify by production and construction. At one point, they agreed that their general model for dose reconstruction was not valid for construction workers, and they agreed to re-do the SRS dose reconstruction procedure. They went and defined where the trades

workers were. They use [text search] terms, and anyone they have a hit on is called a construction worker. Everyone else is a production worker.

At SRS, NIOSH says they can take an all-worker average, make an adjustment, apply it to construction workers, and everything should work out just fine. They can come up with a dose, but whether it is valid or not is anyone's guess. The coworker model says SRS had monitoring data in Health Physics Annual Radiation Exposure History [HPAREH] and those data are also similar to other workers. Construction workers are much more episodic than production workers. In one sense or another, all construction work is improvised. It is not routine in any way. Construction workers discuss work on the spot and work by experience and skill. NIOSH has not understood that or was not willing to accept that there was something special about construction workers. NIOSH says that unmonitored construction workers must also be similar to monitored workers. But just because monitored construction workers were similar to monitored operations workers, it doesn't mean that unmonitored construction workers are like monitored construction workers.

It is unreasonable to expect that claimants should define something that NIOSH itself has not defined. There is a gray area in main, renovation, or repair work. That can be in-house or construction workers. DuPont had full-time construction workers on site. DuPont said they would operate this site if they can do production with non-union and construction with union workers. See the 1946 and 1947 hearings. DuPont won that argument. DuPont directly hired people from union halls. There were also specialized subcontractors, like Miller Dunn, who did electrical work.

OTIB-52 [Construction Worker Procedure ORAUT-OTIB-0052] doesn't adequately cover the differences with construction workers. And so far as the SC&A review is concerned, the summary is favorable to the procedure, but this is different than the content of the review.

The 1999 hearings referenced [in the petition] by CPWR were the hearings that David Michaels held as part of the law being passed.

SEC EVALUATION REPORT – COMMENTS ON SPECIFIC PASSAGES

[An interviewee provided specific comments on statements in the NIOSH SEC evaluation report.]

Page 20, paragraph 2: The independent ventilation system that they talk about failed at one time. Reversed air came into the room and people (office workers and such in the K Area) had to stay out for 3 weeks before they could go back in there. The ER missed that.

Page 20, bottom of page: The [**redacted**] crew was 9 to 12 people, and they were told to cut it and get out. There were all kinds of contamination in those [**redacted**]—radiation, asbestos, and all kinds of contamination. There was no monitoring equipment and no dress up—nothing. [**redacted**], the company they worked for, is not in business, and there is no record of it. [**Redacted**] of the people have claims, some others are dead.

Page 21, Tritium facilities (5.1.5): Buildings 236 and 238 are not mentioned. These are tritium buildings, as well.

Page 22, next to last paragraph: The list does not mention Building 321, where the final stages of the fuel rods were put together. It is now torn down. It was contaminated, and there was a tremendous amount of beryllium contamination there. Some people were checked and they took blood samples at 15 to 30 minutes and said there was none. So far as [the interviewee] knows, it takes 2 or 3 weeks to do a blood culture to check for beryllium.

Page 26, last paragraph: The Naval Reactor Fuels facility was crapped up at first start-up and never restarted. It has been torn down for some time; it is now a parking lot. The decontamination was done by production, and construction workers did the work.

MISCELLANEOUS COMMENTS

[The interviewees, collectively, provided additional comments they wished to include in the summary for consideration, as follows.]

- Until Hazel O' Leary [Secretary of Energy 1993–1996], workers did not even know how much product was being produced.
- A release of beryllium was documented during the meltdown in 105K. There is some beryllium locked up in a vault.
- The Naval Reactor Fuel facility was started in 1985 or 1986 and is decommissioned now. The facility backed up to the F Canyon. A lot of people who worked in Naval Reactor Fuels have a nasty cancer, and a lot of those workers have large non-cancerous tumors in their organs.
- Each subcontractor's main goal is to get their bonus money and get contracts renewed, not help previous workers with problems that didn't happen on their watch.
- All of the reactors used to drain out into those outfalls. There were mutated frogs and fish and all kinds of things.