



SRS Citizens Advisory Board

Old Radioactive Waste Burial Ground

Meeting Summary

January 5, 2000
Savannah River Site Bldg.
703-41A, Rainbow Rooms
Aiken, SC

The Citizens Advisory Board (CAB) Old Radioactive Waste Burial Ground (ORWBG) Focus Group met on Wednesday, January 5, 2000, 7:00 a.m. at the Savannah River Site (SRS) in building 703-41A. The purpose of the meeting was to give an informational status update of the ORWBG to the CAB Independent Scientific Peer Review (ISPR) team. Those in attendance were:

CAB/Focus Group

Bill Lawless, CAB
Karen Patterson, CAB
Wade Waters, CAB
Ken Goad, CAB
Rick McLeod, CAB Tech.
Advisor
Lee Poe
Gerald Devitt
Todd Crawford

ISPR Team

Dr. Karam
Dr. Whicker
Dr. Charbeneau
Dr. Ryan
Dr. Hertel

DOE/Contractors

Rod Rimando, DOE
Phil Prater, DOE
Ed McNamee, BSRI
Don Toddings, BSRI
Gerald Blount, BSRI
John Bennett, BSRI
Sonny Goldston, BNFL
Elmer Wilhite, WSRC
Jim Cook, WSRC
Ed Stevens, WSRC
Jim Moore, WSRC

Karen Patterson, Administrative Lead, welcomed those in attendance and asked them to introduce themselves. She explained to the ISPR team the relationship of the ORWBG Focus Group to the CAB. Ms. Patterson stated that the public is mainly interested in protecting human health, the environment and cost effectiveness. There are three groups of circumstances when making decisions. The first is when the dollars spent reduce risk, then the decision is easy. The second is when you're not sure the dollars spent equal the cost benefit for the risk reduced. The third is when the cost is too high with very little reduction in risk. The ORWBG fits into the second category. The Focus Group in general agrees that they have a hard time understanding any risk reduction for the dollars spent when there is no risk to real people.

Ms. Patterson stated that the members of the CAB were independent. Some of the members held the opinion that if there is a regulatory requirement then that is reason enough to take action. Some others felt that any excess radiation is too much, therefore any dollars spent were for good cause. The Focus Group is looking at a narrow spectrum trying to determine exactly why the dollars are being spent. This is why the Focus Group is requesting the services of the ISPR team.

Ms. Patterson introduced Lee Poe, Technical Lead. Mr. Poe stated that the basic intent of the ORWBG Focus Group is to evaluate the risk from the ORWBG to individuals who might be affected by the ORWBG releases and contained materials and determine the need for remedial action. He stated that in this case there were no people involved and the analysis was very conservative.

Mr. Poe stated there were 19 tasks first developed by the Focus Group of which the ISPR work was developed from task # 11 and 12. He stated there were two parts, the migration of the waste and what would be assumed over the long term that people would be exposed too. He stated that active institution control was considered 100 years beyond the Defense Waste Process Facility operation. Until then, the integrity of the SRS would be maintained. The last 50 years, people would move across the creek of Fourmile Branch. They also assumed there would be nothing more than a clay cap protecting the ORWBG. If you look at the constituents with danger to see what to do with them, tritium falls off the plate due to the short half-life.

WSRC and DOE issued the CMS/FS which suggested interim actions of which the Focus Group felt some actions were good, some they didn't understand. This was expressed in CAB Recommendation #75. The RCRA permit modification proposal for the Mixed Waste Management Facility (MWMF) was issued and the CAB responded with Recommendation #87. SCDHEC issued a permit on October 5, 1999. The CAB was not in a position to contest the permit but Mr. Poe and Ms. Patterson responded with a letter to DHEC expressing their concerns. Mr. Lawless requested that the ISPR team be supplied a copy of the recommendations and responses as well as the letter written to DHEC by Ms. Patterson and Mr. Poe. (Copies were sent to the ISPR team January 10, 2000.) It was also mentioned that the team could access the recommendations by going to the home page via www.srs.gov.

Mr. Poe stated that the RCRA permit used a three-phase approach. The first phase removes 70% of the tritium by irrigating the pine trees and would take from 5 to 20 years. Mr. Poe reviewed the schedule for the CMS/FS, the Proposed Plan and the Record of Decision. Mr. Poe expressed his gratitude for the ISPR team's participation.

Ms. Patterson asked Ed McNamee, BSRI, to give a background orientation on the ORWBG. Mr. McNamee stated that the burial ground was in three parts. The middle section was filled in the 1950's and early 1960's. In the 1960's the burial ground was expanded on the two sides. Disposal stopped in 1974. The burial ground had a minimum soil cover of about 4 feet. Since then, a 10-5 cover was completed last year. Mr. McNamee stated that the Governor of Georgia wrote a letter to DOE Secretary Richardson expressing his deep concern about the potential release of tritium.

The release of tritium in the 1960's was high with a tapering off in the 1980's. Of the releases, only about one-third could be attributed to the ORWBG. The future release of tritium is dependent on the future missions of the site so future releases are difficult to predict. There was an increase of tritium to the stream in 1990. The current concentration of tritium at the seep is 2500 picocuries/milliliter (pCi/ml) versus the drinking water standard of 20 pCi/ml. The concentration drops as you go down the river to around 120 pCi/ml at the mouth of Fourmile Branch. At 200 feet from the mouth of Fourmile Branch into the Savannah River, the tritium is not detectable.

Mr. McNamee stated that the point of compliance is at the boundary of the burial ground because under RCRA, all potable groundwater is considered potential drinking water. He stated the burial ground complex is comprised of 194-acres and reviewed the history of the burial ground.

Mr. McNamee stated that Rev. 1 of the CMS/FS is due April 8, 2000. Rev.1 of the Proposed Plan is due October 24, 2000, and Rev. 1 of the Record of Decision is due April 21, 2001 with the signed Record of Decision complete May 21, 2001.

Constituents of Interest (COIs) were developed from historical burial records and process knowledge of waste disposals at the ORWBG. The COIs included were those substances considered to be most

mobile, those considered to have a large inventory, long-lived radioactive isotopes, and other hazardous materials known to be buried in the ORWBG. The major consideration was the risk to people. The concern was to assure that those estimates considered would bound the problem. This resulted in 12 radioactive COIs and four hazardous COIs.

In the Feasibility Study and the Work Plan, there were three directions considered: (1) Is there current or future risk to people if standing on the burial ground? (2) Is there a threat to the groundwater? (3) If someone dug into the burial ground, would the material be acutely hazardous to be a threat on that person's life?

In answer to questions at this point, the following statements were made:

- Material was placed in the trenches in various types containers from crucibles to concrete containers to cardboard boxes.
- Material of like kind was generally placed together.
- The estimated quantity of tritium is anticipated to be anywhere from one-half the actual quantity to plus or minus one-half million curies.
- There is no good prediction of the accuracy of the inventory, only a strong satisfaction that the inventories are conservative.
- The question on inventory accuracy potentially increases the level of uncertainty.
- The main emphasis of the Feasibility Study and the Work Plan is to manage the uncertainty.
- Removal of the inventory would result in increased cost and exposure.
- After institutional control is lost, the greatest danger would be someone digging into the burial ground.
- Currently, an individual can walk on the burial ground and not receive a radioactive dose.
- Long term protection of an individual would mean making sure that that individual cannot dig down into the burial ground. Ideas include placing big rocks on the burial ground.
- Estimated speed of the contamination in the groundwater is 300 feet per year.

Mr. McNamee reviewed the 100-year hot spots that referenced the primary COIs at the time of burial. A simple model was used to predict the shortest distance to release from the hot spots to the creeks. The simple model indicated that the infiltration calculations were less than the maximum contamination level (MCL). If the calculations would have been 1000 times the MCL's then more calculations would have been required. In addition, the final outputs of the model compared favorably with the actual data being obtained.

The model compared burial ground covers/caps from 10^{-5} to 10^{-7} . It was noted there was no dramatic reduction in contaminants. Mr. McNamee stated that the SCDHEC was interested in using a 10^{-7} cap and was not interested in an intruder barrier. EPA was interested in using 10^{-5} with an intruder barrier. DOE was interested in using 10^{-5} also. He expressed that once again, they were not interested in establishing a remedy, but in managing the uncertainties. The 10^{-5} cap manages the uncertainties without spending large amounts of money.

Mr. McNamee stated that the RCRA permit addressed the groundwater. Since there is no technology that extracts a cup of tritium from the groundwater, the next step is to hold it until it decays. The F&H-Area pump and treat process is not a good solution. Several alternatives were discussed with the State in which two were considered. One was dam and impoundment and the other was to send the contamination into a deeper aquifer. It was decided to pursue the dam and impoundment. Approval on the dam and impoundment method is expected by SCDHEC on January 6, 2000.

In answer to questions at this point, the following statements were made:

- The State recognizes that the tritium problem is a long-term commitment.

- A solution to mix and dilute is not a viable solution because the Pollution Control Act indicates all waters of the State must meet the MCL.
- The tritium level at the mouth of Fourmile Branch is currently 126 curies.

M s. Patterson requested that John Bennett, BSRI, give a CMS/FS briefing. Mr. Bennett stated that the ORWBG is a 76-acre inactive landfill disposal area for solid radioactive waste at SRS. Mr. Bennett reviewed the amount and make up of the waste in the ORWBG. In February 1998, construction of a low permeability native soil cover over the majority of the ORWBG was completed as a CERCLA Interim Action. The purpose was to reduce worker risk, reduce infiltration through waste trenches, promote storm water runoff, and stabilize the surface of the ORWBG to minimize settlement. There was no in place permeability testing done but there were engineering tests that indicated the cap did improve drainage.

The four hazardous COIs were identified as Cadmium, Lead, Mercury and Volatile Organic Compounds (VOCs). The twelve radioactive COIs were Tritium, Carbon-14, Cobalt-60, Strontium-90, Technetium-99, Iodine-129, Cesium-137, Neptunium-2372, Uranium235, Uranium-238, Plutonium-238, and Plutonium-239. Of this material, a lot of it will decay within 100 years. Since the last item was placed in the trenches in 1974, we are 40 years into the decay time.

In answer to questions at this point, the following statements were made:

- No credit was considered for the protection of the material in the culverts.
- The COIs were not factored for relative toxicity.
- The decay life of Cobalt could be overstated by a factor of two based on current standards.
- The model was normalized to 1974, i.e., decay was not considered before 1974 in order to remain conservative.
- It is possible that the amount of radiation projected may be hugely overestimated.
- Cobalt-60 was not in the model since it is not an environmental concern.
- Pu-239 is not really a concern because there is no source of water.

Decay calculations of 100 years and 500 years for COI distribution was mapped to determine potential hot spots. The burial records were analyzed in detail within each potential hot spot to further define the quantity, types, and volume of buried waste. There is one mercury hot spot that accounts for one-half of the buried mercury. The mercury is stored in bottles and placed inside one-gallon paint cans. The hot spot after 500 years is long-lived radioactive nuclides and plutonium. These were stored in a combination of grouted trenches and culverts.

Key concepts of the CMS/FS process were discussed. It was recognized that in some areas of the ORWBG treatment or removal alternatives for principal threat wastes may not be possible due to lack of feasible technologies, extraordinary volume of materials and greater overall risk to human health and the environment.

Mr. Bennett reviewed the steps in the CMS/FS process stating that 96 alternatives were identified for the ORWBG which was boiled down to 9 principle alternatives. There were 45 alternatives for the old solvent tanks (OSTs) which came down to 5 alternatives. The various alternatives were reviewed. For the mercury hot spot, the alternative came down to no further action or us grout. For the radioactive hot spots, the alternatives were not further action, use an intruder barrier or selected removal.

In the CMS/FS fate and transport modeling, the major conclusions are

1. Highly mobile COIs have mostly leached to groundwater already, source term actions have almost no impact on groundwater contamination.
2. Low permeability soil covers and caps have the same general effect with respect to mobile COI migration; and

3. Protection of the low permeability cover system has the greatest effect on minimizing COI migration.

In answer to questions at this point, the following statements were made:

- Original waste storage was for worker protection and operations purposes, not for environmental protection.
- At this time, there is no indication that DOE is planning on leaving the site.
- Political decisions dramatically affect remediation activities.
- The Focus Group would like a final report from a technical basis from the ISPR team without consideration of the political decisions.

Ms. Patterson requested that Gerald Blount, BSRI, present the information on the ORWBG groundwater contamination. Mr. Blount stated that the problem with the ORWBG is that hazardous and non-hazardous contaminants are in the groundwater at the Point of Compliance (POC) and are discharging in Fourmile Branch at concentrations greater than standards. Mr. Blount stated that the likely response action is seep line management with disposition of tritiated water through irrigation. Maps were shown which pointed out the problem areas.

Mr. Blount reviewed a graph that indicated the tritium flux started in 1960 reaching its peak in 1990. From there, the trend line descends due to tritium decay. Without the decay, the graph would stay level with the 1990 peak. The graph indicates that the tritium flux from the source is basically controlled by decay.

The planned interim measure corrective action is to build a dam and pump water to 30 acres of pine trees upstream of the dam. The excess water would run back to the plume that would give the site control of containment of the water. VOCs will be managed with an insitu air stripping technology. The air stripping techniques will be applied to the VOC hotspots, concentrations in the groundwater hotspots will need to be reduced by approximately 25 to 30% to achieve standards at the seep lines.

Estimated costs are \$1 million for impoundment, the irrigation systems and operation with an on going operational cost of \$100 k per year. The site would monitor the operation and expand the irrigation area if results are favorable. If results of the dam and irrigation system are favorable, then french drains would extend from the sides of the dam to collect more water. It is expected that the tritium flux to Fourmile Branch could be reduced by approximately 70% with the dam, french drains and full scale irrigation.

Concerning dose relations with surface water versus atmospheric release, there would be an 80% reduction in concentration of tritium due to the conversion of tritiated water to tritiated water vapor in the atmosphere. It is expected that there would be a 60% reduction in potential dose per person with an atmospheric release versus the dose associated with ingestion of tritiated surface water.

In answer to questions at this point, the following statements were made:

- The possibility of planting a crop on the burial ground has been considered but rejected because of fear of (a.) the root system moving into the material itself and (b.) any crop bringing in ants, insects or other wild life that would burrow down into the waste.
- It is anticipated that this process would take 30 years or longer until the seeps meet the MCL level.
- The site is in the process of updating the maps that are four years old.
- The dam would be approximately five feet deep and would be placed where the greatest concentration of tritiated water could be contained.
- The irrigated area could grow to 600 acres as results are evaluated and the concept is expanded.

Ms. Patterson requested Elmer Wilhite, WSRC, and Jim Cook, WSRC, address the Composite Analysis. Mr. Wilhite stated that DOE low-level waste (LLW) disposal requirements are address in DOE Order 435.1. The emphasis of this order is to plan disposal so that legacy waste is not generated and future doses will not exceed standards. The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-2 concern was that DOE LLW Performance Assessments did not assess the impact from the "total inventory (past, present, and future)". The DOE Implementation Plan for DNFSB 94-2 was to "...prepare composite analyses that account for other sources of radioactivity that may be left at a DOE site." Mr. Wilhite reviewed all the facilities and areas considered in the Performance Assessment/Composite Analysis and the POCs of which the ORWBG is included.

Mr. Cook stated that the inventories and data used in the CMS/FS were the same as used in the Composite Analysis (CA). After explaining the methodology used in the CA, he noted that the screening criteria reduced the facilities from 114 to 49 and the radionuclides from 115 to 31. The selected point of assessment for individual dose calculations is the mouth of Upper Three Runs. This was the closest point where people could reasonable be expected to be exposed to radioactivity from active LLW disposal facilities. The time of assessment was 1,000 years.

The results of the CA were that the peak dose (1.8 millirem (mrem)/year at Upper Three Runs mouth) is less than the DOE limit of 100 mrem/year and dose constraint of 30 mrem/year from all sources. The comparison of doses, calculated from actual environmental monitoring and the CA, were very close which gave confidence in the CA model. Mr. Cook stated that the ORWBG was a major contributor of doses to the stream.

In answer to questions at this point, the following statements were made:

- A Performance Assessment is not needed for a new mission facility. The safety analysis is used. The safety analysis would trigger consideration of a CA depending on the location of the facility.
- Waste from a new mission would have to meet the waste disposal regulation.
- EPA continually does a survey of the Savannah River to make sure water is not used for drinking between the site and 301 bridge.
- The dose of Carbon-14 at Fourmile Branch is 14 mrem/year.
- Numbers/data is not instructive without identifying the uncertainty. An error bar should be used.
- The conservative (high) ORWBG inventory and the low dose count gives confidence in the conclusion.
- Do not maximize inventories in Performance Assessments and CA's. Numbers should be conservative and sensible. A technical argument being translated to a political decision can go from a cake to a snake.
- The data should be general with an honest expression of uncertainty.
- On an integrated dose curve, background dose per person should be placed on the same curve to put data into context.

A tour of the ORWBG and the seepline was given to those attendees who wanted to participate.

Ms. Patterson opened the meeting so the ISPR team could ask questions. Dr. Karam expressed his appreciation of the meeting and presentations. He felt it was most beneficial. He felt the CA was the main document that the team needed to review.

With no other comments, Ms. Patterson adjourned the meeting. The ISPR team met afterwards to discuss their path forward.

Meeting handouts may be obtained by calling 1-800-249-8155.