National Institute for Occupational Safety and Health (NIOSH)
Worker Outreach Meeting for Los Alamos National Laboratory

Meeting Date: Thursday, May 10, 2007, 9:00 a.m.

Meeting with: International Association of Firefighters (IAFF) Local 3279, Los Alamos County Fire Department, White Rock, New Mexico

NIOSH/ORAU Team:

Gregory Macievic, PhD, National Institute for Occupational Safety and Health (NIOSH) Office of Compensation Analysis and Support (OCAS), Health Physicist

Jack Buddenbaum, Oak Ridge Associated Universities (ORAU) Team, Site Profile Team Leader

Don Stewart, ORAU Team, Dose Reconstructor

Mark Lewis, Advanced Technologies and Laboratories International, Inc. (ATL), Senior Outreach Specialist

Proceedings

This is the third of three meetings between a team from NIOSH and the ORAU Dose Reconstruction Project, and members of IAFF Local 3279 representing the firefighters from Los Alamos County Fire Department who serve as first responders to calls at Los Alamos National Laboratory (LANL). The first several minutes of this meeting were not recorded due to a problem with the recording device.

Mark Lewis stated that he was recording the meeting for the purpose of creating minutes of the meeting. He stated that no one would be identified by name in the final minutes that will be posted to the NIOSH Web site. Jack Buddenbaum noted that the introduction of the meeting had not been recorded.

Mr. Buddenbaum stated that the main purpose of the meeting was to discuss the site profile for Los Alamos National Laboratory (LANL). He leads a team that has gathered and researched many historical documents from Los Alamos National Laboratory (LANL) to develop the site profile about the operations and sources of radiation exposure to workers at LANL from the era of the Manhattan Project to the present. This site profile is used during the dose reconstruction process for people who have worked at LANL, who file claims under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA).

Mr. Buddenbaum stated that EEOICPA was enacted in 2000 to provide compensation to eligible workers who may have become ill as a result of their work at nuclear weapons sites contracted by the Department of Energy (DOE) or its predecessors. Certain survivors of deceased workers may also be eligible for compensation. The Department of Labor (DOL) manages the claims process for Part B claims for radiation-induced cancer and other illnesses that are related to the

production of nuclear weapons, and for Part E claims for illnesses caused by exposures to toxic chemicals.

Under Part B, DOL sends a cancer claim to NIOSH for dose reconstruction after verifying the worker's employment and medical diagnosis. NIOSH is only involved in the Part B claims for radiation-induced cancers. DOL administers the claims for other illnesses covered under Part B, as well as Part E claims.

Dose reconstructors from NIOSH and its contractor, ORAU, use the information in the site profile to determine the radiation dose for each case. If NIOSH finds that the worker's radiation exposure is "at least as likely as not" to have caused his or her cancer, the worker may be eligible for compensation and medical care from the date the claim is filed.

Worker 1: Does Part E apply to firefighters who were once employed by DOE but now work for the county?

Dr. Macievic:
Yes, as long as you were performing duties that were related to DOE.

Worker 1: The argument that I could probably make as a new firefighter would be that those who were brought in under DOE can be compensated, but those of us who are contract cannot.

Mr. Lewis: That is something that Karen Martinez at the DOL Resource Center should be able to answer for you.

Worker 1: We talked about it but we never got an answer on it.

Mr. Buddenbaum: Any work performed on the LANL site is covered, whether associated with DOE work at the LANL site or performed by contractors to DOE.

Worker 1: Are you talking about Part B or Part E or both?

Dr. Macievic: You can file under either part if you worked at LANL or any other DOE site.

Mr. Buddenbaum: Even Zia workers are covered.

Dr. Macievic: NIOSH does not decide who gets dose reconstructions. DOL sends the claims to us for dose reconstruction. We do them and return them to DOL and they make the final decision on compensation.

Mr. Buddenbaum explained the steps in the Part B process that involve NIOSH:

- DOL receives the claim, verifies the worker's employment and cancer diagnosis, and forwards the claim to NIOSH;
- NIOSH sends a request to DOE for the worker's employment history and personnel monitoring records;
- ORAU interviews the worker or survivor;
- ORAU uses the worker's information from DOE, the interview, and the site profile to reconstruct the worker's radiation dose;

- The information from the dose reconstruction is run through a computer program that determines the probability of causation, or the likelihood that the cancer was caused by the worker's radiation exposure;
- The worker (or survivor) reviews a draft dose reconstruction report and has a chance to add or correct information in the report;
- When the worker agrees that the dose reconstruction is complete, he returns the OCAS-1 form;
- NIOSH returns the completed dose reconstruction to DOL;
- DOL makes the final compensation decision.

Mr. Buddenbaum compared the dose reconstruction process to putting together a jigsaw puzzle. Available information such as film badge results, medical x-ray doses received as a condition of employment, urinalyses, whole body counts, and incident reports involving radiation exposures are supplemented with information to fill in the missing pieces. Co-worker data may be used if information is missing from the worker's records. Environmental exposures outside the buildings with the direct radiation source areas, such as stack emissions, are also considered, although those would tend to be much lower than the readings taken in the areas where people worked with radioactive materials. Dose reconstructors also use worker interviews and correspondence with both current and former employees to fill in pieces of the puzzle. These interviews are cited in the site profile.

Mr. Buddenbaum noted that because the Special Exposure Cohort (SEC) petition had recently been approved for a class of LANL workers from 1943 to 1975, the site profile team will probably begin to focus on finding information for the post-1975 period.

Mr. Buddenbaum stated that the site profile describes the site: the facilities, the sources of radiation, the levels of radioactivity, the work activities, and potential exposure scenarios for workers. Worker input is important to help put the puzzle together because the available documentation does not always answer all the questions that the dose reconstructors have. The site profile is a "living document" that is updated as new information relevant to dose reconstruction becomes available. He commented that his team had learned of a new source of information for TA-60 at lunch the previous afternoon.

Mr. Buddenbaum: My team is interested in hearing what you have to say about your work experiences at LANL. We heard yesterday afternoon about the work schedules. I understand that you basically wear your dosimeters at all times in case you are called out to the site.

Worker 2: We wear our dosimeters on all calls before 5:00 p.m. and to every call to the Lab after 5:00 p.m.

Mr. Buddenbaum: It is important for the team to consider the number of work hours in your schedules because you regularly work more than 40 hours per week.

Mr. Stewart: We would probably overestimate the dose for a worker with a lot of exposure, so that level of detail would probably not be necessary. Overestimating the dose allows dose reconstructors to give the worker more dose than he likely would have received to get the worker's dose over 50% without spending a great deal of time on the dose reconstruction. When

the dose is likely to fall just short of what is needed to make the claim compensable, we take a more accurate approach that considers every potential source of exposure to ensure that we do not underestimate the worker's dose.

The program requires that the dose reconstructors take steps to make the process "claimant favorable" by assuming a dose higher than the worker actually received to bring the claim as close as possible to compensability. They have to use every favorable assumption they can to fill in the gaps. For example, NIOSH does not always get information from LANL about the occupational X-rays for the occupational medical dose, so the dose reconstructors assume that all workers had all the X-rays.

A brief discussion between Mr. Buddenbaum and Mr. Stewart established that it would be helpful to include information about the potential for higher doses due to longer work hours in the revision of the environmental section of the LANL site profile that is currently underway.

Worker 2*:* One of the older attendees at the meeting yesterday afternoon talked about the shifts that he had worked at Station #2 until about 1985 – regularly working 56-hour weeks until sometime in the 1990s, with overtime on top of that.

Mr. Buddenbaum*:* Can you come up with documentation to show that work schedule?

Worker 4: I have the job descriptions that specify work hours for current employees. The only problem that we might encounter would be in calculating the overtime because we have higher demands for our time during some periods.

Worker 1: We can probably find the information in the department's archives.

Dr. Macievic: If the dose reconstructors know that the job incurs overtime – for example, that it was usual for someone to work 50 hours instead of 40 – they will base the calculations on 50 hours.

At this point, a number of people were talking simultaneously and it is not possible to distinguish exactly what each person was saying. The gist of the conversation is that it is difficult to say how much overtime any given firefighter may work in a year's time. Mr. Stewart indicated that dose reconstructors use a tool that allows them to assume a level of 2,500 hours per year in such a situation. Several of the attendees agreed that this assumption would cover their work schedule.

Worker 3: There are probably 5 to 10 firefighters who actually worked a schedule of 24 hours on, followed by 24 hours off under DOE, which amounted to 271 hours per pay period.

Again, there were concurrent conversations about the number of hours worked, and it is not possible to hear a single thread of conversation.

Mr. Stewart: We are able to assume different levels of exposure based on where and how many hours the person worked.

Worker 3: In the past, a number of firefighters regularly worked their full work schedules inside the Lab at TA-55, so their badge readings would be different. A few of them also worked at the Lab part-time.

Mr. Buddenbaum: That information should be in the case files. We are talking about the environmental dose – the radiation around the Lab – and if someone is assigned to a firehouse, then we can assign numbers to that based on the number of hours in that environment, even when you are sleeping.

Worker 3: Isn't that interesting? That would be Station #5 and Station #3 because #3 is downwind from TA-68 where most of the shot activity happens.

Mr. Buddenbaum: In more recent years, the Lab has moved away from using the more highly radioactive materials. But now they are using more depleted uranium (DU), as well as things like tantalum and titanium.

Worker 3: And beryllium?

Mr. Buddenbaum: The weapons program has been moving away from beryllium use since the late 1980s and 1990s. The depleted uranium would carry more potential chemical exposure than radiation exposure.

Worker 4: My concern is that you might not show a dose on your dosimeter at all. You might be out on a DU shot downwind of the cloud. If they didn't tell you that it was DU, then you might not be wearing a respirator. So you're standing in the middle of this stuff and inhaling it.

Mr. Stewart: That is what we were talking about at the beginning. If something was going on with radioactive material and you didn't have respiratory protection, then you would be put into that category. If we have the information, then we can get a feel for what type of dose to assign.

Worker 3: Not only do we have exposure to radiation, but aren't we also getting exposure to the beryllium out there?

Mr. Stewart: NIOSH does not take beryllium exposure into account in dose reconstruction for cancer claims. DOL considers it under another part of the law.

Dr. Macievic: The DU is also taken into account under Part E as a chemical exposure as well.

Worker 3: This happened on at least two dates. We went out there and we didn't know that it was DU. We didn't have respirators. We're not normally there so we don't know what they're using. That happens a lot and I've been here 15 years as of day before yesterday.

Mr. Buddenbaum: Is that still done at F Site?

Worker 3: Yes. Those shots were staged for DU. So we were out there walking around trying to put out the fires and they told us, "Oh, by the way, that is DU." It started four fires over there.

Mr. Lewis: And you didn't have respirators?

Worker 3: No. When we're out there trying to contain fires, it is impossible to do that wearing fully-contained respirators in wild land situations.

***Mr. Buddenbaum**:* It would be helpful to have that sort of information because it isn't always stated in "official" reports or logs.

Worker 3: If we are scanned for radiation after those events, it isn't entered into a log.

Mr. Buddenbaum: It takes some personal responsibility to get the information on paper, but it could be helpful down the road – the more information, the better.

Worker 3: Any time we go, we document it ourselves. But it's not in the log books.

Dr. Macievic: It is not necessary for such an account to include every detail – just a statement that on a certain date there was an activity where radioactive material was involved and you did not have respiratory protection or any type of monitoring after the fact.

Worker 4: There had to be some exposure because we're right on top of the pit, running around out there in the dirt that has who knows what in it, trying to put out the fire.

Mr. Stewart: If they have information about such an event, the dose reconstructors would probably be able to find a radiation work permit (RWP) with the quantity and type of material or some other source of information so they can figure the exposure.

Worker 3: I can just hear someone say, "I don't have any documentation but I've been working at TA-65 for five years. I've gone on 20 shot activities, so there is a possibility they can't reconstruct my dose because my badge always shows '0'".

***Mr. Stewart**:* When a dose reconstructor looks at a given case, first he or she looks at the records in the case file – the external dose record, the internal dose record, the bioassay record, and any other records in the case – and then uses those records to reconstruct the dose. However, if the worker says in the interview that he was exposed to DU in shots at Bayo Canyon during this period and there is nothing in the file, then that is going to help the dose reconstructor to identify a gap.

The first thing a dose reconstructor does is to look at the records and determine if there are any gaps in the worker's monitoring data. For example, if a plutonium glove box worker who had a badge and was on bioassay for plutonium for his entire career, we can look at that and say that he was probably appropriately monitored. Therefore, we can apply the standard assumptions and the case is done. But if a worker says, "I responded to a fire in TA such-and-such in 1965," we know that there wasn't bioassay until 1989, then that will prompt us to ask more questions. Anything that you can put in your interview that will help us to see that there is a gap will send us back to the site profile to try to come up with an appropriate dose to fill that gap.

While we are here, we need to develop specifics on the Cerro Grande fire. We do have information on some of the DU shots, but we haven't seen actual dose reconstructions with the DU activity yet. We haven't seen a lot of talk about the Cerro Grande fire yet. We think that is because the responders were all pretty young people and are probably currently working and don't have claims yet. We need some information to work something up.

Worker 3: We were out there for days.

Mr. Buddenbaum: We typically talk about trying to remediate an area to an environmental level, but it depends on what is out there. I talked a little bit yesterday about plutonium not being very mobile – it doesn't really move around. Strontium, on the other hand is very mobile. Uranium is more mobile than plutonium. It can matriculate itself into the soil. The one thing about out here is that you have crazy washout rain events.

Worker 4: What is important about this meeting is this dose reconstruction report. The dosimetry data that you get every year usually says "0." However, Mr. Stewart is saying that they give you the benefit of the doubt to be "claimant favorable." The reason that they are not getting claims from firefighters is because they figure that they have to provide so much information that they'll never get compensated, and because they don't want to put the work into it. But if they had attended the meeting today, they would understand that the dose reconstruction is "claimant favorable." If you're sick, you should file a claim. It would help everybody over time, because now they have to put some work into it and figure out what happened at Cerro Grande, what happened at these shots, what happened when we go to fires at CMR or PHERMEX or wherever.

Dr. Macievic: It would help now if you would write about these things that you remember, especially post-1975 – specific events when you were involved with radioactive materials but you weren't monitored. That will cause a trigger for NIOSH to look at it more carefully then. If everybody keeps quiet about it, then it looks like you were a firefighter but you weren't involved in anything specific – so here is your record and this is your dose. But if NIOSH has information, then that will give us a path for further analysis and that will be helpful.

Worker 4 to the other attendees: It is important for NIOSH to understand when we were unmonitored or got injured. It gives them a baseline that will help them if you file a claim, as well as future firefighters who may file cancer claims.

This week, they passed a Special Exposure Cohort for LANL workers from 1943 through 1975, so if you have one of 22 cancers and worked during that time at the site, there is a presumption that you had enough exposure to be compensated. So now we just have to get information from that point forward.

Mr. Buddenbaum: It helps that the records are progressively better than the 1950s and 1960s. The SEC has to do with the lack of records from that time. People were not so paper-retentive then. I don't think that it was intentional. It was just the mentality in those days. They were good writers and they shared information within their programs. There just wasn't a lot of record keeping. It got better after the 1960s.

Mr. Stewart: The long-term implications of exposures to radioactive material are cancer development, obviously, and that can take a number of years to happen. One of the more common cancers is plutonium-based osteosarcoma, which can be identified fairly early. If you get a big whiff of plutonium-239 in a closed zone, then there is a high probability of developing lung cancer. If you have a claim, then that is going to get you quickly to 50% based on one dose. There have been cases like that at LANL where I based the dose on a single plutonium bioassay result. That is because of the way that plutonium works in the body. It leaves the body slowly, over a period of years. So it was actually more accurate to use that one result, even though the worker had a ton of results from the 1940s. Those results were not very accurate and some of the

records were military so we had to take a percentage. Even with just a percentage, the result from that one dose was more than enough to make the claim compensable.

Worker 2: When you are talking about record keeping… It's like being exposed to asbestos – it takes 30 years for that to be detected. Before that became an issue and people became ill, they probably weren't keeping very good records.

Mr. Buddenbaum: My grandfather worked in the shipyards in Seattle. There was no protection in those days. They sprayed it all over the shipyard, all day long.

Worker 3: We participated in an event at PHERMEX, where they use radiographs and they have DU in some of the shots. I know that radiation is a concern with things like depleted uranium, but the material that was involved in that particular event was lithium hydride. We were putting out fires and nobody told us that it was lithium hydride. Nobody mentioned that it was water reactive. So we were out there spraying water on it, creating these plumes of smoke that we were inhaling. We didn't realize that it was anything other than a wildland fire. Several of us went to the hospital and had to be monitored for a period of time. That was some time ago. As you were saying, maybe some of their efforts were in trying to protect people.

My crew and I were called out to the site to put out a bunch of little shot fires. They told us that it was just some materials that they had shot down and it was burning off. After we had been out fighting the fires for maybe 20 or 30 minutes, they decided that maybe we should have been wearing respirators. So, there we were going into another mode, but it was after the fact. I think in that instance, the possibility of depleted uranium was of a lesser concern than the possibility that there was beryllium in the material that was burning. That was more recently, probably within the past year. I don't know how much of that is documented. I don't know how much research we would have to do in trying to document dates and our concerns about potential exposures.

Worker 4 to the other attendees: They are suggesting that you keep a personal log of unclassified events; and then, after each event, go to your station logbook and document it there. For instance, if we go to a shot next week and the Lab doesn't document it, we need to come back to the station and put everything down in the logbook.

Worker 1 to Mr. Stewart: If I understand correctly what you said yesterday: If the firefighters document it, then that gives you a default amount, which will only benefit the employee.

Mr. Stewart: When we have detailed information available, we will try to use it. But if we don't have it and can't get it, then we will develop a document that will help us determine the outcome of cases more efficiently. We go with what we've got, even though it may give the worker more dose than they may actually have gotten.

Worker 3: This particular situation happened in 1995, and within nine to ten months after that, a procedure was issued stating that the fire department would be notified beforehand about what was in the shot so we could wear a Scott 4 respirator if the material was water-reactive. Those procedures were down, but I know that it was three or four years before we were even informed of the details of a shot activity so we could be properly prepared to prevent accidents.

Unfortunately, it looks to me like we walked away from that because the Environmental Protection Agency (EPA) fined that group for what they did because (inaudible). Now we're back to "sign here and sign here" and they're telling us afterwards that it was depleted uranium-238 or 239, or beryllium. I know that you are here to help those who have been exposed to radiation, but I believe that if they followed their procedures and paid attention to the safety of the personnel, then we wouldn't have to deal with these smaller cases.

Worker 4: The incident that happened about a year ago, when they didn't feel like there was any concern but then started rethinking about the possible hazards… Basically, they gave us information about what was in the shot that they were firing. As I understand it, the hazard was not so much from the materials in the shot that was fired, which caused the fires, but the materials that were possibly already on the ground and were burning along with the shot materials.

Mr. Stewart: The legacy residual materials that had been there for years…

Worker 4: They said that we may not have been exposed to anything; but if there were particles of beryllium or DU on the wood that they had chopped up, then there might have been toxic fumes that we were inhaling. That's when we pulled back and put on our respirators but it was an after-the-fact event – after we had already been out there, and to the best of our knowledge, were dealing with just a wildland fire.

Worker 3: The same thing happened during the Cerro Grande fire.

Dr. Macievic: Even if you find out after-the-fact, it is important to record that information somewhere so that it is documented – that there was something there and that you were not wearing respiratory protection – so that information is available for future activity.

Mr. Buddenbaum: This is a little bit of speculation on my part, but I think that LANL does a marvelous job of sampling around the site – and they have for years, and certainly in the 1980s and 1990s. I don't know specifically about the areas where you have had to deal with fires, but there is data about legacy materials relative to those spots and the legacy contamination on the ground. I would hope that they would have some of that. If I was a firefighter, in addition to this rad log – which I think is a good idea – I would also go to a health and safety manager and ask if anyone has looked at the legacy waste to do a worst case scenario. If the contamination levels were super high, then it should be marked as a radiation area. Perhaps they have even done something like, but they haven't shared it with anybody.

Worker 3: I'm certain they have, because after the fire… We talked about it the first day. They went back when people were leveling the buildings, and cleaning them up. Those were the areas where we were concerned that the Lab hadn't attributed what was in them.

Mr. Buddenbaum: Does the Lab have an open door policy, where you can go to the health physics department and ask?

Workers *(Consensus)****:*** No.

Worker 3: We have gone to them multiple times. There is no big list, or – apparently – we don't need to know.

Mr. Buddenbaum: I don't think that they would tell you that the residual contamination data is classified information. There are controls for that. There are different levels of controls. You will encounter radiological postings that say "Dirt Is Contaminated in This Area" or "Radioactive Material Area" or "Radiation Area" or "High Radiation Area." There are all different levels of controls, depending on what is out there. You probably encounter those as firemen, but are they always going to tell you? I don't know. I also don't know the state of LANL's program, but there should be some knowledge out there on their part.

Worker 3: Yes, the people who are out there are smart. They know, but there is shrapnel that is strewn all over.

Worker 4: Obviously, there is some material that is not recovered, and we are out there in those wildland situations.

Mr. Buddenbaum: The EPA has gathered enough knowledge to do risk assessments and fire scenarios. The knowledge is fairly well-established and conservatively based. They assume conservative values about how often you are around it. If I was a firefighter, I would talk with LANL and ask if they've done a risk assessment and maybe they will share it with you. Then you can make sure that it was independent, and that it was done correctly, and included the right data. My company does a lot of risk assessment work for construction workers, and future land developers who are going to clean up a property and put homes on it, to determine the levels of residual contamination. The EPA has well-established principles and techniques that are fairly accurate and health protective. I'm not in a position to give you advice and that's not why we are here. But as a health physicist, I can answer some of your questions.

Worker 3: In these areas where they have done experiments, and again a lifetime has passed with a lot of levels of documentation and keeping track of where they have fired shots and everything else. Now they have everything pretty much confined to these firing points. But as he was saying, you have this shot going off and particles of metal – you can see those in some of their pictures where they have got streamers and everything going out all over the place. The reason that they had the Cerro Grande fire was that there was a large amount of wood that they wanted to clear out of that area, but they didn't want it to go out to the public because of the possibility of permeation of the hazardous material in the wood that people would possibly take into their homes. The Lab took shredders and chippers and turned the wood into a pile of dust. My point is that nobody really knows how far that stuff is going from the site once a shot is fired. You would think that it would stay in a certain restricted area, but there is nothing that prevents people from taking wood from outside that perimeter. Whenever we go out there to fight a fire, it's usually that ground material that is burning and some of the trees that are in the area. We don't have any idea whether they are contaminated with some of that material. When it catches on fire, we don't know what is burning. I think that the risk from the actual depleted uranium metal is fairly low, but when it gets hot enough to burn the fumes are more of a concern.

Mr. Stewart: Certainly, for the kidneys… the uranium-238.

Worker 3: We can be very far from the areas that they say may be contaminated with depleted uranium, but we still have that element of exposure just being out there fighting the fire.

Mr. Buddenbaum: Talk to your contractor about the hazards that you have going on here. Are you a health and safety person? Do you have a dedicated health and safety person?

Worker 3: I'm the union representative. We have a talented Chief of Safety.

Mr. Stewart: Maybe he could get a dialogue going with the Lab to run these concerns by, and maybe even come up with standard protocol for you.

Mr. Buddenbaum: It usually doesn't take a lot of effort to do that. I wouldn't be surprised if there are some areas where LANL has already done that, especially with the environmental levels that Mr. Stewart was talking about. Maybe he can get a dialogue going with LANL. It's the health and safety rep's job to protect the workers – to provide a program that answers questions. There is DOE's version of 10CFR19 NRC regulation which basically says that there will be full disclosure of hazardous or radiation exposure at a nuclear power plant. The workers have a right to review all the records and to ask any questions that they like. There is a provision for protection for whistle blowers in there. DOE has their own version and I'm not sure what the number is.

Mr. Stewart: That is 5048.11, but the contractors have 10CFR835, which is about radiation protection. There are a couple of new rules as well, but I'm not really familiar with them since I left DOE. An example: If you go across a contamination area boundary in your firefighting gear and Scott Air-Pak and you survey out, it is very easy for the RCTs to decide that your stuff is below the least level and off you go. Now, on your environmental sites, it's very much harder even though the levels are very much lower. That requires an HP and a report this long. That could be some of the difficulty that you're facing in getting full communication.

Mr. Buddenbaum: A lot of these sites are under what is known is RCRA, so there is a RCRA feasibility study; and, usually, there's a risk assessment. I think that might help get your answer, but if you're not comfortable with that, DOE sites tend to hire third-party people to review it independently because they don't have a vested interest in the operation. You can look to see if that's been done and you can request it if you think that it's necessary.

Worker 4: Thank you. I know you have more to talk about.

Mr. Buddenbaum *(continuing the discussion about the site profile documents)**:*** We refer to the documents that we use in dose reconstruction as the site profile. At LANL, the site profile consists of six different documents. These are the areas that we are interested in and we feel they cover all of the potential radiation exposures and doses. These are looked at separately to come up with a cumulative dose assessment for a claimant.

The Introduction and the Site Description are the first sections. We have made revisions recently to add operations that we have learned about through new documents that we have reviewed. We have added start and end dates for some of the operations. We still have gaps in some of that information, but this document gives you an overview of the different things that LANL did, dating back all the way to the Manhattan Project and the Trinity shots down at Alamogordo.

LANL's primary mission has been weapons design and device testing. LANL has never really been designated as a production facility, but back in the 1950s and 1960s, they were a production facility. They processed a lot of plutonium, but maybe not on the order of Rocky Flats. They were working hard every day to develop new designs. High explosives development is a big part of their mission. Weapons safety … They have allocated a large part of their resources to making the weapons safe. Nuclear reactor research is another source of radiation. Omega Site at TA-1 is probably the principal operation that was being focused on and the radiation risk there, with waste disposal a consideration. The LAMPF and the LANSCE facilities are sources, and to the offsite workers, the emissions from the exhaust stacks, which would lead to the environmental dose that we talked about earlier. The primary radionuclides are tritium, fission and activation products, and uranium and other transuranics. The sources of radiation are listed in Table 2-1. We have also picked out the highlights of the accidents and incidents and put them into a table. There are many other documents about accidents and incidents of varying degrees of severity. The revisions to these sections – additional unit operations and start and end dates – are in the final review process.

The next section is the Medical Dose. The medical dose is a critical part of NIOSH dose reconstruction. We have made some changes to this section that will lower the dose in some cases, even with the default. We have some fairly conservative values in there, but it was uncertain when this should be applied. We are drawing a blank on some of the medical dose, but there are a lot of default applications that we use to get the medical dose. They are very conservative and very favorable to the claimant because the documentation using the medical X-ray equipment at LANL over the years is not particularly complete.

There are medical records for LANL that we have not been able to get because their ownership has been in question. Senator Udall has been helpful in sorting out the acquisition for us, but the records have to be decontaminated. The records are also in disarray and there is no bibliography. Once we get into them, there may be some groupings of records that we might be interested in.

The photofluorographic equipment that was used for workers' medical X-rays during the earlier years gave two times the dose that standard X-ray machines did. That is considered in the medical doses of workers during that era. With the SEC, that only really applies to the claims of workers with non-qualifying cancers – prostate and skin cancers.

The next section that we looked at was the Occupational Environmental Dose. These are exposures outside in the greater LANL area where you go, and other areas around TA-21 and TA-3. We consider both the internal and external doses from the environmental exposures. We found some additional pre-1970 data for air concentrations. We were missing quite a bit of that. We also included some additional external data that goes back to 1958. Again, we would use that data for workers with non-qualifying cancers under the SEC.

Worker 3: Does it make a difference if somebody was here and (inaudible)?

Mr. Buddenbaum: In some areas, that is correct. The levels are slightly above the natural background. They are not too radically different, but you definitely have some residual contamination. There are some facilities that have high-radiation sources inside the buildings that

are shielded, but there is a "sky shine" effect so that will raise the background, or ambient, external levels in the area.

We use the environmental dose primarily for unmonitored workers. If we don't have dosimetry data for a worker or co-worker data, or if it doesn't look like the worker worked with radiation, but worked in the area, this would become an important part of their dose. If Mr. Stewart has a case where the worker was a plutonium worker and got a pretty good exposure, then he may not even have to apply an environmental dose to make the case compensable.

Again, we have revised this section to include outdoor air concentration data for additional years, and for the external dosimetry data that we have found. That revision is under review now, but we hope to have it ready shortly.

For the external environmental dose, we are looking at values between 30 and 55 millirems (mrem) per year for the years 1958 to 2002. We will probably include data from additional years after 2002 as more documents are published by LANL. They do a fairly extensive job of mounting TLDs around the areas so they can keep track of the general ambient radiation levels. We will add this information as we go because there will certainly be future claims. Also, changes in the ambient levels can be linked to activities that LANL does in any given year. We also looked at the gamma dose – the emergent dose – at LANSCE, which is one of the larger environmental external doses. Emergent dose is for what we call the noble gases, like argon-41, where you're breathing in but that's a very small dose compared to the fact that you're in a cloud and the radiation in that cloud is penetrating your body and giving you a dose to your whole body. The whole body dose is more important and much larger.

LANSCE has done a whole lot of work to try to reduce the emissions from operations there. They put a delay line in to reduce the amounts of activation product that goes out the stack. They have reduced those doses fairly significantly. The (inaudible), which is the largest contributing dose within the site boundaries. We have looked into that and considered it in the TBD.

These values, 30 to 55 mrem per year, are based on a working year of 2,080 hours. This came up in our meetings yesterday when [redacted] mentioned the work shift requirements and your typical work week. So we can put that into the site profile so the dose reconstructors can consider the additional exposure based on how much time you were onsite and receiving environmental dose. You're not wearing your dosimeter while you're sleeping, so it won't count toward that, but it will count on your environmental dose.

Worker 4: Our work schedule is one thing, but the Cerro Grande fire didn't have anything to do with the work schedule. Most of us were up here for about nine days straight in various environments.

Mr. Buddenbaum: The Environmental Dose section provides annual values for radioactive concentrations around the Lab. Not every TA or radionuclide is covered, but the most important ones are – tritium, iodine, thorium, uranium, plutonium, americium, fission products, etc. Most of the data only goes back to 1971. We will fill in some additional years before that. We found some additional data and that is going into the revised document.

Worker 2: For that amount of data, and all the areas to deal with, do you have to average it all out? There's a lot of data.

Mr. Buddenbaum: For this type of approach, we look for a combination of what has been emitted out the stacks. As Mr. Stewart said, some of it you can't turn into a research project, so we try to do some reality checks based on our own experience and expertise. We look at the credibility of what is in the records and, given the kind of production levels here at LANL, we felt that the pre-1970 data was not really validated data. There were a lot of functions that LANL aided, so we had them in the original draft of the document. Between NIOSH and ORAU, we decided that it wasn't the best program. Unfortunately, that leaves a gap. The SEC took some of the pressure off there, but we still need to address the environmental dose before 1975 for cases in which the worker has a non-qualifying cancer. The NIOSH team still has to figure out the best way to do that.

Worker 4: The levels were probably higher back then than they are now.

Mr. Buddenbaum: Yes, they were – absolutely. In fact, some of the data included in this new revision goes back to 1958 or 1959. It is alpha measurements, not specific isotopes. We will probably assume the highest dose conversion factor that we use for plutonium-239. That way, it will cover the upper level alpha emitters for dose to lung for inhalation and internal dose. We will add that into the dose to fill in some of the gaps.

The Occupational Internal Dose section is used for workers who were involved with radioactive materials and were on some sort of bioassay program. In this document, we describe the things that were monitored by the health physics group here – how and who they included in the monitoring program – urine samples, whole body counting, and chest counting – for plutonium and polonium and other things. There were some exceptions like thorium, curium, the mixed fission products, and lanthanum that were not what LANL considered part of the routine program because they weren't very pervasive. There are some results for these, but they are few and far between, and they are hard to get to. They are in handwritten logbooks and notebooks. In fact, this is part of the reason that we have the LANL SEC, because we have this lack of data for things like the curium and the mixed fission products. The SEC was approved because we cannot come up with a credible way to estimate doses for these things because LANL didn't monitor them routinely in workers' urine or by whole body counting. If all LANL had handled was plutonium, there probably would not be an SEC because we have a lot of data for plutonium. But for these other things, we have a hard time trying to figure out how much material they had, and how and where they would have used it. There is just not enough time to do that level of research, so that is why we have the SEC.

One of the big changes to this section is that it was originally assumed that workers who were exposed to plutonium-238, which was the material used as a source of destruction – it was assumed that it was pure plutonium-238. We found documentation that there was a small amount of plutonium-239 in those sources, which actually has a higher dose conversion factor. So we made that change in the document and apply that factor in the dose reconstruction for any worker who has results for plutonium-238, and that increases the worker's internal dose.

Dr. Macievic: Plutonium-238 is 99.9% of the activity.

Mr. Buddenbaum: Yes, the alpha activity. I think the conversion factor assumes that plutonium-239 is 6% of the activity, which increases the internal dose.

Mr. Stewart: When we find out that we have to make a correction that changes the dose, we have to go back and review a number of cases to determine how the change affects the dose. For example, we found out that they were using a type of plutonium at Rocky Flats that didn't behave according to the models that we use right now. It actually had a longer retention in the lung. We are looking at a number of cases, not just at Rocky Flats, but also at LANL, Savannah River Site, and Hanford to see if it that change would make a difference in compensability for those cases in which the type of plutonium would matter.

Worker 3: I'm curious. When I first came on board, I had to give urine samples. I don't remember if it was quarterly or once a year. After five or six years, they told me that it wasn't necessary to check me as often because I wasn't going into those areas.

Mr. Buddenbaum: I can't speak for the health physics group directly, but they do look through the data to see if it continues to make sense to monitor certain workers. You may not be in those areas as much, or the type of operations may indicate that there is not much potential for you to be exposed. They have to figure out how to best use their resources. Hopefully, they would not overlook the need to monitor someone. And, again, I think that it is advisable to talk directly with them and learn what their thought process was in making that decision.

Worker 3: It would be interesting to hear what they have to say. (Inaudible) shot activity.

Mr. Buddenbaum: There has been a rule of thumb that if there is a chance that you might receive over 10% of the occupational dose that you would be put on a bioassay monitoring program. Again, if they have a history of negative values for you year after year, then they probably wonder if they need to spend their resources doing that. But if this has changed, the responsibility for them is to keep track of changing conditions that might warrant them resuming bioassay for any work group. I don't see anything wrong with you talking with them, asking questions to find out where they are at. Maybe you can get them to do a full accounting of those work areas you go into and make sure they haven't overlooked something.

Worker 3: Maybe we can get our safety officer to look into that.

Mr. Stewart: I worked at a plutonium facility and there were times when the bioassay achieved was not giving me the data that I wanted. There certainly were times when it would have been much better if they had been doing specific bioassay for potentially exposed people. That would certainly have given a better dose estimate – much better. And that is certainly the case in dose reconstruction. Routine bioassays really don't tell you very much, and I have certainly seen this as a dose reconstructor. There may be bioassay after bioassay after bioassay and one positive reading, but there is nothing anywhere about what that potential exposure was so we may need to make assumptions about it. What I have to do then is to get all of the data to concur with a different assumption and still remain claimant favorable in the process. If I had a record for a plutonium worker that only had special bioassays at certain times, I can presume that it was associated with a specific event, then I can reconstruct that dose much more accurately.

If I could go out after this project is over and preach the gospel, it would be monitor your workplace conditions. They will give you an indication of a potential exposure. Then do the special bioassays, especially for anybody who is anywhere near that place, and they would be much more protected. You would also spend less money on bioassay. Matching a bunch of zeroes doesn't really help anybody.

Mr. Lewis: We only had one fire station at our site and we were on the bioassay program. When they took us off the program, I went over to the hospital and talked to the radiological officer for the site. I found out that they had decided to base the program on the building that you were assigned to. If the building didn't have any radiological sources, then you were no longer on the program. I explained to them that the fire department responded to calls all over the plant. We were put back on the program. It may be that you just need to talk to them.

Mr. Buddenbaum: I apologize that I need to finish quickly because I need to get to the airport. I want to give you my business card so you can call me if you have any questions.

The External Dose section talks about some of the larger sources of external exposure: TA-1, TA-3, TA-21, TA-55, the Bayo Canyon shots from the 1940s through the 1960s, the Omega Reactor, and the pits associated with destruction test devices. There are X-ray units here that certainly led to exposures. There were (inaudible) facilities that certainly were sources for beta exposures. The profile explains some of these radiation fields, the dosimetry technology used, and the practices for who was monitored when. Maybe Mr. Stewart can talk about how we deal with unmonitored workers or "missed dose" or where the dosimeter only has the capability to detect down to a certain level and how we address that, or the early years when dosimetry technology wasn't quite as sophisticated as it is today. We have some additional revisions to the document. We have added photon-to-neutron dose ratios with handling the pits. You probably aren't handling pits, but you certainly might be responding to fires involving pits.

In conclusion, the workers' input is very important to us. The site profile documents are "living documents." We want to add to them and revise them as we gather new and useful information. We are always trying to improve the process to make it more favorable for the claimant. You can send your comments to NIOSH. Here is the contact information. If you need more information, here is the Web address. Thank you for your patience and your time.

Mr. Buddenbaum adjourned the meeting adjourned at approximately 10:30 a.m.