Nevada Test Site Oral History Project
University of Nevada, Las Vegas

Interview with Layton O'Neill

July 23, 2004
Las Vegas, Nevada

Interview Conducted By
Suzanne Becker

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[00:00:00] Begin Track 2, Disc 1. (Conversation begins before recording).

Layton O'Neill: Ray Duncan, the Assistant Manager. called us, myself and Dennis Vetter, who was the lead man in radiological training for REECo [Reynolds Electrical and Engineering Company] after we'd started to build an expanded training organization. He told us that he wanted to make REECo a training institution at the Nevada Test Site [NTS]. And so we were given a lot of authority to really go gung-ho on this and push out in all directions. And we did some of the very first training in the nation of first-on-the-scene people, and that includes firefighters and police departments. And before we finished this program, we had trained every fireman in the State of Nevada, every policeman, highway patrolman, and a few morticians.

Suzanne Becker: *So essentially, you guys were set up to train those people that would first be arriving on any kind of scene.*

Yes, those that would be first-on-the-scene-type people, and we gave them a basic knowledge by going through this Radiological Emergency Operations course, and hands-on training exercises where we used real radioactive materials and realistic-type accidents on the test site. And we were able to use the abandoned facilities at the test site, and we even had one facility that was in up in Area 24 that was devoted to conducting reactor-like scenes. The facilities looked like reactors, and we had players and actors and the radioactive materials and fires and the whole nine yards, for example radiological shipments laying on the ground, turned over truck and auto wreck scenes. We also conducted reactor accident, response; we had live stream clouds,

radiation, injured people, and used mulage techniques to make it look like real wounds and accidents.

Wow. And this was in the sixties and seventies?

Yes.

Before HAZMAT.

Well, yes, more like 1970s and 80s before HAZMAT years. This program was strictly radiological, and then as HAZMAT [hazardous materials] became more and more prominent with years, they adopted that into this program, so it became the HAZMAT program in later years.

OK, so it's sort of the precursor to that.

Yeah. Well, that was because the particular interest in this program. The training was within the Atomic Energy Commission [AEC], and so they pushed for the radiological part initially. The AEC had some HAZMAT problems, but they were minor, and actually they had a handle on them and the radiological part was more visual, more vivid, in everybody's mind. And it was when we were starting to ship large amounts of radioactive materials across the United States. In fact, we *had* been shipping some for a long time. The general public just didn't know it, but the DOE [Department of Energy] did—that's why each office operation had the Radiological Assistance Teams that were to respond to accidents/incidents involving radioactive materials.

So anyway, we continued progressing with this training thing, and REECo did become quite a training center. After we had trained most of the people in the State of Nevada, we found that there was interest by other states—other fire departments, other than Nevada—so HQ said we should start training people from all over the United States.

And did they come here for that?

Yes, they came here for the training, and initially—I don't know if I should say this or not. Well, we paid for their lodging at Mercury, and they ate at Mercury, subsidized food prices, and yet they weren't government workers. That was put down. As soon as the government lawyers found out what I was doing, why, I got called in on the carpet and they said, O'Neill, if you house and serve food to another civilian, we're going to take you to court. So we had to quit doing that, but we continued on the program by revising what we did and making the students pay for their housing and they had to pay for their food too.

And were these people that were sent to this program by the counties that they worked for?

State governments, county governments, and city governments. It was all within the realm of government in the United States, so there were people who were first-on-the-scene responders, and there were some people who were supervisors of the first-on-the-scene-type **[00:05:00]** responders that came to our program, too.

And so Bama [Charles] McKnight was one of the key figures in this training, and he worked for Dennis Vetter. But he was the contact, and he used to have his office where he collected hats from everybody who came, and badges, and all that kind of stuff. He was famous nationwide, and he was an excellent instructor.

My job was just to oversee this and find funding. In the early days, for the onsite people and for some of the DOE people that we trained, I would give a closing talk about the importance of our program, and would always speak to each of these classes.

And what else? Dennis developed over the years a great group of instructors and a very fine program. We not only had classroom training, but we had field exercises with every course. That was the big part of our course, the actual realistic field exercises.

And I imagine you'd have to do things hands-on.

I can tell you an interesting story. We had one exercise going on and we had the manager of Nevada Operations Office [NVOO] who attended the course. Ink [Mahlon] Gates was his name. And he was out there and he had been put into some kind of a controlling position on the Response Team. We had these actors, and this woman, an actor, she was supposed to put psychological pressure on the team. And when we did that, we actually applied psychological pressures. And we had her screaming and yelling that her husband was inside this reactor, and she wanted to see him and she wanted to go be with him; she wanted to see if he was alive or dead. [She was] literally beating on the guards that were trying to keep her out, you know, flailing her hands a little bit, and she was just raising Cain all through the exercise, out at the front gate of the exercise, while the emergency teams were trying to respond. And Ink Gates, he walked over behind this woman and wrapped his arms around her from the back side, picked her up, and carried her back away from the scene action, and they handcuffed her to an automobile.

Wow. Are you allowed to do that?

Well, we did. It was all in the exercise. She was an actor. And Ink took care of the situation. So it was quite a story for everybody that was involved. We also had a lot of exercises where we provided foreign-speaking people; like a guy that walked in with his horse that could only speak Spanish and he would harass and put pressure on them. Well, we tried to build the pressure up so that they were as close as we could get it to the pressure of a real incident, because that's where you get real training.

And how did you go about creating these scenarios? I mean how did you come up with what things might be like?

Well, we came up with a lot of that from our familiarity with real incidents. I told you about the story when we went to the truck incident in Wyoming, and in that incident we had a real farmer

and his daughter appear at the scene, which is, you know, the classical. There was a fire. The fire along the highway burned over into his field, onto the farmer's land. This is a real accident that I'm talking about. This truck caught fire. And so we had real people involved. We had the highway patrolman who was involved at the scene. He was the first on the scene, and then he came and picked us [the Federal RAT team] up at the airplane, and he was back out there. He was a real respondent, and yet he walked over and picked up the radioactive source, trying to figure out why we were so concerned about this little chunk **[00:10:00]** of metal. And he could see everybody was concerned about something, and he was trying to figure out why we had finally sat it on the bumper of this truck. So he walked over and picked it up and looked at it and he says, Oh, "Radioactive Material." And he had sense enough to put it back down. A week later he received erythema on his hands from picking up that radioactive source, but as far as we know, that's all. We lost contact with him in later years, but he never called back and complained. But he did receive erythema.

Which is what?

Reddening of the skin, like a first-degree burn. But we had all these people plus the truck operators, and all these people and things were involved.

Then I was involved in the SL-1 [Stationary Low Power Reactor] accident at Idaho, and we had real stuff there, too, which we used in our scenerios. Like government people who came and thought they didn't have to obey the government signs. The sign said, "United States Government. Keep out." And this guy says, Well, I'm a government employee, and he walked across the barrier and on in. Well, he contaminated himself, and we had to take his—I think we took his shoes away from him. And so those are the kinds of things that really happen,

and they put pressure on response groups. After that incident we put up "Radioactive Contamination" signs.

And so there was a definite need for training, and I'm sure there's a growing need.

It's still going on right now. That's one of the major things that Bechtel Nevada is doing today, as I understand it. I haven't been out there. But they're doing anti-terrorist response training right now. And it includes radiological and HAZMAT problems.

And so they are basically training people, not just in Nevada but from around the country, how to respond to certain situations?

Yes, they come from all over the United States, including all the militaries. So that kind of training is going on, and it's an offspring from the program we started back in the seventies and eighties. So it was a big thing, a major thing, and a lot of manuals were written.

And one of the things that I wanted to tell you about, things that I did, was all the radiological safety documents, like the one I have here, that came out of these programs was my responsibility to sit down and review these documents.

So you had to review this—

Yes, I reviewed these documents and passed approval and made comments on these documents when they were in the draft stages. And as long as the program was alive, they were living documents. They changed with time and as we learned new things and new approaches. And then the other part of the review responsibility I did was every program that had—well, that was off the test site primarily—when we went to Hattiesburg [Mississippi] and we went to Colorado, went to Amchitka [Alaska], and those kind of places—review of radiological safety documents that people had written in my own organization and other organizations that applied to the programs we were involved with had to be reviewed.

Just documents they'd written in regards to other training documents?

Yeah, training, and then documents that had to do with procedures and operations, and primarily that. And reports. There were follow-up reports. And so review of documents was a major part of my program and my responsibilities. And as I changed from health physics into waste management, that again became one of my biggest efforts. The contractors were writing most of the waste management documents, and the review of those documents was one of my big responsibilities. And it got to the point where—I want to crow a little bit here, I guess—I became one of the better reviewers, and so we got some new people in, like Leah Dever, who was an assistant to Joe Fiore [Assistant Manager for Environmental Restoration and Waste Management], and she wouldn't sign on a document until I had reviewed it. So I got a **[00:15:00]** reputation. And today I still sort of have a problem with that because I'm a nitpicker.

Right, which probably is what made you so good.

Yeah.

So when you were reviewing them, what types of things were you looking for to make sure that they were accurate?

Well, that's one that I was looking for, was accuracy, primarily accuracy. Not opinion. Because people have their right to opinion and how they present it, so I tried to be impartial. I just wanted to make sure that what they said was accurate. And that's the big area. And it was as accurate as best as I knew from my familiarity with the procedures and my college training in the radiological business.

This seems like it would be pretty straightforward. In what ways would things end up being inaccurate or biased or not partial?

Oh, they were usually simple mistakes like, I don't know, something was not exactly correct. It's hard to pick that out. They were general things. And there's a lot of scientific data in here, and you can look up in manual to see if that is actually right, what they've said. And I don't know how to tell you—how they were used and the amount of time, you know, like this is a REECo training manual and I determine whether I thought what they were doing was adequate, too.

OK. So essentially, you were the final gatekeeper, so to speak, that it passed through, and you reviewed it for accuracies, everything from the data, if they had it, to procedures.

If there were comments on it, I made comments, then wrote a letter that went back to the originator. But there was one document that I reviewed I got in trouble with. It was a pamphlet to be handed out to everybody on the test site, and there was a picture in there that I totally disagreed with because they showed this guy picking up this item that could've been radioactive, and I just said, That was a dumb picture. Here's a sign that says "Radioactive Material" and the guy's picking up something and looking at it. And I wrote that in my comments that that was "dumb." Well, the system didn't like my using that word, but the letter got out and got to the contractor and writer, and it came back and ate me. So you had to be careful.

And the other thing was along with reviewing documents, of course, as I told you, we had to review programs. We actually visited areas and reviewed contractor programs. And the policy out of Washington was for us to write up a document like an inspector would write, like the things he found that were good and the things he found that were bad. Well, as time moved on, we had different people at the top, and one of the problems was one of our top supervisors came in and said he didn't want documents that said what was wrong with the contractor's operation. He wanted documents that said that if you found something wrong, it had been corrected. And he

wanted the items *closed* before he got the document in his hand, before it was published out and sent to the contractor. He wanted a document that said, `Well, we found this but it was corrected.`

And if you said that, would that be corrected?

Well, we started changing our way of doing business and started trying to write—he was high enough up that we needed to satisfy him, but it was not according to the HQ orders for conducting appraisals.

That you needed to do that. Were the changes made, usually?

Yeah. Oh, yeah. That was the other problem, of course, was proving the validity of them. And it depends on where you go with a critical document, criticizing another operation. You can go to the guy that was responsible for that, but the people upstairs from him who *get* the document first might not know that the operation was not good, but the guy who was doing it would agree with you. In fact, one of the things we did was always take our documents out and let the contractor review them for *our* errors that we had made in writing it, and of course we never let them change anything unless they could prove that it was wrong. So it was tough. And then the **[00:20:00]** document would go through our system. It goes upstairs in the DOE and [if] it's a major document, it's signed by the assistant manager or the manager himself, going out to one of the contractors. Because you're messing with the contract.

So essentially, the whole process and the paper flow or the paper trail, I guess, had to be changed so it would read a little bit more positively.

It had to read well and it had to read so the upstairs understood it. And there were things of interest. An interesting story is one time I had written a document about Los Alamos National Laboratory and some things that we found there that needed correcting, and when it went over the assistant manager's desk, why, his secretary had lined up the signature lines on a whole

bunch of papers and he just signed them all and sent them out. Well, that document circulated clear to Washington. And it came back, and I got called on the carpet, and I was told that the document would be rescinded and that Nevada was asking for those documents all to be shipped back home to us, and that I was supposed to go through it again, which I did, but I didn't change anything. And then we had a meeting with the Los Alamos group, and the people down at the lower levels, some of them were quite adamant, and one gentleman even got to the point that he followed Khrushchev's lead and took his shoe off and beat on the table about how we could—this one had to do primarily with—I think I spoke about that before—the U.S. Department of Transportation [DOT] regulations that we were enforcing. And it was a legitimate thing because Los Alamos *had* taken the lead in the shipment of radioactive materials and was making shipments, and they were *exempt* because they were shipping nuclear weapons components and stuff that was classified. And the gentleman was underneath the impression that he didn't have to follow DOT regulations. Well, he had apparently got left out of the chain, and in the meeting that we had, they had a whole group of their people plus their top advisor, and there was three or four supervisors of our DOE group in there. But when the meeting ended, all the supervisors in *my* group had left. And Jerry Dummer**,** who was the head Health Physicist of Los Alamos, was there. And he verified that everything I had in the report was accurate, in front of his leader who was there, the first time he'd seen it. And when the meeting ended, the chairman of the meeting, the head Los Alamos man, said, `Layton, we'll take this all back and work on it and get it taken care of.`

Wow. That's quite the procedure, though.

But it was quite a, you know, for *me* it was a lot of stress for something I was doing. And there were times when contractors were called in by my supervision and said, `This is pretty serious. Rather than have a document written up on this, I'm going to`

instruct you verbally and give you a copy of this draft report. You better go out and get it straightened out. And so there was the buddy-buddy factor.

So how was that? I mean that must've been frustrating.

It *was* frustrating for me, but we got the results we were after, so that was the important thing. And I guess—I don't know where you cross the line, you know. I had trouble with it myself because it's good to be a good-old-boy and be friendly and try to get things straightened out, but **[00:25:00]** it's also important to get the word there, and from my personal viewpoint, I was the low man on the totem pole and not getting much credit for anything.

Right. So is that something that was pretty pervasive, sort of that mentality and the good old boy—?

Well, I don't know if it was or not. That's only personal experiences, and I don't think everybody had that kind of problem.

Right. Just maybe in the circles that you were in, the folks that you were dealing with.

Yeah. I think it was, because I had lots of conversations with guys who worked on nuclear criticality safety, and they didn't have those kind of problems at all.

Right. What do you think it was about the particular stuff that you were doing that you always faced so much opposition?

Well, I think it was primarily due to the fact that [pause] I don't know, let me back up a little bit. You run into that kind of thing everywhere. When I was a Sanitarian in Kittitas County [Washington], I went in there to try to teach people how to build proper sewage treatment, septic tanks, and how they should lay out the drain fields and that, and I sat down with a lot of plumbing people and people who put those kind of things in for people out in the country, and their response to me was, Well, I been doing this for fifty years, and you're just out of college and you're trying to tell me how to do my job. And sometimes

they did what you wanted to do and sometimes they didn't. And what I had is the knowledge of people who had gone and looked at all these systems and experienced all these systems and had proven better ways to do it. And yet they didn't want to accept that.

So they were sort of just set in their stubbornness, set in their ways.

Yeah, they'd done it. You know, I had that type of problem with waste disposal in a city I was associated with, and they had been dumping the city garbage alongside of the riverbank, and the river took part of it away when they dumped it over the edge. That was a good way to get rid of it in those days, I guess. There was always swamp land around the rivers, and so they would dump it there. And yet the county attorney, who was supposed to be *my* representative, refused to support my positions. And they'd been doing it that way for years. Why change?

And it's easy.

And it's easy and it doesn't cost a lot. So everything that I tried to change and have done, all this cost money.

So maybe it seems like cost and—

Cost and tradition and familiarity. And what they call the buddy-buddy system, you know, where you get working with somebody and you don't want to step on anybody's toes. Well, I got in trouble a lot because I guess I stepped on toes.

[Laughter] Yeah. Trying to get everybody into line.

But that was the first few years. Things lined up and we had good systems. And one of the big struggles we had in the contractors was getting people to write down procedures, how you do something. `Is there a procedure on this operation?` And they'd say, `No, we been doing this for twenty years. We don't need a procedure.` Well, the DOE system

from headquarters down and the things we were trying to enforce was, We need procedures written up. We need procedures. So it was tough to push people to procedures.

It almost sounds like, you know, old family traditions that are passed down and that's just the way that you do it.

Well, I think that's the way it was because I was in on the birth of health physics, and so when it started pushing itself out beyond the immediate realm of the people that were working with it **[00:30:00]** and the government and the DOE and the Atomic Energy Commission said, We're going to start inspecting your places, and they never had an inspector there before related to radiological safety, why, they took offense to it. They'd been doing well without us and now it was going to cost money, and they were being told that they had to change operations, they had to write procedures. This was all very, very tough for the contractor system. And I was involved in a lot of that.

So basically people are resistant to change.

Yes, I think so. Then the other thing I wanted to talk to you about, because of that and the positions I had and that, was a number of times I was the first-on-the-scene at projects. And for instance, Enewetak. I went out there on the island. I was the first health physicist to be sent out there before we got started on the actual cleanup. And we established an office, along with the rad-safe contractor who I was working with, Eberline [Instrument Corporation]. Eberline had representatives there and we had people there, and we set up procedures for the radiological safety program on the Enewetak Atoll. What we would require people to do and how they would do it, and wrote procedures. And we spent a lot of time getting the facility ready to receive people *en masse* to do work. So I was on a number of operations on Amchitka, when we went back up for reentry. I was the government representative for the RADSAFE, [radiological

safety], and we set up procedures and decided what we would do and what we wouldn't do in cooperation with the contractor. And most of those were very enjoyable and were not difficult, because they weren't established programs.

Right. You came in and established them.

Yeah, we established them. And at Johnston atoll, we did that with Eberline also, the same contractor. Eberline was a good contractor. They didn't have any workers at the Nevada Test Site. They were out of Albuquerque. And so we did a lot of that kind of thing, setting up procedures, and that also happened in the Colorado Plowshare programs.

And so essentially, you saw a big difference between coming into a project that's already going or situations that were already established, trying to change procedures—

Versus setting up programs.

Yes. Which I guess makes sense because—

Yeah, it would, because they were there trying to decide what to do, too, and we all put our heads together and tried to come out with the best we could.

Oh, let's see. What else do we want to talk about?

Well, I'm just curious because you've had so much to do with the way that we handle accidents and spills and that type of thing, locally what types of things went on that you responded to? Was there anything that impacted the Las Vegas area or the surrounding areas?

No. We never had anything that strictly impacted anybody. We had a few incidents, most of them minor. We had a truck sitting in a casino lot that had radioactive placards on it and people were concerned, somebody was, and called it in. And we went down, and the truck driver had parked his vehicle there and gone in, I guess, and went to bed, had a drink, or whatever he

[00:35:00] did, ate dinner, gambled, and went to sleep. And in the morning he got up and got in his truck and took off. Of course, he had a little bit of a delay. He had a notice on his vehicle.

Bet he was surprised.

In those cases, why, we worked with the state and local rad-safe people, and with the local emergency response organizations. I worked very, very close and very intently with the State of Nevada and their emergency response capabilities and the Civil Defense capabilities and the local rad-safety office and emergency response office, I worked with those also. So we had very close association and we were involved in quite a number of exercises and helped them put them on. We had one exercise out on the highway coming into Las Vegas of an accident with a couple of vehicles with a truck involved, and a fire, and a highway patrolman. And everybody acting, and we had a gentleman from the test site who was a security guard pull up and turn into the road, off to the side of Highway 95. He'd seen me there and he came over to me and he says, `Layton, this is *really* a *mess* you got here.` He says, `Do you need some help?` Of course, I had to let him know it was an exercise. He was surprised at the realism.

So generally when you do these things, people don't know that you're doing exercises.

No, the general public didn't know. The only people that knew were the top dogs—maybe some of the responders knew and some of them didn't. The way we did them, we would call them and say, hey, there's been an accident. You know, we would work with the state and we'd do our networking with the guys that *knew* about it, but they would turn it on to respond. But they were always told that, `This is an exercise.` So the guys responding knew it was an exercise, but they didn't know what kind of problems they were going to encounter. And like I told you earlier, we used real radioactive materials at times. And they used instruments, and they knew it was a radiological incident, and [that] there were people out there critiquing and grading them.

We had people dressed in a special jacket that everybody knew they were a judge. And then they had big critiques afterwards. We did a lot of training. And we had aircraft accidents. We had an aircraft accident in a park down here in Las Vegas, where we even brought in a part of a fuselage and laid it in the middle of the park, and they had all kinds of people responding, including our RAT team. So there were big-scale exercises. There were county exercises; actually, they were orchestrated by the county, some of them were, and we supplied everything we could supply to help the county or the city who wanted to put on an exercise of that type. And I worked in the discussion part of them, in the early part. We met with them and planned all this out so that everybody knew what everybody was doing. The first people we started training in the RERO, [Radiological Emergency Response Operations], was the Nevada Highway Patrol and the local police and the local fire departments. We got started with our own people in the City of Las Vegas, and we branched out throughout the state. At one time, every highway patrol car in the State of Nevada had two radiological instruments that had been calibrated recently and the patrolman knew how to respond to a radiological accident. And I don't know where this program is at this time. But there are little kinds of twists in it. The State of Nevada at that time, when we started that program, didn't have any capability to calibrate the instruments. They didn't have the money to hire the person to do it, they didn't have the facility, and so the Department of Energy took on that responsibility. We calibrated their instruments and issued [them] to them, sent them by mail to them, and traded them out, kept them calibrated.

And they don't still carry these.

No, I think they still do carry them, but I'm not sure who's doing the calibrations.

Right. It's not statewide.

Yeah, I think it's still statewide. The State of Nevada is running the program, though, underneath the state emergency response group. They were able to get funds and they now have a calibration facility and they do their own calibrations. But we even provided them carrying cases—when the Civil Defense **[00:40:00]** first put out these instruments to everybody, they were in a cardboard box, and there was two instruments in each cardboard box, a high range and a low range. The highway patrolmen had had some of those in their vehicles earlier and they said the instruments just got beat to death. So we bought them an aluminum suitcase with sponge rubber inside of it with cavities built into it.

Wow. That's pretty fancy.

Well, that's the only way to protect a delicate instrument when you're going to carry it in the trunk of your car.

Right, and they do get a lot of mileage.

And they run over rough roads occasionally, too, in their pursuit of evil. So we, as the government, in my program did provide them with these suitcases, and every patrol car in the State of Nevada had one of these whenever he was on the road. And we pushed that program for nationwide, but I don't know how well they did in other places. I don't know. Anyway, we had the people educated. It's been a national program for some time.

Have the rates of accidents, gone up or gone down?

No. There are accidents that occur. They call them RAM [radioactive material] accidents in the DOT, and there are accidents with haulers transporting RAM that do occur with some frequency. I don't know what rate it is. They've never had, as far as I knew, a public individual injured due to a radiological material involved accident. I'm not aware of any. At least when I retired, there were none. And we had had some pretty good size accidents. We'd had places where the

radioactive materials were spread around on the highway. Once we had a truck coming down through Nevada that had a wreck, and we flew a member of the RAT [a REECo member] up by helicopter to the scene. The boxes were still maintaining their integrity and there was no spill of radioactive material. The one I told you about earlier, the truck fire in Wyoming, there was no *release* of radioactive material. We were lucky because the radioactive iodine that they normally carry wasn't being carried when the truck caught fire. They had just this one radioactive source, and they're built to withstand something like a fire. They're small, and it's almost impossible to break them open to scatter the radioactive material, so it was intact. We built a self-constructed shielding thing out of sand and a tub, and then a small can in the center. We put the little source in a tin can with a lid and then buried it in sand in a washtub. It worked. Reduced the radiation level so that we did not have problem with moving it back to where it ought to be at their lab in Laramie, Wyoming

That's good. So just by doing that, that reduces the radiation level and you can transport it?

Yeah. I don't know of any major release of material. There was one accident that occurred with a yellow cake spill. Yellow cake is refined uranium ore that I spoke about earlier I think, and we had an accident of a shipment of yellow cake itself. The cakes were in boxes, being transported, and as I remember they cleaned up the spilled uranium ore area with a vacuum cleaner.

So knowing everything that you do, and having had all these experiences, do you, ever worry or does it just ever creep into your mind that there is potential for a bad accident or something that can't be contained? Or do you ever see it as dangerous and think, well, we've got all these procedures and we know how to contain these things but still this is really dangerous.

Well, I think there is a potential for a bad accident. That has become lessened. The DOT **[00:45:00]** shipping regulations require quite a bit of protection in shipping containers and it

would take an unusual-type accident to bust open a container to cause dangerous radioactive materials to be released. Liquids are shipped inside of sealed cans, just like your canned vegetables, with absorbent material around the can to absorb the contents of the vial of liquid that you got. Usually the quantities are very small. And usually the quantities of radioactive material, in relationship to the size of the container, is also small. Even for fuel elements that we have concern about being shipped, they're inside a *humongous* size container. And so it's a small package in the center of this great big steel shielded container that if you ran a bulldozer into it, it wouldn't break open. Now, if you were able to shoot a rocket, like the Iraqis are doing into the sides of trucks, those bombs and that kind of thing, you might be able to bust one open. I've never seen one busted open. DOT requires each type of container to be thoroughly tested.

But it would take something pretty extraordinary to get one open.

It would be very extraordinary, to free the radioactive materials to a hazard point. And then even if it *does* get out of the container, it's my belief that things can be cleaned up. Radioactive material spread on the ground can be cleaned up. Vacuum cleaners will clean them up. Sweeping will clean it up. Just ordinary cleanliness will clean up things, too. You can isolate the radioactive material from humans. And those kind of cleanup jobs go on all the time. And it can be handled. It's not a—I don't know how to say this. It's not a type of a scene that you can't handle.

I think sometimes the general public have—we have so little information about that that I think people tend to—you have fear of something that you're not familiar about.

Yeah, I think so too, but the thing that you have to realize is that most radioactive material is just like dirt. What do you do when your kitchen gets dirty? Why, you clean it up. And if it's giving off some rays, the smaller the particles, the smaller the amount of radiation goes along with it.

And if you *did* have to clean up something that was fairly radioactive, like a radioactive source, which we've done—I've never picked up any with my hands. I know better. I mean you use a pair of tongs, even a short pair of kitchen tongs. Just get your hand away from the source. And you can pick it up and take care of it in a short amount of time, and then you're free of it. So that's not anything that you should get too excited about. I don't know how to say that. Just stay calm and collected. Use knowledge to take care of things. And I've cleaned up a lot of messes, radioactive ones.

Sounds like it. So just shifting gears for a minute, last time I think you mentioned that you worked on some Plowshare projects?

Oh, yes, I did work in the Plowshare field. It was two or three events that the United States government had decided to develop the peaceful uses of nuclear explosives. And these were used—one of the early ideas in the Plowshare Program was to dig trenches or ditches or harbors. Sedan, crater which is that great big hole on the NTS. That idea was a precursor to test the ability to remove the earth and make a harbor like that. And they were going to even do one of these in Alaska, to **[00:50:00]** make a harbor up there at, oh, that big city.

Anchorage?

Anchorage. Yes, out of Anchorage. Then the president seen the folly in that because every time they did that, there was always a release of radioactive materials, airborne and in the water and earth, and he decided that he didn't want to do that. So those programs for digging holes were discontinued.

Well, then they decided that we could stimulate the methane gas underground in what they call the tight gas sands deep in the earth. They could stimulate natural gas production by shooting off some nuclear shots underground, and using that space or cavity that the shot made

deep underground as a cavity to gather the gas, and then drill back into that cavity and make that a reservoir of natural gas. And it would continue to be a source of gas even after you emptied what gas had gone initially into the cavity—it would continue to be a source of natural gas. And so Gasbuggy was the first one. That was near the Four Corners area of New Mexico, Colorado, Utah, and Arizona.

When was this, roughly, what time frame when they were—?

In the late sixties. [actually 1967]

OK, for the gas.

Yes. And maybe very early seventies for a while. And one of the problems with it was—well, let me go back and explain. We went down into this cavity. Rulison [1969] was the first one that I was involved in, and we drilled back into there and got into the top of that cavity. We ran the gas through a system just like they do when they get oil, and the gas brought up with it a lot of water and/or paraffin. It turned out that the initial methane gas that came up had a lot of tritium in it, because that was a major component in the explosive used. We actually burned [or flared] that, and of course burning it doesn't do anything to the tritium. But the EPA [Environmental Protection Agency] monitored the plume back up on the mountain where we were at by aircraft, and within a mile or two miles of the plume source, [from the stack] they couldn't find the tritium in it at all. It was lost in the natural tritium of the atmosphere. The well was tested for over a month or more. We flared gas out of that, and from *my* viewpoint, it was very successful. The amount of tritium in the gas was reducing with time because we got the highest concentrations out first and that continued to go with the tritium concentration becoming less and less through dilution by clean gas. The Nuclear Regulatory Commission [NRC] was involved with it, and in order for anybody to *use* the gas, the NRC had to approve it. We had a man who

was running an industrial business in Colorado who wanted to buy the gas. He was willing to spend the money to put in the pipeline over the top of the mountain to the other side of the mountain where he had his plant that he wanted to use this gas. And the NRC wouldn't allow him to get a contract because of the small amounts of tritium that it had in it or would have in it.

I don't know what was going on, really, because I didn't get involved in the political side, but I know that before that occurred, we did the second test in Colorado, which was called Rio Blanco, [1973] and it was an effort to put three shots, one above the other, to make a big *longer* cavity. And when they fired that, we had a problem: it *didn't* form a big long cavity; it formed three separate cavities. And in fact, the layers in between the three shots—there would be two places—they were more compacted than they were before, from the blast causing compaction. And when we drilled into the top cavity we didn't get *anything* out of the lower two cavities. What they had done is put some chemical tracers in each of the shots so that they **[00:55:00]** could tell which gas cavity they were getting or which shot was responsible for the gas we were getting out, because we drilled back down in the top cavity first, hoping to get *all three*. Well, we found out that we only had the chemical tracer for the top shot, and there was no connection with the other two cavitites, not even a drip because it was so tight. So then they tried to drill into the second cavity by coming back up, going outside original emplacement casing, and using directional drilling. But they had a lot of problems with that, in the formation that they were in, and the drill bit fell off—not "fell off," but the angle of drilling fell off, and they entered the bottom of the third cavity instead of the top of the second hole. And not at the top of the third cavity either. The way we found that out was when we started to flare the gas out of the hole. We had the tracer for the third cavity and so we knew we were in the third cavity, and we never *did* get into the middle cavity. We were into the bottom of the third cavity rather than the top. That

resulted in our getting lots of water out of the hole. And being down in the bottom of the hole, we were getting some of the other fission products other than tritium that were in there. In fact, cesium-137 [Cs137] was one of the major isotopes that was coming out of there, and Eberline had to stop flaring. We stopped immediately when we discovered that and we—

And that's pretty dangerous?

Well, not really dangerous. It's something you can handle. Again, it's an isotope you don't want, OK? Not in the gas or in the water which had to be separated and steamed off. And what we did was we stopped the operation immediately and designed and built a machine that would remove the cesium 137 out of the flow. So all the gas and water that came up went through this apparatus where it was separating and the gas was flared after that. Well, we had to dispose of the cesium 137 contaminated water, so that became a problem. We ended up putting that back down into the deep sands, the tight sands, in another well that was nearby. And then when the Nuclear Regulatory Commission wouldn't let CONOCO [Continental Oil Company] sell that gas to anybody, CONOCO pulled out of the whole program. So did the other oil companies that were involved. And it died. The program died. Immediately. So both of those locations were plugged back and surface areas were all cleaned up. And EPA and DOE revisited them here recently, I guess, since I retired. I don't know what the outcome was. I don't think they found much because as far as I'm concerned, we cleaned it up pretty good before we left.

Yeah. Usually after a cleanup, there's little in areas not considered hot.

One of the things that came on was the non-radioactive hazardous material control, which we didn't even look at, to speak of, when I was there because we weren't responsible for it; somebody else was. And when they revisited these sites in these recent years, they looked very hard at the hazardous material disposal and control, and have straightened that out wherever

there were problems in all those sites that I'd visited. I know they found some chemicals at Hattiesburg, Mississippi. It was in a dump back off in the wooded area. I had been to that dump but I didn't see anything that I knew was a hazard. Also, it was buried when I was there but by the time of the revisits rain had uncovered the containers. And I wasn't looking for HAZMATs.

Right. Not your area.

Yeah. Though they've gone back in and cleaned all those up where they can and they've brought all that stuff back to Nevada and put it in the state approved disposal channels and trenches [not at the NTS)]. We have HAZMAT **[01:00:00]** material that's taken to a special EPA-approved facility in Texas where it's disposed of by destroying it. Burning, I think. It's an incinerator.

Now, does this work the same way when we bring all the radioactive material back and we bury it here, basically, put it in the trenches?

Yes.

It neutralizes the waste?

No, it doesn't neutralize anything. It just puts the radioactive and hazardous materials [called Mixed Waste] out of reach, and it's in a location that is—the trenches are thirty feet deep, covered with four feet of clean soil that brings the cover up to the surface. And then another four feet is put on top of that, above the surface, so there is a mound on top of the burial, wherever there are trenches. [It is] the approved technique which we developed ourselves and the state approved it after they seen what we were doing.

We've had to go back in and put some—like with the hazardous material disposal at the Nevada Test Site in the early days before they had the incinerator, it was buried in some trenches. And we have gone back and built a monitoring system surrounding those, according to state and the EPA requirements.

So just in your opinion, I guess I'm curious what you think after all of that stuff sits in the ground for however long we're going to have it sit there?

Well, it'll sit there forever, as far as *I'm* concerned. The government has the responsibility to make that ground identifiable and marked so that nobody'll dig into it. That's the only *hazard* I see. I told you about studying the ground water problem, and we don't think it's going to get into the ground water *anywhere* from the Rad-waste and Mixed Waste Management Sites [RWMS], even if it rains like crazy.

So you think it's pretty well contained.

It's well contained in the earth where it is, unless somebody goes in and digs it up. So there is a responsibility to make sure that the land—and you can talk like they're doing recently here, you know, there's articles been in the paper; instead of contaminant for three hundred thousand years, we did the radiation calculation for ten thousand years, and we proved that the computers calculated that and said it would be safe for ten thousand years, and now the state wants it for three hundred thousand years.

Right. That seems almost unrealistic.

That's a political statement that I refuse to address. It's out of my mind. I can't think that far ahead.

That, to me, seems unfathomable, to project that far out.

I don't see any reason why. It's been in the ground. The ground has been like it is for some of these places for thousands of years already. And why anybody would go out and dig in the middle of a desert area, hopefully that will be posted, you know, and under somebody's care. There'll probably have to be a caretaker. The government is going to be responsible for the Nevada Test Site for many, many, many, many years. Three hundred thousand years, if we all

live that long. There's other people arguing, when you get to three hundred thousand years, you get to the point about the people who are arguing about the earth being destroyed in less than three hundred thousand years, and we're going to burn up in the sun or something like that, whatever.

Right, if it even goes for that long.

And I don't know.

I'm just curious, because listening to you talk has been really informative and enlightening in this area for me, but what does it do to the actual earth; the actual earth that it's in, that surrounds it?

Well, it doesn't do anything to the earth. Let me give you an example. In the diamond mines in Africa, they were digging away happily, finding diamonds, and then the radiological people came along and they got interested in these mines and the diamonds, I guess, or the mines **[01:05:00]** mainly. And they went down in there and they discovered radioactivity deep down in the earth in Africa. Not only did they discover what *we* find in the U.S., like uranium and thorium—which are old, old isotopes that have been around for, you know, six million years is uranium's half-life—and they found relatively young fission products deep down in the earth that have come from nothing except a fissioning scenario. Something, probably the uranium in the earth, fissioned down in there.

So this stuff happens naturally.

Yes, so deep down, and this has been documented heavily now and you can get a book out of the library and read about it, about the fission products found in Africa deep down in the diamond mine, which *proves* that the Earth had a *chain reaction* of uranium down there, and it

consolidated and it achieved a critical mass. And the first reactor that man *knows* about now occurred in the ground underneath Africa. Millions of years ago.

Right. In somewhat of a natural process.

In *a* natural process, yes. I mean there weren't [any] mines down there or anything man-made. The Earth had its own—well, the sun is giving out heat from a nuclear reaction, so we have nuclear materials on the sun itself, and it's giving off gamma rays and protons and all kinds of energies besides heat, which we use. The ultraviolet is coming from there, and that's how we get sunburn. And so man is finding out more and more, that radioactivity is a part of our world. And it's *been* a part of our world since before man first started to live on it. And maybe even in higher concentrations than it is today, because radioactivity decays with time. When it decays, it seeks to go to a level of rest, which means there's no excess energies in the atoms, and therefore they're not radioactive. And so all the atoms that we've generated and all the atoms that we've found, radioactive atoms that we've actually found, they're all seeking to become stable isotopes. And the word "isotope" does *not* mean "radioactive." That means a whole family of different types of the same material, but at different energy levels with different things [radiations] coming out of it. So there's nothing happening to the earth when it gets radiated. It heats up, maybe, because of the energy of heat. Also, radioactive materials like plutonium are used to make electric generators, the heat off the plutonium. It does create heat, an internal reaction does, as one of its byproducts. So there's heat, and it's no different than a volcano heating up the Earth down there, too, see? So what does radiation do? Radiation may sterilize an area for a while. If you're talking about a million years. There is one exception and that is neutron bombardment of the earth will a few short-lived isotopes through neutron absorption.

[Do you] think it'll regenerate?

Well, the Nevada Test Site is regenerating biological life where we shot weapons off above ground. And it's just part of nature that we have around us that we've now become aware of it. I don't understand why people are so afraid of it myself. And part of the reason they are is because there's a group of people, particularly the news media and the television, who wants to make radioactivity a big bad, bad, bad actor; sensationalism!

I definitely think that you're right about the media, and I think, to me, I don't know if you agree, it would just seem like a combination of a lot of—there's not a lot of awareness on the part of the public, or education about it, and then combined with the stuff that the media puts out there and how it portrays things….

Well, you know, what people seem to forget is that in the scientific field, we know more about radioactivity and its processes and where it comes from and its behavior than *any* other **[01:10:00]** hazardous material. We have *volumes* of documents on radioactive material, and we have very *little* on HAZMATs. We're getting more. There was a time when—

I'm guessing that's another concern.

Yeah.

Let me just stop you right here so I can switch out the CD.

Sure.

[01:10:21] End Track 2, Disc 1.

[00:00:00] Begin Track 2, Disc 1.

OK. Baneberry.

Baneberry was an event that Lawrence Livermore Laboratory conducted up in Area 8. And there had been some oversight, and I mean by oversight, not looking over their operation but something they missed. They had not discovered that there was a fault very near to the shot site. I

don't know the technical background of it. It may have been known by some people. But their conducting of the event did not take the fault into consideration. And I think they didn't know about it themselves, due to their oversight. When the shot went off, I was not there. I was here in Las Vegas.

Did you go out there?

Yes. My cohort who I'd been working with at the test site was the federal health physicist on the test—that's something I should talk about, too. Let me back up a little bit before we talk about Baneberry. The presence of a health physicist in the control room at shot time was not, when I first came down here, was not a regular thing. Don Hendricks, the Director of Heath and Safety [a health physicist], when he first came here had invited himself somehow, or got permission, to be present in the control room for shots as they were conducted. But we did not have an established position. And one of my first experiences, I think I told you about, I was invited to go with Don up to the test site to sit in on a shot. That's when I won the 'collapse pool." But anyway, we didn't have a position. We were guests. We didn't have a position of authority to say anything at that point. I don't know how much power Don had at the time, because I was new and green. But with time we became, and Don was responsible for this along with somebody "upstairs," we became a part of the panel that sat across the back row in the Testing Control Room, and we had a desk assigned to an Atomic Energy Commission Health Physicist. So we were present there as an advisor to the Test Controller in the field of health physics, and this was another new area that we expanded into and that I was part of.

But this was not initially. This evolved over time.

It was not initially. This evolved over time, and when they built the new CP [Control Point], we got a table and we had a member present there. And we were the interface between the test

manager—the Test Director is the representative of the laboratory, and the Test Manager was the government representative and it was an AEC or ERDA [Energy Research and Development Agency] or DOE employee—and we were the interface. The Test Manager didn't talk directly to REECo and the—well, mainly REECo. The onsite RADSAFE people were REECo, and they had an office right above us, in the balcony in the Test Control Room—they still have it today—and they watched everything through glass windows.

Like a sky box?

Yeah, a sky box, and they're in contact with all their people in the field, and they control *all* the movement on the field, in cooperation with security. So we were the contact in between the Test Panel and the REECo supervisors. If the Test Director or Test Manager wanted something, they would turn around and tell us, say, `Layton, get some monitors over here,` or, `Get an airplane. Get a RADSAFE plane up,` or something like that, and with time we even became involved with the EPA that sat in **[00:05:00]** another room in the CP building. EPA had a representative on the Test Panel at the table with the Test Manager. And then down at the other end of the table was the laboratory Test Director. And there was a medical health man, too.

It sounds like there were a lot of people that were present and involved when a shot goes off.

Yes, there were; every shot. Including people in Washington, D.C., because before you shot any shot, there was an open line and a man *on* the phone talking to Washington, D.C., for every event.

So how many people are involved in the actual procedure to do a shot?

Oh, quite a few, because there was a room next door to us where the test controller people had an office, and *they* were involved in it, too. They were DOE people, too. There's quite a few people. Oh, there's a *lot* of people. I should take you out there and show you that or something. In one

room were the weather service with four or five people, and in another room was the EPA, and they had maybe five people, five to ten, and they were in contact by shortwave radio with all their people in the field offsite. There was a security rep and he was in contact with WSI [Wachenhut Security, Inc.] supervision, who controlled 10-20 guards in the field. And REECo was in contact with all their monitors and people necessary for the operation. For instance, on shot day, there was a man in the respiratory equipment shop, [who] stood by in case there was respiratory equipment needed in mass quantities. And they were in touch with him and they were in touch with the monitors and all kinds of people, plus their own people down at Mercury. And then there was a medical doctor there who was in touch with the people over at the hospital at Mercury. The EPA had their head people, talking to their head people. So there was a *lot* of people involved in every shot. And there was this *row* of advisors behind the big table, and we were elevated so we kind of looked down on them. And there was an Air Force person there, a REECo representative there, a health physicist, and a NTSO [Nevada Test Site Operations] man that was DOE people from down at Mercury.

Oh, so this was a pretty big chain of folks.

Yeah. Probably close to two hundred people involved. Sitting next to our station was a Sandia person, and then there was a security person, and then there was an Office of Public Affairs, OPA, and there was some other people there. Oh, there was a representative of Holmes and Narver, and Fenix and Sisson. There might even be more. But they were all sitting up there as advisors, and before any test was conducted, the contractor-type people had to agree that what the builder of that test had done, if it was within reasonable agreement with the plan that was published. They had to vote on that, and actually they signed a document after it was reviewed. There were pre-meetings also, and then there was this meeting, the main meeting, and then there

was another meeting that talked just about the device itself. That was a classified meeting. And I was fortunate enough in later years to get to sit in on some of the device meetings. We became concerned from the radiological viewpoint in that they were using materials that were highly secret, but they caused us a problem with monitoring.

The materials did?

Yeah, the materials that they were using. I have to be careful here. It's just that some **[00:10:00]** of the things that were being used were classified and still are today, but they caused a different type of response and preparedness for a response. There were even items that caused different types of isotopes to be born out of a shot. We got caught with the fact that there was radioactive gold involved, and we didn't expect that, and we couldn't figure out what isotope the monitors were dealing with in the field. So Don Hendricks went to the system and said, we need somebody in the classified meetings so that we know all the materials that are being used.

Sure. I would imagine that would complicate your job if you guys weren't—

Yeah, it did because, see, gold is an unusual isotope and the monitor in the field had never dealt with anything like that, and they're all different. So you have to be ready for those things. So anyway, we started to get access. See, that's what's interesting about the thing is we didn't step into it originally. Even though the system had been going for a while, the system wasn't complete. It was still being changed. It was dynamically moving.

The system of testing.

Yeah, the system of testing was evolving all the time, and the weapons themselves were evolving. So anyway, we just needed to know more, and so we got involved in more.

Well, going back now to Baneberry, the reason why I told you all that is to set up the story of Baneberry. Oliver Lynch was sitting in the government health physics spot during that

event. And when things started to come out of the ground, it came out of that fault just like a shade that you pull down from the ceiling, a screen? Well, it came up like that, just *ssshhht*, like somebody picked it up and lifted it up, and there was a line source, and the fire and the smoke was coming right straight up in the air in a narrow path.

[00:12:58] End Track 2, Disc 2.

[00:00:00] Begin Track 3, Disc 2.

OK, going back to Baneberry, and so Oliver was in that spot and was being asked to participate in it and was involved in the situation, was giving health physics advice to the test manager. And there were all kinds of things happening. First of all, which direction was the cloud going? Well, the thing split. The top half of the cloud went to the northeast; the bottom half of the cloud went to the west and went up towards Camp 12. [Drawing a diagram] Area 12 sits up here west of surface ground zero, and this is the Rainier Mesa highway, and Baneberry was right north, sort of where this road bends. It was up against the mountains that were right through here. And the top part of the cloud went off in an eastern direction, and then the lower part went up this way to the northwest.

Wow. Had that happened before in a test? Had the cloud ever split like that?

Well, yeah, yeah, that happened. But I don't—I better not. I don't know this for sure. There was a complete weather synopsis always made before every shot, just in case there *was* a release, because we had a lot of—it was a quite a long time before they learned to contain the tests underground, and so we had a lot of releases, and so we needed to know which way the winds were going all the time. And I don't know anything about the weather, what they knew and what they didn't know, not being there. Ollie [Lynch] was the guy that participated in the pre-meetings and was there for the shot.

But anyway, because of the cloud—wind blowing in different directions carried that cloud low to the ground in two different directions. Well, at that time, they didn't evacuate. They didn't stop people from staying in Area 12 camp. There were people there that stayed overnight and were living there. Some actually lived there. The miners actually lived in Area 12 camp. And security guards were back here [drawing on diagram] at the control point or just a little bit north of the control point at Gate 300. And when it started coming out of the ground, why, they had to get security people out here to handle people. It was security's responsibility to control evacuations, and since this cloud was headed in that direction, they said that it was necessary to get those people out of there. And the only way out of there—this was close enough to the road that this cloud had already been detected on the highway over here [indicating on diagram] from the low winds. This was very early in the morning, almost before sunup, and in the early sunrise time.

And so they evacuated these people westward, to up on top of the mesa, and the idea was to go over here and come back down this way [indicating direction on diagram showing Rainier Mesa Road and Buckboard Mesa Road]. And this way was in the EPA's hand because the EPA was sitting right out here [indicating on diagram], and what they did out there I don't really know. The problem came about because of workers. And so they started evacuating, and security guards and REECo monitors were sent up here to control this and make sure that they got everybody out of here and escort these people out, and then make sure they got them back out of there.

They did the job. They did it well. But the cloud caught up with some of these people **[00:05:00]** and some of the security guards became contaminated. They wore these fur-collared jackets—

Right, yeah, and it got into that?

Yeah, and it got into the fur on their jackets, the fallout did, coming down. There's an interesting story. There was a man sleeping in a trailer in the Area 12 camp, and he was missed, and he stayed there and slept the whole time. He had his film badge laying on the table next to him. When his badge was analyzed, he had less exposure than the guys who were running around outside.

Because he was inside.

He was inside the building and got missed. The cloud just went right over the top of him and around his trailer, I guess. And the guys that were running out here [indicating on diagram] that the cloud caught up with, they got slightly contaminated. And some of them were guards and monitors and were put on stations and weren't relieved right away. There were a lot of such problems that were handled OK, but there was a lot of problems *handled* with that, and so some of the guards had to stay. And some of them, when they got back clear down to here [indicating on diagram] to the CP, where the decon facilities were, and were monitored and checked [and they were probably monitored in the field and *sent* there; somebody monitored them, says, `Hey, you're contaminated. Report to the decon facility at CP-2.`] they were still contaminated. They had to take their jackets and whatever else and put the person in a pair of clean coveralls and send them home. And it scared a lot of these guys.

And then there was an electrician who was—there was a problem with an electrical device on a telephone pole sitting out here [indicating on diagram] and it was a generator or a transformer, like a transformer sitting on a pole. Anyway, they sent him and a monitor up to this location to do the electrical job, and he went up, and they were inside of a low-level radiation field. It wasn't bad. People got inside these fields all the time when they were working out there.

[I think I told you about driving with the U.S. Public Health Service through the middle of one of the contaminated areas, and that my meters, on the vehicle floor, kept going up. And they had people in REECo RADSAFE who made entries into contaminated areas.] Anyway, the electrician had a monitor with him and determined that he was OK and that his length of time would be OK. You can stay so long and get a certain exposure, depending on the dose rate.

So they went in and did this job. Well, the guard and the electrician—there's something else I have to tell you before I tell you this, is that leukemia is one of the responses that the body has to radiation. However, it takes around twelve years for the exposure to mature and become effective in the body. Well, within a year of their doing this operation, two guards died of leukemia.

Within a year.

Within a year or two years, yeah. One of the guards up there and this very electrician. Well, their wives sued the government for two million apiece, or two billion. I don't know what it was. Big money. And it went to court. What happened in court was the judge and everybody there practically, and the wives there, they were completely unfamiliar with radiation and its syndromes and its capabilities and all that. So the DOE—and I even went to court one day, but I just sat beside my lawyer to keep him straight. And REECo sent up one of their REECo supervisors, Arden Bicker, who was a topnotch young health physicist. [In fact, he received on-the-job training through me in Idaho long ago and far away.] He gave a complete course of radiation; what radiation is and how radiation behaves and on and on, radiation syndromes—and we had the doctors, and everybody gave a complete training program to the judge and everybody attending the trial. In the end, **[00:10:00]** they could not prove that the radiation exposure—oh, and then the film badges, of course, were involved, and they were all less than maximum

readings. They were way down. I mean you're allowed something like 3 Rem [Roentgen equivalent man] or 3,000 millirem [mrem], and these guys had like 100 or 200 millirem. Which is nothing.

Significantly below the level.

Yeah. I had approximately 3,000 myself up in Idaho. Two point eight, 2,800 millirem in my two entries that I made in the reactor in Idaho. So anyway, these are not dangerous levels and will not cause leukemia. Historically, it's not *known* to cause leukemia. *High* levels are known to cause leukemia, and these gentlemen did not receive levels considered dangerous. Therefore, the causal agent of their death was not *proven* to be the radiation. And so they were denied their claim, the two women were. That's pretty much why Baneberry made the history.

From those two?

Yeah. If there had been nothing said about it—or it wouldn't be interesting if those two women hadn't filed on this. But there was a large contaminated area near the Area 2 camp. We had to decon lots of this area up there, clean it up. We had to wash buildings down with hoses. We had to clean up roads. We had to rope off areas that we didn't want people in until it decayed away.

How long did that cleanup take?

Oh, golly, it took two or three months. We went into the Area 12 camp and cleaned. They cleaned everything up in Area 12. They surveyed everything. It was a *big* expense.

I have just a couple of questions. One, just wondering what things were like by the time you got out there.

Oh, OK, when I arrived on the scene. Ollie spent the first week or week-and-a-half there. I don't remember exactly. And then I was sent out to relieve Ollie. So I was the second government health physicist to be out there. By that time, they were making the reentries, and I think I was

there when this guy made his entry, the electrician guy. I wasn't there when the guards were involved [that was on Ollie's team]. And we were doing decon up in there, and my position was just to coordinate the health physics. I sat at that table in the control room for the next week. And it was routine procedures that we sort of do after—every test that we conduct, even in the tunnels particularly, we go back into the tunnel; we had controlled areas and we had areas you had to wear anti-C clothing, and areas you had to wear respiratory equipment. There were routine entries made into contaminated areas. People wore dosimeters, and monitors controlled what was going on and watched what was going on and monitored new areas that they went into and made sure people didn't get overexposed. The monitors kept track of people's exposures. They also wore TLDs [thermoluminescent dosimeters] and they were checked. When you go into a radiation area, you wear a little dosimemter pencil, the little yellow thing over there on the display in the reading room, which measures radiation as you receive it, and you can hold it up to the light and see how much you've got. And you can, of course, use time, distance, and shielding to reduce your exposure. You can figure out—if you got a Geiger counter, you can take a reading of the millirems per hour or rems per hour and multiply by the time that you've stayed in there and come up with a calculated estimate of dose. And then your film badge TLD you're wearing measures it so that it's made an actual record of an actual exposure. And those are watched very carefully. Usually when something like that happens, the dosimetry department is put on round-the-clock operations and they have to change out film dosimeters every eight hours or less, depending on the level of radiation that you're working with. In some cases, more than one film badge is worn. We had a belt designed that you wore a belt with film badges all the way around because when you go into a building, like **[00:15:00]** the SL-1 reactor, the proximity of the wall to you, if you're working on a pipe the wall could be exposing you from the back, which the

badge hanging up here on your chest probably wouldn't really see what you were getting in the back.

So you'd have to keep checking from time to time.

So yeah, they worked out a system by putting a belt of dosimeters around everybody and then figuring out how they were going add them up. All kinds of dosimetry can be used. We have finger badges that have dosimeters in them. We have neutron dosimeters. We have gamma dosimeters.

Wow. So there's a lot of devices for detection.

Yeah, all kinds of safety procedures to—yeah, it's a big field and process, handling the safety of personnel.

Yeah, and important. So in your opinion, Baneberry wasn't necessarily any worse than—

It wasn't any worse than a tunnel reentry. Absolutely it wasn't.

All right. But how would—It just seems, interesting that both the guard and the electrician had leukemia within a year. What's your take on that? Because I think a lot of people would argue, they're both on the site, they're both at the accident, they're both exposed, they weren't sick prior, and they were sick within a year.

Well, I really don't know because I'm not God. But in all my studies and everything that I have read and learned about the formation of leukemia, it just is hard to believe that it was caused by that exposure, unless again, there are these people that you were talking about that were so close to the edge of having leukemia themselves that it tipped it over the edge. But I don't know if I really believe that or not either.

Or maybe they just had been exposed to other things prior to that.

There was an extremely in-depth study done. We brought people from Washington and from Oak Ridge [Tennessee] to participate in this big problem and got involved in it. They were there to help Arden Bicker [REECo], and the people with more experience, you know, and top level health physicists who came to work on that problem. And the final outcome was that there was just not enough information to say that radiation caused it. And so they were denied.

I have a very tough time right now with what our government's doing. They've passed a law here now that if you got any sign of radiation exposure in your history, that you can collect money from the government. See, to me, that's really bad news.

They've got some fairly stringent guidelines in place.

Well, the guidelines became more specific not due to physical damage to people but genetic damage. And they were more concerned about the genetic problem and passing it on to future generations than they were the about damage to an older person. Older people, like most of the workers—I can't say "most" maybe, but many of the workers are middle-aged workers anyway, and there were young workers there, too. I think—there were not any young *kids* out there. Earlier, you had to be over eighteen to even get a job, or over twenty-one to go to work at the **[00:20:00]** test site, so—and they won't even let people under fifteen on the test site today, for lengthy periods or off the bus. They do take them on tours now. But the level of radioactivity and the threat or potential for a radioactive cloud has gone away, too.

Oh, from what I know, I have a hard time giving these people any credibility that their illnesses are caused by radiation—and then I've seen so much, what do you call it? Where people—anything that was wrong with them, they made a claim. I've seen people with lumbago, with fingers—born with fingers partly gone, or some kind of illness and they all want to blame radiation exposure for it and collect some money from the government.

Do you think any of those are legitimate, that people who spent time out there for years, and over time—?

Well, there probably are some legitimate. You need to determine what their exposures were and study to see if they have had other types of hazardous exposures. But to give a blanket nationwide reward to anybody exposed to radiation is bad thinking, in my mind. I just can't believe that.

Why do you think they've gone to this?

Maybe it's because I'm one of the guys that's not got sick.

You may not be the norm. You just might be the superman that worked out there.

Yeah, but—and the documented data, if you read up on it, you know, the Health Physics Society puts out a journal which has been coming out for years and years. I have two shelves in my home with documents from them, about seven, eight feet long that have all this—as people have documented and written about this, and studied this, and experimented with animals and everything, and like I said earlier, we know a lot about radiation, but it's very difficult to get the general public and even the people involved in a court case to accept what the health physicist has to say.

Which you think wouldn't *be because you guys are the officials—*

Yes, well, we are the experts, you know. But it's very difficult to get accepted. Even our own lawyers here in the DOE questioned me when we had a guy that had cataracts. I looked into his case, and he was a welder, and welding causes people to get cataracts. And I went on the side of the man making the claim, that he should get his eyes fixed by the government. This was in the early days and he needed an eye operation.

And the lawyers didn't want to give it to him, I guess, because they came to me and they said, Who do you think you are? Are you a medical doctor?

And I said, No, I'm not a medical doctor.

[And they said], Then why are you making a statement that his cataracts were caused by radiation.

I said, Because I'm a health physicist, and that's my business. And you guys can say what you want to say. I think his cataracts were caused by radiation exposure.

Either welding or working on radioactive items—he worked on radioactive items also. He had to go in and cut and weld steel that was already radioactive, in the tunnels. So he got not only exposure from the welding operation, but he got exposures up close from the steel that he was cutting and the pipes that he was working on. So I just thought he had a justified case, that's all. So who knows?

But anyway, it's still a growing trade, health physics is, and not very many people read the health physics journal.

Not very many people read the journals outside their field, period, I think. So again, just from **[00:25:00]** *previous experience, it almost sounds like that this job, this line of work that developed, and I know you guys have been fighting for an accepted spot, so to speak, particularly within the test site, within that community, within that industry. Is there sort of an unspoken—I don't want to say hierarchy, I don't think hierarchy is the right word, but just an unspoken acceptance of what people deem to be—not necessarily good jobs but credible? It seems to me that you would have one of* the *most credible jobs, but because you came into this community that's already established—*

Trying to establish this credibility. Well, it was difficult. And one of the problems might've been, for myself, was that I was never certified. There is a certification that you can get in the Health Physics Society, become a Certified Health Physicist, and I never did that, mainly because I never had time, and also, I guess, I probably had a small mental problem. I just missed being certified by the grandfather clause by about two months, so I was always a little disappointed because I never got into the certified group underneath the grandfather clause. To get certified you had to study and take a massive test which had mostly to do with reactors more than it had to do with the kind of work I was doing as a government health physicist. The tests were not designed to fit that category. In later years, they started getting environmental health physics tests and they relaxed it a little bit so that you could get an environmental health physics certification rather than a reactor certification. And the other thing was, they required certified health physicists in the reactor business. NRC pushed that kind of stuff and everybody was to be certified, where in the field that I was in, in weapons testing and environmental monitoring, there was not a big push for that for a long, long time. And then I was too near the end of my career to bother with it.

Sure. In your opinion, particularly since you dealt with all the procedures and the safety procedures, do you think things happened that maybe didn't need to happen? You talked about Baneberry a little bit, where they weren't really aware of the fault line that was so nearby. Do you think other accidents that happened or the sort of things that went wrong happened just through careless procedures or things that could've been avoidable had there been any more responsibility or procedures in place?

No. I don't believe that's true. There's not been a lot of accidents within the field, and there's not been a lot of deaths related to exposures of radiation. And I think if you look at the total record,

there's fewer deaths within the nuclear field than there are in other fields, like oil well drilling and shipping yards and all those kind of things. We've not had a rash of incidents. Had a lot of claims, but I really think it's related to the psychology aspect of everybody being afraid of radioactivity. And if they were educated in radiological aspects, we wouldn't have that problem. **[00:30:00]** And that problem of educating people is one of the reasons why I was interested in the training aspect in my total work history, and training the responders. It was amazing, the difference we had seen, you know. Early days, we'd get calls from highway patrolmen or police that'd say, get somebody over here quick. We got radioactive material here. And they'd be all excited and that. And after we got these people trained, why, we'd hear about it or they'd call up and say, we had a little incident over here and we took care of it.

So they were able to function more in their field.

Yeah, and the need for radiological assistance actually became less as people were taking care of their own situations.

One of the things I wanted to briefly touch on, too, was the waste management program that I was in for eight years. And it came on in the last eight years of my work for Nevada Operations Office. And when I got into it, we were in the throes of starting to receive radioactive waste from government facilities throughout the United States. And outside of the United States, as a matter of fact. We received waste from Johnston Atoll from testing. Wherever it was associated with government-produced radioactive materials or government nuclear tests. And so Washington and everybody got involved in this waste program, and the states became concerned, Nevada in particular, because we were shipping waste—and Utah, also, has received waste, too. They have a large waste facility in Utah, up by Salt Lake [City].

So there was a need to verify that the waste being shipped to our facilities was exactly what they said it was, and were they dumping other things in there? But I mean what do you do if you got a bunch of garbage going out? I know we all do this because I do it and I think everybody else does. A battery or two in the garbage can, there's no problem, but it's not supposed to be done anymore underneath the new HAZMAT. And so it's a common thing to know that somebody might have thrown something in the waste that really wasn't part of that waste originally, or wasn't meant to even go in there, but it was an easy way to dispose of it. Anyway, it's just going out and be buried in a trench anyway.

So what we did was initiate a program of certification. And my first job with regard to that was to hire some good health physics people. And Joe Fiore pushed me. And so we started getting a crew, and by the time we got to the middle of this thing, we had to develop procedures ourselves and develop these programs. And so this office developed a certification program that would allow other people to ship waste to us and certify that it was what they said it was. And we had to have a way to verify that, so we sent our health physicists to the contractor areas, to the generators actually, to the generators of this waste, to inspect their control of the waste itself and see how careful *they* were about putting the right kind of waste in the right barrels and properly containing them and properly shipping them here to us as a certified waste package.

That was quite a program. It became a very big program because we traveled all over the United States. We've had shipments from as far east as the coast, East Coast, Massachusetts and **[00:35:00]** places out there. We've had waste shipped to us from Spain that belonged to us when we lost a couple of weapons over Spain and they were picked up by the Air Force and ended up at the Nevada Test Site. We've had waste come from Johnston Atoll. I shipped those myself. I went to Johnston Atoll and shipped those back. That was during part of my time, I was loaned to

United States Army as a health physicist and conducted cleanup operations on Johnston Atoll. We tore down buildings that were contaminated with plutonium, put them into Sealand transportainers and then shipped them to the Nevada Operations Office. They went to the Area 3 RWMS.

And we had to have a very strict program, and it cost everybody money to certify. And it was a detailed program. And one of my rules to my staff—and I had it above my desk—was "To act, for it is easier to gain forgiveness than permission." It's easier to get forgiveness. And surprisingly enough, I had mostly ladies. They were topnotch health physicists, and some of them—a lady named Stacy, she was not afraid to crack down on the program as required. And she was another one of those type of people, like myself; she was an enforcer, and wasn't too well liked because of that.

But anyway, with that staff and those people, we went out to, I don't know, slightly under fifty generators across the nation. We inspected their ability to properly prepare the waste, certify the waste, and their sampling. They had to sample the waste and conduct sampling programs. We were lucky that we did all that because when the state finally jumped in on top of us and started wanting to see everything, everything was in order. It took a while to prove it to them, but there was nothing there for them to crucify us with, and they were unable to stop our program. The government had decided that the DOE would take care of its own waste, and that the DOE people in other areas would ship the waste to a DOE facility, and the State of Nevada was not in control of that.

So they were wanting to stop the program because they did not want the waste to come in here.

Come to Nevada. "Not in my back yard." But we have, as far as I'm concerned, the best place in the U.S. to put it. We directed studies to prove that. We did environmental studies. We drilled

wells into the water table to sample and to see the status. We did verification studies on our waste disposals. One trench in particular that had been here since 1945 and the 1950s, we were able to show scientifically that the rain water itself does not travel down from the surface of the desert down into the water table, which is 300 feet deep at Frenchman Flat. We were able to show that scientifically and testing-wise. We were able to get documents prepared that would present our argument and verify us, that it was a safe place. And I personally believe that, from my knowledge of all the work we did, that the Nevada desert out there at the test site is the safest place in the United States to put radioactive waste, low-level radioactive waste, at least, and I believe also it's safe for the high-level, too. But that's not my **[00:40:00]** business. I shouldn't even *talk* about it. It's pretty political.

But anyway, so we received waste here from everywhere. So it was quite a program and we were really heavily involved in it, and we received waste from many different places. Some places we received from are classified. But we disposed of it very well, and we had some very good procedures.

One of the procedures which we used was called Greater Confinement Disposal [GCD], which was a ten-foot diameter hole drilled 110 feet deep in the alluvium. We put high-level waste in there. I don't mean by "high-level" what the system currently calls high-level waste, I mean highly radioactive waste, we put down in the bottom of these holes in the ground. Oh, anyway, the state decided that any hole that you put waste in that was deeper than it was wide was an injection hole into the waters of the state. That was an arbitrary decision on their part because if this is zero, ground level, and this is only 110, and the water is down here at 300 feet or 400 feet, which it was in Area 3 and in Area 5 it was 300 feet, it's still not an injection hole.

An injection hole, to me, is when you put something into water. It's injecting. But they decided that GCD was an injection hole.

And so what are the implications?

So we had to close them up, and I don't know what they did with all of them. But that was one of the points of arbitration and discussions and arguments, was whether these things were legal or not. And I think they decided some of them weren't legal, and so they made us discontinue these, but as far as I know they've never made us dig it up.

And then there was another example of an experience I had where we had some waste that was thorium, and thorium has a daughter product that comes off of it that is a gas called radon and is radioactive. However radon, with time, decays into a stable isotope [i.e., not radioactive]. And what we started out there under my direction was if this waste can be placed deep enough and held up by a layer of earth [drawing diagram] both here and here, both these paths are stopped, that you wouldn't have any hazard from the thorium underground because the radon would be decayed and it would end up below the surface with nothing but stable isotopes. So we buried thorium waste out there under my direction, after they had written a document that said this is the way we were going to do it and why. And we allowed the contractor to do that.

And so that's some of the things we did. But I still believe those to be good ways to put waste away.

Right. And so we're still burying out there.

Yeah, it's still buried out there.

OK. And we're still continuing—?

Yes, the NTS still receives low-level radioactive waste for burial. And there's some TRU, transuranic waste. There was some transuranic waste put away out there, some in GCD and some in trenches out there before they started saying that all TRU had to go to Carlsbad, New Mexico.

OK. So this is quite a bit. We produce a lot.

[00:45:00] Yeah. So I was involved in all of that, and I don't think there's anything wrong with leaving it where it is. They really don't want to have to dig it up. Anyway, my struggle with this was a lot of the tension that I had, making sure that even people I didn't agree with were satisfied. But we innovated some new techniques.

And stuff that they're still using now.

Yeah. Yeah. This we're still using [tapping diagram]. This we've stopped doing [indicating another place on diagram], drilling the holes. I don't think they're even using the ones that were *unused,* that were drilled when the state said cease and desist. And Washington and the people here gave in to it, against my better wishes. Because I wouldn't have given in to it because I don't care what they say, it was not injection. And I have a friend that'll back that up, and he's in the United States Public Health Service in Washington, D.C.

But we carried on quite a program. They're still conducting this certification program here.

It's still going on, the stuff that you set up. Which is good. It was so needed.

Yeah, it was really a wonderful program for handling radioactive waste.

Well, it certainly sounds like a lot of time, a lot of your hours, went into this, a lot of dedication.

Yeah. Yeah, there was. And I think that's why I ended up with the shingles. It was stress.

Yeah. A lot of stress. Any regrets?

No, no regrets. I enjoyed my job. I loved it.

How about, a lot of time, did that impact family stuff at all?

Yeah, I think it did. It really affected my total marital relationships. I don't like to point my finger because you're never sure of anything in marriage. I'm currently with my fourth wife.

You guys have been together for quite some time, though.

Yeah, twenty-five years, almost, this December.

That's pretty significant.

And I just—my biggest tragedy in life was my first wife and my four children, but that didn't have a lot to do with the pressures that I received in the later years. So it was just a bad choice on my behalf.

It sounds like you were pretty young at the time, too.

Well, I was older than most people. I didn't get married till I was twenty-seven.

Oh. I guess that is older.

Somewhat.

Now, it's not.

Yeah, now, it's not. At that time it was. My wife, she was eighteen.

But it sounds like since then, you weren't doing the same stuff that you were doing.

No. I was in health physics, though, when I got married the first time. I was in Idaho. Actually, I was in the Army when I got married the first time, come to think of it. So I wasn't in this field at all. Went to school for the first three or four years. If I had it to do all over again, I'd probably do the same thing.

[00:50:00] *Yeah? Well, it sounds like quite the adventure. Sounds like you've done and seen and established a lot in this field.*

Yeah. Being next to the beginning of programs and starting programs was stimulating. Being involved in emergency radiological assistance was stimulating. Exciting at times. And I got special treatment with that. I don't know if I told you about the incident that EG&G [Edgerton, Germeshausen, and Grier] had over in Santa Barbara? Did I tell you about that?

Yes.On the last tape.

They flew me over in a small jet aircraft, and I was just a sort of a wheeler and a dealer. I made decisions on my own. And the other thing that was significant about the work I did up until waste management, I never had to deal with finances. I don't know if I told you that before or not.

I think you mentioned it.

I was shielded from the cost of operations by somebody above me. I was a doer.

Right. So you were just sent out to do it. You didn't have to have any concern with—

Yeah, I did what I thought was necessary, and the government picked up the tab.

But when you switched over to the waste management, you were more responsible for the costs?

Waste management. Then I became responsible for the financial aspect.

That must've been quite a switch.

It was. It was a major switch for me, and Mr. Fiore thought I knew all about all his engineering techniques for handing budgets, and I didn't know anything about it.

And is that just because you switched the type of jobs that you were doing?

Yeah. Yeah, because I was doing strictly health physics up until then.When I switched to the waste management job, I was managing a staff of people who were doing the health physics, and a contractor who was conducting—and we were getting deeper into controlling the finances.

I guess that's one of the non-perks of moving up the ranks.

Yeah. So it was quite a change for me, and a tough change because I wasn't too good at finances, budget. I'm a much better operator in the field.

Yes. It's good to know what your strengths are.

And I enjoyed the field.

Yeah, it sounds like it. You've got some great stories, and good insights.

Well, I can't think of too much else to talk to you about.

OK. Well, as always, good to talk to you.

Well, I enjoy talking.

And, you know, we can always set something up again, because like I said, this is an ongoing project, so as we get further along in the project—

And certainly if you or anybody else that deals with my stuff have any questions, don't hesitate to pick up the horn and holler at me.

Oh, I definitely will.

[00:53:56] End Track 3, Disc 2.

[End of interview]