Oral History Project
Interview of Bud Franz 2
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Interviewer: Richie Ashcraft

[Music]

Bud Franz: It's Gustav. G-U-S-T-A-V. "A" as in Alfred, Franz, F-R-A-N-Z. I'm the third of that — with that name. Grew up in Ouray, Colorado.

Interviewer: Okay, hang on one second. Let me ask the questions and then you can answer.

Bud: Okay. [laughing]

Interviewer: Sounds good? All right. And you're okay with all these questions?

Bud: Sure.

Interviewer: Okay. And then we'll get into some stuff you want to chat about. So to start, please talk about your early life and where you grew up.

Bud: I grew up in a little mining town south of here, called Ouray, Colorado. My family was in the mining and milling business, and I went all the way through 12 grades in Ouray. I eventually went on to get a further education, to the Univers— University of Colorado. I've gone to school down in New Mexico State University and I got some classes out in Michigan, where I was teaching at the time, just to the point where I almost got to a postgraduate degree. I've had a lot of opportunity to do all kinds of things in my life. I was able to get a degree in education and — and taught in physics and biology, general science, in junior high and high schools. The job that I got here pretty much required all the education that I got. I have a master— not a master's — a bachelor's degree with four minors: one in biology, one in physics, one in geology-geography, and one in chemistry.

Interviewer: Pause right there for a second. Excuse me. Tell me what it was like to grow up in Ouray. Give me one minute. I'm going to get a drink of water. Go ahead.

Bud: Growing up in Ouray was a privilege. Most of us that lived at that time agreed that it was really a great place to grow up. The small town gave you the advantage that you knew everyone in town. When the school did anything, everybody in the school participated in it, so that it was a great place. Everybody worked in the summertime. All the kids had jobs, one kind or another. My — I was really lucky. During World War II, my dad and uncle were running a concentrator mill for heavy metals: lead, zinc, copper. My dad would take me to work with him because he couldn't find any help, to help he and my uncle in the mill. So I go to work with my dad and uncle, and my uncle would say, "Okay, listen to that machine over there. If that machine gets louder, come run and tell me. Or if it gets quieter, come run and tell me. And that machine over there, if that spray of water stops, you come run and tell me." So, I ended up kind of being eyes and ears for my dad and uncle. And I did that from the time I was nine, 10, and 11 years old.

And by the time I was 12 years old, I knew just about everything that went on in that mill. And my dad and uncle would teach me to assay, or weld, or things like that. But you know, how many kids have an opportunity like that? I grew up, and, you know, Ouray has that hot springs pool? I eventually became a lifeguard at that pool and another one that was an indoor pool in Ouray. Not too many kids have an opportunity like that in — anywhere in their life. But I was really lucky to be able to do that. Interviewer: You mentioned earlier that you knew what radon was from a young age, from working in the mill, can you talk about that?

Bud: Basically, I learned that in my living room, at home. My dad was a mine inspector for the District Number 4, which is southwestern Colorado. A couple men from a health and safety lab out of Salt Lake City came to our home one time and were talking to my dad, and I was present, and they said that they're — they're — they needed to find a place in Colorado where they could measure the — the — this radioactive gas that was present around uranium mining called "radon." And they — they were looking for a mine where they could go in and measure the amount of radioactivity that was in the air in the mines. That's the first time I heard about it. My dad did arrange such a meeting for them, and, to make a long story short, they met at the mine.

One of the men had on a mask with double filters, and the other man just walked in, and they talked at the portal of the mine and then went underground, and while they were in underground, the man with the filter wouldn't say anything. He just wouldn't say a word. And when they got outside, the guy took off the mask and he says, “For Christ's sake, Franz. I was counting my breaths.” That was how they knew how much air had been pulled through those filters. That's how primitive the measurements were at that time. You needed to know the volume of air that went through a filter so you could take that filter and count the radioactivity on it. That would give you the — the amount of — of radioactivity in the air, and it was — in those days, it was called working levels.

Interviewer: I'm gonna assume that your dad was Bud Franz II.

Bud: Yeah, he was G.A. Franz, Jr.

Interviewer: Okay.

Bud: But he also was named Bud Franz.

Interviewer: Gotcha.

Bud: I was Buddy. [laughing] There's no — not many people that still call me Buddy. [laughing]

Interviewer: I like it.

Bud: They’re all gone. [laughing]

Interviewer: Anything else you can think of that you'd like to share —

Bud: Yeah. What —

Interviewer: — about growing up in Ouray?

Bud: Well, another thing about radon measurement. Eventually, Dad was able to set up this kind of a program in Colorado to measure radon underground. And when he'd come home, he'd say, "Yeah, just had to go to another autopsy. Another guy died of lung cancer." The measurements in those days were pretty primitive. A couple men came — the same two men came in at a later time, and one of them had a — a box with a crank on it. And that was an air pump, and they'd crank so many cranks through this box, pulling air through a filter, and then they knew how much air had gone through that filter. There were — the ability to — for us, our society, at that time was very primitive. We knew that radon in mines in Europe had created a lot of lung cancer when they got here to the United States.

And we're really looking at that after the uranium effort, you know, for atomic energy, there was a lot of difficulty in just how — how do we measure it? When do we measure it? And the instrumentation was very primitive in those days. Finally they got air pumps that ran by battery, and they were more reliable, but not as reliable as some of the stuff we have today. And —

Interviewer: When — Oh, I'm sorry. When your father set that meeting up with the mine, what year would've that have been? How old were you?

Bud: I was probably 14 years old. That would be about 1948.

Interviewer: Okay.

Bud: '48, '49, somewhere in there.

Interviewer: Okay. I said — you said you went to Ouray High School, correct? So where did you go to school after that, and what did you go to school for? Bud: I wanted to become an electrical engineer, so I went to the University of Colorado. That didn't turn out very well because I was a lousy mathematician. The — so I — I essentially flunked out that first year, went into the Marine Corps, because I didn't have enough money to go back to school again, spent two years there, got out of the Marine Corps, worked a while, went back to school at the University of Colorado, essentially flunked out again, decided that I needed to do something else, met my wife and got married, had a couple kids, went back to school, finally graduated in the School of Education, and that's what I had. That science background — chemistry, biology, physics, and geology, which fit right into the job that I eventually took here in Grand Junction because you needed all of those aspects of science in order to understand what was happening here and how to try to explain that to people.

The people here in Grand Junction were just amazing. You knock on the door and say, "Would you allow me to come in and look to see if you have any radioactivity in your home?" "Sure. Come on in. Here, look over here. And we got this ore specimen." "Yep. It sure is." How, you know — "Can I go over the whole house?" "Yes." "Can I go down in the basement?" "Yes." The people were just amazing, how cooperative they were, and they needed to be, because we really did have to look through the whole house. Same thing with businesses. The instrumentation — the air sampling equipment that I had when I took this job was not primitive, but the air sampling pump created noise that was 94 decibels. That's almost like standing next to a jet engine. And that's pretty loud, especially if you go into a home where there's people sleeping or you go — or a baby, or you go into a business where they're just trying to conduct business. So the people here were amazing.

Interviewer: In your previous interview that we did a couple of years ago, you also brought up that you had taught in various states.

Bud: Mhm.

Interviewer: Can you talk about your teaching — teaching career?

Bud: Yeah. My first teaching job was in Ouray, my home town. I got to teach kids of people that I went through school with. And I really enjoyed it. I taught gen— general — physics, biology, and general science, and it was — I never realized how much time a teacher had to put in to just have those different classes with all the different kids that you taught. After I left Ouray, I was trying to find a place closer to my wife — her — my wife's family, and that was out in Wisconsin. And I taught general science in a small farming community out in Wisconsin. Then we finally went over to Michigan, where my wife's family is from, and I taught at a high school — chemistry, physics, and biology. And then leaving there, came back here to — to Colorado and took the job that I took here. The job here was supposed to be making measurements underground in uranium mines. The state of Colorado, by that time, had developed a pretty full program to try to deal with radon underground.

But that job was not yet available, but the one looking at the uranium — the — the radium around the mill site here in Grand Junction and a couple places where they thought that some of the tailings had been hauled off the mill site and used to construction. There were about 100 of those locations that they come over and made — as close an estimate of how many different places it was — that it had been hauled to. So, I took that job, came over here. I had an air sampling device, a pump, and a — threw it together — alpha counting device, and a gamma radiation detector. Not — not a Geiger counter — a scintillator. And that's — that's the equipment I came to this community with.

Interviewer: Why did you decide to not teach anymore?

Bud: I was — had been looking for a teaching job, but at that point in time, 1969, there were — there weren't a lot of teaching jobs available. I looked in — in Michigan and I looked here in Colorado. My dad mentioned that the state of Colorado was looking for someone that could make those measurements underground, and I knew that he did it, and I knew I could do it, so I went over to the state health department, who was issuing the contract. Actually, it was a government contract out of the health and safety lab in Las Vegas. And they needed someone to look to see how much radon was coming off the mill tailings pile itself. So we had sampling devices scattered around the mill site. But they noticed that on one of the visits when they were installing that equipment, that there was trucks coming in, loading up with tailings, and leaving. So they followed one of them to a brand new business that was being built here in town. And they saw that they were using it underneath the slab of that new building. And they said, “Hmm, we better start looking into that.” So I was really the first one to come in and — and go to those sites and measure the radon daughter concentrations that were there.

Interviewer: When you came back, who did you work for? Were you a contractor, and what was your job title?

Bud: I worked for the Colorado Department of Health. I can't even remember what they called me. I was kind of a radiation technician. Health physics. At one time, they called me a health physicist. The last title that I had was remediation technician, or something like that.

Interviewer: Okay. Can you describe to us — and you started to — but can you describe to us what uranium mill tailings are?

Bud: Uranium tailings — the word "tailings" comes from the fact that — that — so — comes out the tail end of the milling process. The tailings is — is just nothing but ground-up rock to remove the uranium from the — from the ore, which is a mixture of all kinds of minerals. You crush it to a very fine powder, and then through the milling process, separate out the uranium, and then everything that — that's left is called tailings, comes out the tail end of the milling process. It's a very fine sand, almost powdery in some instances. In the milling process, through ion exchange, you remove the uranium and what's left is everything that was in the ore except uranium.

That means that all the decay products of the uranium, the radium — I won't get into the whole chemistry of the thing, but it turns out that about 85% of the radioactivity that was in the original ore is left in the tailings. So a lot of the radiation — most of the radiation — is in this waste product, and if you don't pay attention to that, you — you know, when we allowed it to go into the various homes and businesses, people didn't really realize it. They thought, “Oh, you've taken out the uranium that — that — that's — there goes the radioactivity.” No, it doesn't. Only about 15% of the radioactivity is removed with — with the uranium.

Interviewer: When you talk about the mill here in Grand Junction, can you tell us what mill that was and where it was located?

Bud: That’s the Climax Uranium Mill that's located down on the Colorado River, just upstream from the Fifth Street bridge. It was a sugar beet factory initially, and then they converted it into a uranium mill. They used the grounds around to store the ore until it could be processed through the mill. They used part of the grounds for the settling basins for the tailings. When the tailings leaves the milling process, it does so in a slurry, and then they pipe that slurry out to a pond where the sand is allowed to drop and the — and the water is decanted off.

Interviewer: Can you describe what the — the mill looked like? How many people worked there or maybe just a description of what — what it was like there?

Bud: I don't think that I'm really qualified to do that. The — I was only in the mill three or four times. Like most uranium mills, there’s ore bins, crushing plants, and then tanks where the ion exchange would take place in a process to move the ore crushed through this whole process and — and come out the — the tail end of the process. But the process is an ion exchange where you attach the uranium and pull it out into a filter and it comes out as yellowcake, which they then would put in 55-gallon drums and ship over here, literally.

Interviewer: Right.

Bud: To this — [laughing] — this facility.

Interviewer: What kind of training did you receive when you started to work for the state? What was your training like?

Bud: Okay, here's a — here's an air pump. It's loud. Here's a stopwatch, so you can time how long you have on the pump, how — how long you run the pump. Here's a filter that you attach to the pump and filter papers. And you take an air sample, and you've got to time it perfectly, you've got to pull air through the pump, take the air filter out, put it in this box — black box. Literally. And let it count for — for a very precise amount of time, stop the counting, wait a precise amount of time, count it again, And then, using a — the amount of activity measured by this black box, calculate the working level — that was the amount of radon, radon daughters in the air.

Also, here's a Geiger counter. Well, it isn't a Geiger counter, but it does the same thing as a Geiger counter. It's called a scintillator. And it's a — in the scintillator, there's a crystal, and when gamma radiation hits that crystal, it gives off little flashes of light. It's a photomultiplier tube that's right next to this crystal, and that changes those flashes of light into electric current, which then moves the needle on this device, and you look at this — this meter, and you can see if there's gamma radiation in the area around you. And you go into a home and — or a business, and turn on your pump and make the measurements to see how much radon is in there. And here's a mathematical equation that you plug these amounts into, and it'll tell you how much radiation is in the air. And I ran the pump a few times, and the calculations a few times, and they sent me over here.

So that there wasn't a lot of training, but it was enough because I understood what I was trying to do, and we didn't know what we were going to find over here. They didn't know. They knew that there's a possibility that some of the levels could be very high, or there could be none. And so it was pretty much an effort to go over there with this kind of instrumentation, try to measure the amount of radiation in— inside the — the buildings, inside the home, inside the school, inside the business.

Interviewer: So, how did you keep track of your data?

Bud: Just write it down on — on a pad, then I —

Interviewer: And then would you have to create a report, or —

Bud: Yeah.

Interviewer: Or — and who — who would receive that report?

Bud: I worked for the Radiation Control Division within the state of Colorado Health Department, and so I would provide that information back to Denver. I'd send it by mail. I'd show the actual measurements, the recordings that I'd made, and it would just go as a paper report back to Denver. Also, I talked over the telephone to the people in Denver, and about the first thing that I noticed when I got over here and started going to these addresses that they had developed where they thought some of the tailings had been hauled, using the scintillator, this house was the one that I was supposed to go to, but the one next door, as I was walking down the sidewalk, would show a radiation — elevated radiation reading also.

And so, after probably about the first week of making those measurements, I could call it up, and I said, “Yeah, there's — I'm finding these places and here's the kind of measurements that I'm getting, but there's a lot more than that’s on this list.” And so after about the first month, it became very apparent that the — that the problem was a lot bigger than we ever imagined. And the levels of radiation that I was measuring — some of them were very minimal, but some of them were very high. And so it became apparent that this was a lot bigger problem than we'd ever imagined.

Interviewer: Right. You want to break to take a drink?

Bud: Yeah.

Interviewer: Yeah, yeah, that's a lot. I’m keeping you talking.

Bud: Am I doing what you want?

Interviewer: You’re doing great. Yes. Yeah. Yeah, you're doing great. And I don't — Well, you know this, I don't say it a lot, So we're not capturing a lot of “uh huhs” and stuff. I try to nod so you know I'm listening. My job is to —

Bud: I know you are.

Interviewer: — stay quiet over here, if I can.

Bud: Well, you know, I've had to explain this whole thing for a long time.

Interviewer: Mhm.

Bud: Act— actually, being a schoolteacher really helped also, because —

Interviewer: You talk to people.

Bud: Yeah. Yeah, you had to talk to people, and it was usually a big mystery to them all. And not many people even ever heard the word "radon." “What is it?” My dad ran into this when he was a mine inspector. He'd say, “Well, you know, we're trying to be sure there's radioactive gases in the mine here with you.” And the miners would say, “I don't smell anything.” He said, “Well, no, it doesn't smell. It’s — you can't taste it, you can't smell it, you can't see it. But it's here.” “Well, how do I know that?” “Well, take my word for it.” “No, I'm not going to take your word for that.” Well, what can we do? “Well, okay, here's this meter. See the — the needles wiggling like this? Well, that means that there's radiation in here.” It didn't mean much to them, wiggling meter, and so, they — finally, he — he said, “But no, really. You need to take this seriously. This gas is killing miners.”

And so he finally got a meter that had sound to it. And then when they could hear the ticking, then it — okay, that they — maybe they could accept that. He also said he had a smoke tube and he used smoke to — to get an idea of the — how the flow of air underground was — was moving. So he put a little puff of smoke out in the air, and the smoke tube chemistry would cause this material inside the tube to change color. And he said, “See that the tube is changing color?” And so that, to them, being that something was causing it to change

color, what — and they — so they thought it was the radiation when it actually was just a chemical reaction.

Interviewer: Right.

Bud: But it was very hard to convince people that there was a problem in the underground mines, and then again, when I came over in the homes and businesses.

Interviewer: Well, talk a little bit about what that process of remediation looked like in those homes and businesses.

Bud: Well, at first, mitigation was — about the only thing that we knew of at that time was, well, let's remove the deposit, break out the floor, remove the tailings, take it back to the mill site. We had a couple old settling basins on the mill site that we started using as a repository for this stuff that we hauled back. At first, there was no government program, and so some people found out that they had it and they wanted to remove it on their own, so they literally would dig it out themselves around the foundation, around the under the floor. One business did that by themselves before there was ever a government-financed remediation program.

So removal was the first remediation technique that we could use A little bit later on, Colorado State University said that maybe we can seal the radon under the slab so it doesn't get into the air inside the house. So we tried to seal it on two or three places, and then found that — that — that not only didn't deal with it, but it actually increased the amount of radiation because it trapped more of the radon under the slab, which then decayed into the daughters, and some of those were gamma emitters, and so it actually increased the radiation exposure. Did that help? [laughing]

I — we learned an awful lot. We were the first ones to do it. Nobody else in the world was doing this. So we were, "Well, let's try this. Well, let's try that. Why — why don't we, why aren't we bringing down these levels?" Part of the — part of the answer was in the radon itself. Radon is a noble gas. That means it doesn't chemi— it doesn't combine chemically with anything. So once it's formed — once it's formed from the decay of uranium and radon is then gas in the matrix, and it's in the soil, or the dirt, or ground-up material. And then it's free to move about by whatever means move soil gases through the soil. And it — it becomes an influence by whatever is built on the soil. When you build a house, basically, you're building a smokestack, in a sense, on — on the soil, because it's going to create a flow of — of soil gases into this smokestack. Easiest way to — to find this is the temperature differential in a smokestack causes air to rise in the smokestack.

Well, you know, you don't picture a home as a smoke— smokestack, but it's — in a sense, it is. So it's pulling soil gases from underneath and from immediately around the house into the house. And that — finally understanding that concept helped us to understand why, when we moved the — this deposit that was right up against the house, and that's all, and that was still was elevated inside the house. Maybe the deposit that was out 3 or 4 feet was contributing, which it was. So we learned that, initially, just remove anything that's within a meter of the house or under. And that didn't — that didn't solve the problem. So then we started looking at the stuff that was out away from the house, a few feet or a few tens of feet. Some of the deposits that were used, were used as bedding or around utility lines that would come into the house — water line, gas line, sewer line.

And actually, those trenches that the utilities were put in and then the tailings that were used as bedding around the pipes, those — those deposits became contributors to the inside of the house because soil gases were moving along those trenches and into the house, being pulled in by the heat of the house.

Interviewer: So would you remediate a house and then test, but perhaps have to take more or go back and do more remediation as you learned —

Bud: Right.

Interviewer: — the process?

Bud: Yeah. The first remedial program was called GJRAP, Grand Junction Remedial Action Program. This was a program financed by the state and the federal government. We would design the remediation, hire a contractor to do the remediation, and we would test before, sometimes during, but most of the time after, and the original designs were minimal removal. Well, that didn't work. More extensive removal, and sometimes that didn't work. There was one home that we went in four different times, which was — we were learning. It was one of the early places that we worked on. We did a small removal of — of a very hot deposit. That didn't work. We went in and got more of minor deposits. That didn't work. Then we finally got into those trenches and removed those, and that finally was able to remediate that particular house.

But we were learning. Nobody — the — the — the best advice, or the only advice we got, was from this guy who — this man who worked on radium, and radium dial painters. He was the authority on radium research. And he said, “Well, you know, the relaxation length of radon means that it can move maybe one meter from where it originates.” And so we used that. Anything that was a meter of the structure, we’d get. That didn't work at all. One time, I was asked to give a paper at a symposium out in Washington, D.C. The program had been underway for quite some time, three or four years, just before we went into the UMTRA program, and they asked me to give a paper, so I just was giving them the — the statistics. We looked at this many structures, we found this many that were at this level, this many that were at this level. We remediated these, then we've not remediated these. We have this much workload left.

I was sitting there, at the symposium, and the guy before me was an attorney from the AEC, and he gave the exact paper that I was going to present. [laughing] So I — I — when it became my turn, I was next. I got up and I said to these people, “This man has just presented to you the information that I was going to give you. So about the only thing I can think of, 'Would you like to hear all the mistakes we've made?'” And — and it was amazing because I was watching people as this guy, this attorney, was reeling off all these numbers, and they were pretty bored, but they were all sitting up because very few people ever go in and say, “Hey, look at all the mistakes I've made.” Well, we learn from those mistakes. We — we — we were the first ones to do them. So it — it — it is important to recognize and to admit that you don't know everything and that you can finally get things done if you just hang in there and try to get her done. And we — we always went back in to see if we had remediated a place. Sometimes we could, sometimes it was almost impossible. There were a few that were very borderline that we just couldn't seem to bring down. But we tried.

Interviewer: You can take a drink if you want.

Bud: Sure.

Interviewer: I'm looking through — this is kind of a transition in our questions, so I'm looking through your notes that you gave me, if this is a good time to talk about those.

Bud: Could you even read them? [laughing]

Interviewer: I could, yeah. I can. Tell me — because some of this — what you've covered and what you've been talking about — but you mentioned you wanted to talk about the expansion of the project in 1971. Can you tell me what you wanted to share

Bud: Sure.

Interviewer: — about that?

Bud: I got here in '69. By '71, by '70 — I hadn't been here more than three or four months — it was very apparent that it was a lot bigger than anyone could imagine. There was a short period of time where, after a board of health meeting in Denver, where the news media found out about the whole investigation, that things really took off. It was apparent that we needed more than just me over here, poking around. So the AEC authorized the contractor, Bendix, to provide two guys to work with me to do more screening, and that produced just a lot more down here. But it was much bigger because I could only do so many surveys in a day.

So it became apparent very quickly that we needed to expand the — the area that we were looking at, not just down in the center part of Grand Junction, but in the outlying areas. So, we had been working with — it wasn't just the Colorado Department of Health and the AEC. There was the U.S. Public Health Service also. So the U.S. Public Health Service said, "Okay, we — we can — can contribute. We'll go to our — our labs that are scattered around the country, our radiation labs, and we'll bring in a couple people from each one of those labs to add to the number of people that are out there looking." So they would bring these guys in, for some of them, two weeks at a time, and then they'd send them home and bring in a couple more. And so we had a crew of about — at the most, probably 16 of us out at one time, and I was to coordinate that. I'd say, "Okay, you guys, you take this street, you guys take that street and go door to door."

And man, that — the — the information that was flowing in indicated that this — this problem was just growing exponentially. So AEC at that time had some well logging trucks here on the compound, and they converted one of them to a — a sensor on the side of the truck. And they were experimenting, and they were driving down the road, And they — the truck would pick up gamma fields off to the side of the road and they'd note the address. And that — so that was a first mobile units that we had, and because you could send it out in places we hadn't been before, it'd start picking up these hotspots along the side of the road. So that really helped. But we still had to go back with a man physically on the site to develop the kind of documentation that we could then use to say, "Well, we need to do something with this one." Or "That one, we don't." The — the kind of documentation that we were using at that time, was the one that I used initially.

Well, one of the guys from the Denver office and I would go to a site and it would be hot. And so how do we document it? Well, you draw a floor plan map of the house, or a lot, and you plot radiation measurements in

that floor plan where there's elevated radiation. You make one measurement at ground level and one at waist level. Sometimes the one at waist level would be higher than the one at ground level. Well, why is that? Because there's radiation coming from over here and over there and over here. And so, using that kind of documentation, we got a picture of where the deposits were on the property. And that's the kind of documentation that these guys who were going out would make, and then we'd use that information to develop this — this registry of all — all these different sites. And finally, Oak Ridge National Lab made a mobile unit that they thought was really a pretty good one. They presented that to the — the people that were just starting to develop the UMTRA program. The — the GJRAP program was — was pretty much over in 1988.

Interviewer: Yeah. Give me one second. I'm still looking at your notes. Tell me first about the BPE program. And what year was that and what — what is it?

Bud: Building permit? Early on, when we were finding tailings deposits scattered all around, we started finding them in vacant lots. A — one contractor was hauling in tailings to recontour a lot that was a little bit low. And then was building a new house on it. And we said, "This is ridiculous. You know, you got to stop this somehow. You got to tell the building department, don't — don't issue a permit until we've had a chance to look at the — the property to see if it's contaminated." And it was very difficult to convince the building department because it was another step that they had to put in their process to do that, and nobody likes more work if you don't have to have it. But it was necessary, and after we had to remediate some brand-new structures, we finally convinced the city and county that we needed to — to do a survey every time that a building permit was issued. And so we used the same kind of documentation that we were using in the remedial program to — to document what we'd saw on a building site.

Interviewer: What year was this? This was after '71?

Bud: Yeah. I was trying to think. It probably was — We probably started recognizing this problem in '71, and it was probably a year or two before we finally convinced the building department to allow us to do the survey, what — so when they — so when they apply for a building permit, we were contacted and we'd go out and do a survey.

Interviewer: What areas of the city were they giving these permits at that time?

Bud: All over.

Interviewer: All over?

Bud: All over the county. Took us a long time to get that same process going down in Durango and Gunnison, Rifle. And it's — it was a progression. We learned about it here, we tried to develop the procedure, methodology that would eliminate those kind of problem here, and then we'd send it out to the other mill sites. But it was probably in 1970, late in '70 and '71 before I started going down to Durango to take a look to see what was there.

Interviewer: Tell me what the GJRAP program is.

Bud: Grand Junction — Grand Junction Remedial Action Program.

Interviewer: Okay. Give me one second. Tell me what the GJRAP program is, what the UMTRA program is, and the transition from one program to the other program.

Bud: Okay. The — the Grand Junction Remedial Action Program was the first one that was a cooperative effort between the federal government, the AEC, and the state of Colorado to do remediation paid for by the program to remediate these structures. We picked the worst locations, so we had identified and worked on them. There was one, a business structure downtown, that had 4 feet of tailings underneath it because, eventually, that — when they started the building, they overexcavated the foundation. So in order to deal with that, they just used tailings to fill in the back end. There were churches, schools, residential structures, just businesses there that they were the worst ones that we had identified up to that point in time, based on the gamma and alpha radiation that we found in them.

It was — It was a learning process. “This doesn't work, we've got to go back and figure out what's wrong and — and — and correct it.” By the time we finished that program and, probably I think the final report was written in 1988, we had remediated 200 and some locations. But we knew that that wasn't going to be enough, just based here on Colorado, that that bigger program needed to be designed that would pick up where the Grand Junction Remedial Action Program left off and continue here in — in this community, as well as the other communities that we had identified with similar problems. Not only that, but there were other mill sites around the country that were identified as having problems. Mexican Hat. Shiprock. You know — I think my mind is — has gone a long way. [laughing]

Interviewer: You're doing great. You explained that well, that — that — basically, my understanding is, anywhere there was a mill —

Bud: You had to look.

Interviewer: — they were experiencing these same sorts of issues.

Bud: Yeah. So, that — we developed a task force here in Grand Junction made up of the — the AEC contractor, or DOE contractor here in town, and myself, one of the guys from the Denver office, Health Department office in Denver, and the AEC, DOE people here that would kind of take a look to see if there were government contractors working on other projects that could be utilized to develop a new remedial action program that was ultimately called the UMTRA, or Uranium Mill Tailings Remedial Action program. We looked at contractors down in New Mexico, up in Washington, Hanford. Oh, there was one out in New York, close to Niagara Falls, I got to see Niagara Falls. [laughing] Washington, D.C. You know, we just went around trying to find the expertise that would be necessary in order to design and carry out this remediation program due to the uranium mill tailings, wherever it was in the country. And that was — it was an interesting time for me, and we interviewed a whole bunch of different people and then collectively with — with all our expertise from the engineering people and the AEC, the contractors, us, we were able to finally come up with a contractor that could carry out the program nationwide.

Interviewer: And you mentioned the world here, at the end of your notes.

Bud: Well, everything that we learned, we were the first one to do it. Canada sent down some people to talk to us. We sent the — one of the contractors from Nelson, Haley, Patterson, Quirk, that were our architect-engineering firm, up to there to help them design remediation for their cleanups in Canada. There was a guy that came over from Sweden specifically to see how we did it, because they had a naturally occurring problem in Stockholm, in the glacier moraines that surround the city of Stockholm. And so he was seeing how — how we measured, what kind of equipment we used to measure, and how we developed techniques to remediate. There were people from Australia that come in. People from down in Florida that were dealing with radioactive deposits in the fertilizer business that were creating problems for them.

You know, the — what we had learned just was being disseminated out into the whole world. Developing instrumentation was — was — was fun, really. [laughing] You know, I — I was — was it — my experience in this building was down here in the basement, measuring radon daughter concentrations on an hourly basis, trying to calibrate some new air sampling equipment that we'd gotten from Colorado State University. We used the place down in Uravan that had a house that had been built on an old tailings po— tailings pond, actually. The levels in that were really quite high. And we'd be down there taking grab samples, trying to calibrate the instrumentation that we were bringing in. Just the gamma radiation. The first scintillator I had was a nice one, but it wasn't very durable. But it was what they were using in the uranium builds that, you know, mining business. It had a strap on it, and I'd just kind of hold it out around and pick up where the gamma fields were increasing and decreasing — decreasing. Can't even talk.

Well — the metering was what you'd see. Well, when you're walking, you can't keep your eye on a meter all the time, so we got some new scintillators from the health and safety lab down at the Nevada Test Site, and they were a small, compact scintillator. Looked like a small purse on a strap, and they had a meter rating. Well, again, you needed to watch the meter all the time, which you couldn't do when you were moving. So they found some that had a sounding device on it, and that worked, but it buzzed an awful lot. So one of the guys down at that lab decided that if they cut down the amount of sound coming out of it and reduced it by a seventh, by seven times, that, yeah, it would reduce from a steady buzz to clicking. And that really helped. So you not only were to watch the meter, but you could listen to it. And then, moving around, you could watch where you're walking and you could still tell when the — the gamma radiation field increased or decreased.

Interviewer: Because you could hear it.

Bud: Yeah. And then there's the air sampling, measuring the radon daughter concentrations. At first, it was those grab samples. Then it was, "Okay, how do we develop a continuous radon monitor?" So CSU decided that they could build a — an air sampling device that utilized thermoluminescent dosimetry, where you pull air through a filter, and next to that filter, you put this thermoluminescent device, which was a little disk, and then, after running that for a certain period of time, you knew exactly how long you had it plugged in, you knew how much air could flow through it, you'd take that TLD, we called it, and measure the amount of radioactivity that it had been exposed to.

And those became our kind of standard for measuring radon daughter concentrations. And the first group was a little wooden box with an electric motor pump inside with a little TLD, a filter head sticking out. And we got probably 20 of them. And those were the things that I was trying to calibrate down here in the — in the basement. And then we started putting them out in people's homes and businesses. Well, they were a little electric motor, and they made a sound. In fact, a little wooden box kind of amplified the sound a little. I had one in my home. I was using my home as a background location because I couldn't find any radioactivity in my home or — or any, you know, above background.

So my wife had bridge club, and this box was sitting there buzzing away. In fact, I had two or three of them in the house. [laughing] And she would run and unplug them all. Kind of ruined my experimentation, but then we — became apparent that that wasn't going to work. You couldn't keep them in people's homes or businesses. So they then designed a new — same mechanism, but different housing, and it ended up being these tubes of PVC, about a foot in diameter, about 18 inches high, with a wooden top and wooden bottom, little hole where the — the TLD could look to the outside air. And that cut down on the sound enough that people could at least put up with them. And we used those pretty much up until we were — but we were still using them, I guess, when — when I retired.

Interviewer: So that had been a prototype for what they use today?

Bud: Yeah. Yeah. We — everything was new. The — that card that I showed you was a track etch —

Interviewer: Can we talk about that? Give me one second and I'll — All right, well, tell us what you brought in today, why this is an important sample you came to show us.

Bud: All right, so this was a card that we used to demonstrate that we wanted to make radon daughter measurements in the — in a home. And we used a device called a track etch chip placed on a card inside the home. And this one was one that we were using to calibrate the whole system and how long did we need to leave it in a home. The different colors were to indicate which chips would be pulled at an interval after they would first start it. One at one month, another one at three months, another one at six months, and the rest, at — at a year. The basic design is that it's just a piece of plastic. But it re— reacts to alpha radiation that's close enough to it to actually strike the piece of plastic, and any alpha radioactive material in the air would reduce — would produce alpha particles that would strike the plastic.

When it struck the plastic, it would leave a damage zone. Then you take the plastic, put it in a solution, and etch out the damaged area in the plastic and the number of the damaged areas within the — an — an indicator of the amount of radiation that it exposed to over that period of time. And using microscopic examination of the plastic, you could count the little pits that were — that were created by the alpha radiation. These became one of the main radiation — alpha radiation measuring devices towards the end of the UMTRA program. And then, because we were demonstrating what could be done, other places in the world started using something that was similar to this. A company out in San Francisco developed this, sent it to us, see if it'll work, we tried it, demonstrated that it would work. And so, that was one of our main measurements towards the end of the UMTRA program.

Interviewer: A little bit quieter than the boxes. [laughing]

Bud: Very much quieter.

Interviewer: And so would you take those pieces of plastic and were they analyzed at the lab here on the compound?

Bud: Not here, we sent them to a lab down in — in Las Vegas and another one out in — in San Francisco. During the dem— demonstration that was the parent lab out in San Francisco. But, you know, we tried everything. There was one device that was a little — little wooden box, about this square with a little hole in it, and the inside the hole was — best way to describe it was a little plastic film that, when it was struck by radiation, would give off a little flash of light. And next to that film was a Polaroid film sheet, camera film. And if you put it out there and left it for long — long enough, eventually it would discolor that — that piece of Polaroid film. But it was not very — it didn't lend itself to what we needed it for, but it was one of the ones that we — we tried. We tried all kinds.

Interviewer: I have a few more questions for you at the bottom of the list from Taylour, but — or is there anything else on this list that you gave me that maybe we didn't cover, or anything else that when you were — when you were writing that, that you wanted to share with us from your list?

Bud: Well, when we first started, when I — when I'd first come over here, there weren't any standards, what— what — what can we — we're measuring this. What do we do about it? Do we need to do anything about it? So there was a committee that was set up that met down in Las Vegas to discuss the matter with the U.S. Public Health Service, the Atomic Energy Commission, Colorado Department of Health. I think they brought in a couple of experts from other fields. I'm not really sure. But the discussion was made. Well, we're — we're asking the miners to reduce the level of radiation to this amount, what do we do with people that are exposed, sometimes 24 hours a day, to the same kind of thing? So they eventually came up with a — a standard for gamma and — and — well, for, basically, alpha radiation that could be used to say, "Okay, this place needs remediation, and this one doesn't." It was — it was a learning process all along because no one had gone there before. Can I look at my list again?

Interviewer: Yeah, absolutely. Take your time. We've got plenty of time today. [pause]

Bud: Designing the remediation was always a — a challenge. You had measurements on — on this map showing generally where the deposits were located, because usually, there was something between the — the contamination and the measurement instrument. You had to take that into consideration. That was — there was a concrete slab on top of the tailings. There was dirt on top of the contamination. There were flower beds and wooden floors and all kinds of things between where you were making the measurement and the actual contamination. So it was a — always a problem to — to define as accurately as you can where it was located and how much of it was there. We used augers that go down, deep down around the foundation, and then you'd send a probe down the — that auger hole. And based on those measurements, you got a better feel for what was there. They didn't always — you didn't actually know unless you could see it.

Interviewer: What — what shields radon? Would a — would a wooden floor —

Bud: Just —

Interviewer: — affect your readings?

Bud: Oh, yeah. Yeah. Wooden floor would affect it. Plaster wall would affect it. Concrete would affect it. Dirt would affect it. Any — any intervening material could affect it.

Interviewer: Which made it hard to get readings —

Bud: Yeah, right.

Interviewer: — if something was shielding it.

Bud: When you — when we were going in to remediate, the way we decided when we got it removed was a gamma measurement over the area, and if the gamma measurement dropped down to background, which is something that we had to establish initially, then you — then you knew you had it. If this area right between us here was contaminated, you went in and scanned the whole area after, dug it out, and there was a meter reading over here of 20 and a meter reading right here of 16. Okay, why is that 20? So you get a shovel and you go over it, and — and you could take that much soil right off of that meter reading, whether it was 20. And if it went up, you knew that there was something deeper down. And so you were always looking for that background measurement after you'd done the removal and it — sometimes it — all it'd take is just scrape it with your foot, and that would be enough so that you could see, okay, there's something deeper down.

And what we developed over the years was a second pair of eyes. The contractor would go in and remove the deposit and say, "Okay, we got it," and the contractor for DOE, Bindex, would go in and say, "Yep, we got it," and then we'd go in and we'd do a sc— scan over to confirm it, because maybe you averted your — your eyes and your attention enough so you miss that slight sound over here. And then you'd go back, and usually the second pair of eyes would find them.

Interviewer: Did you have anything to do with the remediation and teardown at the Climax Mill?

Bud: No, I did not. That was done by a contractor, and it was done — at that time, the staff over here in Grand Junction working for the state health department was big enough so that it wasn't just me all the time. But, you know, we — our influence was in the — in the remediation over there. We had to come in and say, "Yep, we got it," or "It's still hot." Or —

Interviewer: How long did that take?

Bud: That was a tough one. If you've got a searchlight over here, huge searchlight, and it's lighting up this whole room, but the light's only coming from that searchlight, how do you know whether the light that you measure over here isn't a new light source? So the shine that we called it, the shine from those huge deposits, from the mill tailings pile itself and from the contaminated material, wasn't influencing this meter rating over here. So we had to use what was called shielding to shield the — the survey instrument to see whether or not

the radiation was coming from this direction or from that direction, and that — that was always a problem that you had to deal constantly with. You couldn't dig it out and then immediately put something back on top of it. You had to leave it open so that the shine from other deposits weren't influencing the measurement you made.

Yeah, it's one of those things you just learn by experience. And it was a heck of a learning process. [laughing] You know, I — they said "You're hired for a probably a year, but — and you could probably go two years. Might even last as long as five." Well, I worked at it 26 and a half years and it's still ongoing. You know, the — I talked to one of the guys that took my place with the health department, and he's still going out measurement — making measurements every day. There's still deposits being dug up. When they built a repository out here and they wanted to close it up, I said, "No, you shouldn't do that, because there's — you've left all of this stuff out there around the utility lines, and people are going to dig it up, and then what do you do with it?"

So they're still hauling tailings out and putting it in that — this repository, and they will continue to do so as long as they left stuff out here. It's just one of those things that — it was — the thing that — the thing that started all of this was that uranium was a big, mysterious radioactivity, but man really didn't know too much about how to deal with it. We needed the uranium for our safety, our — our — our defense of our country. And so it was in the best interest of the country that we go out and get this stuff and we process it, we use it to build bombs and later on reactors and things like that.

But the — the people that were out in the field, for the most part, didn't understand what they had. And when they brought the ore in and — and processed it, and took out the uranium, they didn't realize what was left over that was in the waste that was there. And people that made decisions about what — what to do with it, where to put it, weren't qualified to make the measurements of how to — to deal with it. They were accountants and engineers that knew how to find it, but didn't know what to do with it after they found it. Nobody knew that it was 85% of the radioactivity that was still left in this waste. And as far as they were concerned, it was just ground-up rock. And so people that said, "Yeah, go ahead, use it," those people that made that decision really didn't understand what they were doing.

It wasn't their fault. They just didn't know. And so that's — that's really why the federal government finally decided, "Hey, we encouraged this whole kind of thing, now we need to deal with it." And so you know, they're still dealing with it to this very day. They and the state of Colorado, you know, the state. We — we had people that were health physicists, but they were dealing primarily with radioactive materials that were in health, and X-rays, and things like that. They weren't used to this stuff. It was a waste material.

Interviewer: Aside from your work in Colorado, where were you involved with other mill tailings programs, or were you involved with them in other areas as well?

Bud: Well, I always had input when we were looking for contractors to — to deal with it for the AEC contractor, DOE contractors. But I visited quite a few of the different sites and would make observations. But I was a pretty low-level individual as far as the whole program was concerned. There were times when people would ask me to provide input, like when I was asked by the International Atomic Energy Agency to help write a

paper that would — I can't remember exactly how they put it, but — emerging nations, nations that were just beginning to start dealing with uranium mining and milling, how would they deal with such a — an effort in their — in their country. So a couple of guys from Australia and I were asked to come to Vienna and write a paper that basically would say, “Okay, if you're going to have uranium mining and milling in your country, here are the things that you need to — to think about. Here are the kind of people that you need to have present to make decisions, as this will affect your country. Here — here — here's what you need to know about the mining, here's what you need to know about the milling, here's what you need to know about the disposal or contamination or con— or control of contamination.”

Interviewer: Did you present that paper and what was the name of the event?

Bud: Yes, we presented it to a conference in Vienna about six, eight months after we wrote it. And I don't know exactly what happened after that. The criticism that we got was that if you — the emerging nation should have to deal with this, they should hire people who have already dealt with it before. They shouldn’t try to deal with it themselves. But we wrote it as if, “Okay, this is what you need to do. This is why — this is why you need to think about this. This is the kind of people that you need at this point and at this point.” Interviewer: Do you remember the name of that conference? No?

Bud: No, it was basically — it was a review of our paper. They brought — I think they had 10 people from all over the world: China, Germany, France, Canada, Australia.

Interviewer: How long were you there?

Bud: Well, it took us about a week in Vienna to write it. And then we went home and — and fine-tuned what we'd written. And then one of the guys from Australia and I went back and presented the paper to this committee, basically, from all over the world.

Interviewer: What year was that? When was that?

Bud: 90 — 19 — 1996, year after I retired.

Interviewer: And did you do any other projects like that, after retirement?

Bud: No, no.

Interviewer: Just nothing?

Bud: That was — that was disappointing because they rejected — we — we wanted the — the people in the — the hat of — hat in the ring, so to speak, we wanted those people to be making the decisions, and that was the local people. The people of that nation that needed to make those decisions. And they said, “Well, you know, let's just hire consultants from Canada, or France, or Germany," and that — "or the U.S.” and that's not good. You needed locals, because they really — they're the ones who are going to have to deal with it.

Interviewer: What else did you do after retirement?

Bud: Well, by the — I — by the time I'd retired, I'd quit skiing. I was a ski patrolman for a while. So, you know, I just — I retired. I spent some time at home gardening, and — and visiting our — our family. My — my wife and I really enjoyed skiing. We skied until we — I think we were 77 years old. This year, with all this snow, I thought, "Ugh! What a year not to be able to ski. It would have been glorious out there." And the — you know, I — I volunteer at the VA. That — that really is rewarding, you know, and there's so many nice people, and the ones that are coming into the hospital are coming into the hospital for a reason. And so you try to help them find ways to help themselves. And it's really — a lot of nice people in this world.

Interviewer: I agree. How has — has your job that you had here impacted the rest of your life today?

Bud: Well. Well, it's made me more aware of the world. It's made me more discerning. Dealing with the press was — man, talk about a — I had no experience with the press, and I quickly found out that the press would color things the way they wanted them to be presented. That you could give them a statement, and they would take that statement, chop it up so that you'd ended up saying something on film that you really didn't intend to say. I would — I'm much more discriminating. The — you understand where they're coming from, but you also need to understand that whatever you're presenting is a valid way of looking at things. That — that's — I've used that knowledge quite a bit in the world of politics and — and interaction with people, you know, trying to deal with a wide range of people that I had to deal with on a daily basis.

It was a heck of an education. And I found out that there's so many really nice people all over this — all over the world. Man. A guy from Sweden and I have been friends until he died a couple of years ago. You know, it just — [laughing] We'd go — we'd go rafting together, we'd go skiing together, he'd bring his family over, they'd stay with us. You know, that was — that was neat. People — people all over this world are the same, but they're different. And it's just been one heck of an education. One that — I know I understood more what my dad was going through when he was trying to teach people about radiation. And he finally got a — a really good program going in the mines here in Colorado that saved a lot of people's lives. Then — and I valued his judgment and his information, and I used it a lot on the job.

Interviewer: Do you miss getting up for work every day and coming to the compound?

Bud: Yep. When — you know that right after I retired, I, probably for about the first month, maybe two, I always had that feeling I should be doing something else. And I finally decided, well, you know, it was just I used to be doing this or that on the job, but I got over that because I started installing a new irrigation system on my — my house. And I had to dig a lot of ditches. [laughing] I was using a shov— you know, my — one of my first jobs, was when I was a little kid, was my dad or uncle would say, "Go over there and look down at that tailings pile at the mill. And if you see water that's running somewhere it shouldn't, you run and tell us." And then when I was 16 years old, I got a job at the Idarado Mine at Red Mountain working on the tailings crew, and I shoveled tailings all day long, all summer long. So I've had a lot of jobs dealing with tailings over the years. From the time I was 9 years old until I got this job.

Interviewer: Is there anything else you want to tell us today? That was the end of my questions.

Bud: Just that I think that this idea of legacy is important and that it's important that we learn from our mistakes. And, Lordy, we made a bunch of them over the years. And that we continue to learn from them because we are still making the same sometimes, or brand-new mistakes. And if — if we can just learn and — and learn to deal with it, and learn that it's — it impacts people everywhere that that's — that's neat. And I think that you're doing a pretty good job.

Interviewer: Well thank you. We appreciate that. Did you have anything that would have popped in your head?

Crew: Just like hearing the stories.

Interviewer: Yeah. They're important.

Bud: Well, you know, it is important. We — we — there are things — the people I met, the expertise from, oh, everywhere, the amazing — just some of the — some of the people, you'll never forget them. John Themelus[?] was one of the guys that I worked with initially here in Grand Junction. He — I wish I knew where he was, if — whether he was still alive, how his kids were. The guy that I worked with developed the way in which we document things, J.B. Baron [?]. He was — he worked — he was in the Air Force, and he worked with people, giving astronauts their first ride in weightlessness. You know, the — the — the different people that you encounter. Andy — I can't think of his last name — from the health and safety lab in New York City. He was a constant source of information that nobody else could provide in the world.

I embarrassed myself totally once with the guy that had worked with radium dial painters, Robley Evans, came out to see what we were doing, and I took him out to show him some survey techniques we used to use in the scintillator. And he said, "Well, what kind of air sampling equipment?" "Well, we use the TLD." "Well, how does that work?" And I thought, "You pile of something or other" — meaning me — "you haven't taken the time to really understand how it works." And I said "I don't know." And I thought, "Oh, and you should know." So, I very quickly — [laughing] I came back and — and learned how — how — the, you know, the TLD system works. Thermo— thermoluminescent dosimetry.

Interviewer: Okay. Anything else you want to share with us today? I'll let you out of the hot seat and out of the lights.

Bud: Well, no. Just, we need to keep learning. We make mistakes, we need to correct them. Need to 'fess up to the mistakes we make. And that conference in — in Washington was an eye opener because I was sitting there watching other people as presentations were being made, and most of them were just kind of sitting there. And then, when I said, "Well, I guess this man's just pretty much made the presentation I was going to make. How about if I tell you the mistakes that we made?" Man, all the heads turned around. [laughing] And they were glad to hear about all the mistakes we made. But it helped. It helped.

Interviewer: Totally. All right, Bud, I don't have anything else. You want to cut the camera?