ORAL HISTORY OF THE
TENNESSEE VALLEY AUTHORITY
INTERVIEWS WITH
CHARLES OKEY

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MISSISSIPPI VALLEY COLLECTION
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INTERVIEW WITH CHARLES OKEY

JUNE 10, 1970

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PLACE Knoxville, Tenn.

DATE June 10, 1970

Lucie W. Okley

(Charles W. Okley)

(Interviewee) Lucie W. Okley

Charles W. Okley

(Charles W. Crawford)

(For the Mississippi Valley Archives of the John Willard Brister Library of Memphis State University)

(CHRO Form B)
DR. CRAWFORD: Mr. Okey, if you're ready, could we get some information about your early life, your education, and your experience before you went to TVA.

MR. OKEY: Well, I went to school at what is now the Iowa State University, and took engineering.

DR. CRAWFORD: When did you go there, Mr. Okey?

MR. OKEY: Well, I got there in the spring of 1905 and graduated in 1909. I was interested in drainage work before I went there, as a boy on a farm, and so I studied that. I made a study of drainage work. Then in the spring of 1909 an organization of the government--really the Department of Agriculture--put out studies of that sort of work and so you might say we took a study of that. I made the study and came out
very well on that and the Department of Agriculture sent me to New Orleans in connection with the flood work around there, and I got there the last week in December. At that time the Army Engineers and also the Department of Agriculture was doing work around there--work like you have in Holland, and there would be places where they would have work around New Orleans. They would have dams there and then they would have pump water like they do even yet in the flood control in Holland. That was very interesting and I was tied into that. I did that work and then got tied in with engineering offices all up and down the Mississippi River with Morgan Engineering Company. That's where Arthur got into it, you see, and later on I was in engineering work with Morgan Engineering Company and worked like that in Arkansas. That was before the creation of the TVA. And so I could see the long reason for it--the time it might be in developing this river--and so I came over here in 1935 because I could see that the work would be tremendous and would last for years, and would be permanent maybe long after I was gone. That was the reason I came over here.

DR. CRAWFORD: When in 1935 did you come?

MR. OKEY: Let's see, I think that was November 1, 1935.
DR. CRAWFORD: What dams were underway then? Norris Dam?

MR. OKEY: Yes, Norris was underway then.

DR. CRAWFORD: What others?

MR. OKEY: Let's see, I've been away from them--the names are gone, but Norris was the big dam, and then the other dams were up and down the main stream, and of course, the records show who they are. They started way up in the mountains here and came on down and that controlled the floods in the river, and through these dams on down they had to put in a--like they have in Panama Canal, you see.

DR. CRAWFORD: Yes.

MR. OKEY: And so there was the question of what the capacity and storage of each dam would have to be, and I was tied into that in detail. Then, as I said, when the big floods came along they would have to spill, so I was in on that, studying the flood possibilities on the river--studying what the floods were, the rains were and how many thousand acres of water would be above each dam. All that had to be worked out.
DR. CRAWFORD: Did you have good data to work with?

MR. OKEY: Well, we have to have it, yes.

DR. CRAWFORD: Did you have studies made when you arrived, or did you have to have to make them?

MR. OKEY: They were just getting started, you see, in '35, and so we had to make studies of the rainfall. We had the weather bureau on that, of course. And all that had to be planned so that when the great storms came in we would know what was going to happen. Then I was also involved in making the surveys of all the country so we would know what the streams were and how many thousands of acres there was in each one of them. About the time of the World War--the first one--I was involved in making surveys of all the streams, and of course you had to get out and make surveys on the ground, but at that time we developed a way of making a survey contour of each one by pictures from the air.

DR. CRAWFORD: That was new, wasn't it?

MR. OKEY: Oh, that was new and it got into World War I and World War II, and it was an advantage to fighting, especially in World War II, because they made surveys of
the topography of all the territory from the air and it was perfect enough so that in fighting why they would know what the distance was from here to yonder and so the American fighting was at an advantage. They would know the miles over there where the enemies were because they had that topography.

Did TVA develop that?

Well, yes, they helped develop it. And that was an advantage because the topography-making surveys and contouring it this way on the ground was pretty slow. But that thing was developed in the world war and here was a place over the mountains, maybe miles away, and from the pictures taken they knew right where to shoot. It was a big advantage in the war. Some of our engineers were over there helping to apply it. I wasn't over there, but some of our engineers were over there and applying it so they would know what was what four miles over there for big, long-distance artillery, and they could put it right on the other fellow. That was part of it. As I say, some of our men were over there. I believe Harry Wiersema was, but I'm not sure, but some of the men that I knew were—I can't recall their names now. Time goes past—but they were over there as quite an advantage to the army.
DR. CRAWFORD: I'm sure they were. Did many of the TVA people go into World War II?

MR. OKEY: Not many, as I recall.

DR. CRAWFORD: I know you had more construction underway at that time than you had before. What was your main responsibility when you went to work with TVA?

MR. OKEY: Well, it was a study of the size of the different streams and what the flow was going to be from there, and we made a study of the rainfall, and then of the area. That was the main thing so you'd know and to find a place to put the dam, and how many acre-feet of water there would be there by each one of them. That was the problem at work that I had--of making a study of the different streams that came in, and there were other engineers who were finding the place that the dam should go.

DR. CRAWFORD: Did you work in locating the dam sites?

MR. OKEY: Yes, yes. I was educated in that.

DR. CRAWFORD: What was your work in that, sir?
MR. OKEY: To select a place of where it might be and then, of course, the geology in the river at that place--of whether it was such that you could depend on it, that there wouldn't be any holes under that work so that it wouldn't work out. You see a lot of the geology on the streams up here was of a character that would have holes in it--it would leak. The type of the geology is such that it would leak and, of course, what we aimed to do was to get on streams that would not wash away. You know, the kind of geology that is hard stuff.

DR. CRAWFORD: What locations, what types of geology made the best dam sites, Mr. Okey?

MR. OKEY: Well, the kind that was in the character of hard stuff.

DR. CRAWFORD: Did you look for a certain type of rock?

MR. OKEY: Yes, we did.

DR. CRAWFORD: Did you take core samples? Did you do boring?

MR. OKEY: Oh yes, and let's see what is the mountain that is made hard and squirts out the hard stuff? What's the name of it?
DR. CRAWFORD: Let's see, that would be volcanic ore, wouldn't it?

MR. OKEY: Yes, that's it, so that would be one of the things that we would look for--where a dam had to be. We would look for volcanic character because that wasn't going to dissolve.

DR. CRAWFORD: Were you able to get enough samples to be sure what you were doing?

MR. OKEY: Oh, yes. We had to take borings and then we had geologists here who would know about the character, but a lot of the mountains up here are tough stuff--are the kind of thing--hard stuff, and then some of the stuff would be of a different character, so you couldn't use a dam on that sort of a thing.

DR. CRAWFORD: Did any people--did any laymen or politicians ever doubt that the dams would hold water?

MR. OKEY: Yes, because East Tennessee had potholes in it, because it wasn't hard; it was the sort of stuff that dissolved. All over East Tennessee you've got potholes in it and the water leaks all down through there.
DR. CRAWFORD: Were you able to locate those potholes?

MR. OKEY: Oh, yes, they had to watch that, and that was one of the things that was talked about Norris Dam. They figured that they never would be able to fill it with water because it had potholes, which meant that that was a lime formation and that you couldn't fill Norris Dam because there would be too many potholes. Well, that was just somebody's idea. There was enough tough stuff in there, so we stood there. They said because it was in pothole country the water would leak out, but it didn't. It just so happened that we got enough borings in so water wasn't going to leak out of Norris Dam.

DR. CRAWFORD: Did you ever have any doubt about whether or not it would work?

MR. OKEY: Well, no, because we were making detailed studies because East Tennessee is a territory of potholes, because of the limestone character of the country. But, of course, when the geologists got to making a study of Norris Dam they made enough borings and everything to know that water was going to stay in Norris reservoir. That was one of those things. But in traveling around over East Tennessee on the farms and all that, you'll see
MR. OKEY: potholes in the farms because it's a limestone formation.

DR. CRAWFORD: Are the potholes often deep?

MR. OKEY: Yes. They are, but that was one of the big things from the army engineers. The army engineers were still jealous because the army engineers had the authority over the whole United States—all the navigable streams. That was their baby.

DR. CRAWFORD: They did until TVA, didn't they?

MR. OKEY: Then, of course, the locks to get the boats through the dams down river—the army was very much interested in that, and not very happy at times. But they worked out these locks to each dam to preserve river navigation. They were very active on that.

DR. CRAWFORD: Well, did the Corps of Engineers learn anything from TVA's flood control experience?

MR. OKEY: Yes. They did, all right, because it was the biggest thing of its kind in the country. Of course, you know the outfit that developed in the West . . .
DR. CRAWFORD: The one that built Hoover Dam, or was that a corps dam?

MR. OKEY: What was the name of the government agency--Department of Agriculture--for building all the dams in the West?

DR. CRAWFORD: Was that the Bureau of Reclamation?

MR. OKEY: Yes, the Bureau of Reclamation. They studied that, you know, and one of our best men--the geologist--left TVA to go with that outfit at the right time. He was a very important man, but and I can't get his name right now. He was a native of East Tennessee and knew about all these potholes and everything else. He graduated at U. T. and then finally he went to one of the big geologist schools in the Eastern United States. He took his final work there and the one thing about the TVA was that they were much more important in developing the geology on all these structures than the army was and they were the top people until that outfit in the West. Finally when they got to developing, they took our best man and took him out there. That big outfit out there didn't have the geologists at first, and so this man that we had here went out there. As you probably know, there was a dam or two in the West
MR. OKEY: and Northwest that failed, and that was because they didn't have a geologist ahead of time like we had.

DR. CRAWFORD: Whose idea was it--having a geologist working with TVA?

MR. OKEY: Well, it was probably Arthur Morgan's. It was probably him.

DR. CRAWFORD: He had had a good deal of experience in flood control.

MR. OKEY: Oh, yes. The Morgan Engineering Company was all up and down there, and so they put him in charge, you know. Remember those tremendous storms and things they had in Ohio?

DR. CRAWFORD: Yes, that led to the establishment of the Miami Conservancy District, didn't it?

MR. OKEY: Yes, and he was in on that. Morgan Engineering Company got in on that.

DR. CRAWFORD: Where had most of the TVA engineers had their experience in flood control and hydraulic engineering?
MR. OKEY: Well, like some of that work they had at New Orleans, and then they had work on the rivers up in Ohio. I think—I'm not sure—but I think some of the men came from the big bureau in the West. We probably got some from there.

DR. CRAWFORD: The Bureau of Reclamation?

MR. OKEY: Yes.

DR. CRAWFORD: Do you know if any of them had had foreign experience in building dams?

MR. OKEY: No, I don't remember any now, but there was some work abroad. There were some dams built in Europe, all right, especially in Italy. There was some there.

DR. CRAWFORD: Yes. I know there was not much dam building in the United States in the 1920's, but in TVA in the 1930's you had a great deal of it.

MR. OKEY: Yes, but there were some dams in Europe before we had ours. Some of the biggest early developments were in Italy.
DR. CRAWFORD: How did your previous experience help you in your TVA work?

MR. OKEY: Well, it was the work with the Morgan Engineering Company, then my early experience around New Orleans, and then my experiences on drainage work—but the amount of work with the Morgan Engineering Company on the work we did up and down the Mississippi River.

DR. CRAWFORD: That went all the way from New Orleans up to the Ohio, didn't it?

MR. OKEY: Oh, yes.

DR. CRAWFORD: What about the flow of water in the rivers? Did you have tables of that before you arrived at TVA or did you have to develop them?

MR. OKEY: Well, some of my work was along that line already, and even before I left the Iowa State University, I was making some studies of flows there.

DR. CRAWFORD: How did you measure that?
MR. OKEY: Well, you had the devices which you put down into the water and it made that thing spin around.

DR. CRAWFORD: And what about information on rainfall? Did you have that tabulated when you arrived or did you have to do it after you got here?

MR. OKEY: Well, there were some studies before. I made some studies on rainfall, of course, when I was still in college, and we worked on that. And then when we got in here we made studies of the rain. We put out devices, you know, for studying it.

DR. CRAWFORD: Did you learn much by that? What sort of average rainfall did you find in East Tennessee?

MR. OKEY: Well, we made studies of it. The weather bureau outfit, you know, out there recorded the rainfall--had devices for recording the rainfall. How much and whether it was two inches in an hour, or five or six inches in a day--devices were for recording the rainfall, and the time. It would show whether this device was recording two inches in an hour, and that was part of the study here--the devices for the rate of the rainfall.
DR. CRAWFORD: You took that into account in building your
dams, didn't you?

MR. OKEY: Oh, yes, the rate of the rainfall. And I could
study all over the USA yet, you know, especially with
that outfit in the Mid-West. So they had devices for
rainfall--recording it.

DR. CRAWFORD: Were you able to get floods under control in
the Valley as much as you wished?

MR. OKEY: Yes. The storage in these reservoirs and then
the capacity of the spillways, so that the dam wouldn't
be overtopped. And we worked on that--on the capacity
of the spillways--after the reservoir was full. Of
course, all these reservoirs were hydro--for making
power--all of them.

DR. CRAWFORD: They were all multi-purpose, weren't they?

MR. OKEY: Oh, sure.

DR. CRAWFORD: All for power and flood control?

MR. OKEY: Sure.
DR. CRAWFORD: Was your concern mainly the flood control—not the power aspect of it?

MR. OKEY: Well, of course, it was like this: they interlocked, and that was one of the things of putting a reservoir in—a dam in—and its storage capacity so that the hydro developed would be worked the whole year—storage water, and not only storage water but the rainfall and the capacity. The hydro had to be backed by all the rainfall and the storage reservoirs, so the hydro would be continuous.

DR. CRAWFORD: Did you ever not have enough water? Did you ever run short on water or draw it down too far behind the dam?

MR. OKEY: Well, yes, we would have dry years, you see. We would have dry years and that would reduce the constant ability to furnish hydro. You would have dry years, but that was one of the things we had to look out for—to have the storage to bridge over a dry year. But the river as a whole is probably the biggest hydro-development in any one place. Of course, this stuff in the Mid-West—that was for two things: for hydro and also for irrigation.
DR. CRAWFORD: And the dams are scattered more widely there, aren't they?

MR. OKEY: Oh, yes, and those dams were fixed up for hydro but also for irrigation. In that territory they needed it more than we do because in some parts of that country the rainfall has dry months, all the time. And so they had to store more water as it was, but the dry years in East Tennessee were not so great.

DR. CRAWFORD: Did you have any particularly bad drought? Did you have any bad years?

MR. OKEY: Well, no. No, that was studied and so the hydro—of course, the hydro of the Tennessee Valley Authority—is also hooked into the river south of here. That's in Georgia, and over in Alabama they—a quite interesting thing on this developed: one of the big drafts on hydro now is for cooling.

DR. CRAWFORD: Because of the nuclear plants?

MR. OKEY: Well, you know in plants now you use electricity to have the power to control the temperature in big buildings. You have to use hydro for that. Back before Alabama and Georgia, and TVA—in certain areas (I don't
MR. OKEY: (Cont'd.) know whether this is Alabama) the biggest draft is on cooling.

DR. CRAWFORD: But that wasn't known at the beginning?

MR. OKEY: Oh, no. And they swapped back and forth, you see. In certain times of the year Alabama and Georgia helped us--big plants down there--and we helped them. But one of the big drafts now on electricity is cooling things. I believe, sir, that the biggest exchange between Alabama and TVA and Georgia is cooling things.

DR. CRAWFORD: You do get peak use of electricity in air-conditioning season, don't you?

MR. OKEY: Oh, yes. They have to have cooling down there, you see. That's a hotter temperature, and I think their biggest exchange with TVA is cooling.

DR. CRAWFORD: Did you work with engineers from private power systems when you were with TVA?

MR. OKEY: Well, at least there was some but there wasn't much. But the big thing that TVA had on geology was that they looked down the long road and made planning way ahead of time on the geology of the rocks and every-
thing else, and that was one of the things that the TVA was way ahead in. As I said, our top geologist went to the Mid-West.

DR. CRAWFORD: What people did you work with most closely in TVA?

MR. OKEY: It was the water supply. That was my biggest menace then. The men would study the flow of the rivers and they put down a device, you know, and that would spin around and give you the flow of the river--I mean how swift it was, both up here and there, and that had to be checked. And then the rainfall per quarter--whether it was two inches a day or two inches in an hour, or something more, and I was tied up with watching the rainfall gauges that had to be studied.

DR. CRAWFORD: What year did you retire from TVA, Mr. Okey?

MR. OKEY: Well, in '56. You see they had a list of seventy years, and so when October of '56 came along and I was born in 1886, and I was seventy, I was retired. And now I believe it's sixty-five. But it was seventy, and then because I was with the government, I wound up with a pension, and that's kind of interesting. In '57 I had some special work with another part of the government on a study of flood control over in East Pakistan and some
MR. OKEY: other studies in India and Dominican Republic, and that was a branch of the government so that my pension became active.

DR. CRAWFORD: With what other agency did you work after leaving TVA?

MR. OKEY: It was a wide-open space of flood control and I went with them to that outfit where they were making a study of flood control. What was the name of that branch?

DR. CRAWFORD: Did any other TVA people work for it?

MR. OKEY: I don't know that any of the rest of them went over there. What was the name of that multiple flood control—it wasn't the army—it was another outfit. What was that? That was in '57. That's several years ago, and they went over there to make a study of the flood control in East Pakistan. They had those streams coming down out of the Himalayas, you see, and so this branch of the government made a study.