CAP Oral History

Pam Stevenson (Q):

Let's start off by identifying on the tape that today is Thursday, July 8th of 2004, and I'm Pam Stevenson and we're here in Mesa to do an interview for the Central Arizona Project and I'll let you introduce yourself. So go ahead and give me your full name and when you were born.

Ed Hallenbeck (A):

My name is Ed Hallenbeck and I was born October 10, 1932 in Madison, South Dakota.

Q: Can you tell me a little a bit Madison, South Dakota, growing up, was it a farm family?

A: No, we had a furniture and undertaking business in a town of about 5,000 which served a large agricultural area. It was a great place to grow up and it was kind of typical Midwest at that time, small town, an innocent place. It had a four-year college in it so we were exposed to some opportunities for higher education right at the beginning. It was a great, great town.

Q: Did you go to college there?

A: No, I didn't. I took a few courses there, but I went to South Dakota State University and got a degree in Electrical Engineering.

Q: Why did you decide to go into that field?

A: Oh, I sort of liked electricity, liked electronics, and that sort of thing - although I didn't do much of it. Professionally, it's a great background in engineering. You need engineering in a lot, a lot of areas, construction and design and that sort of thing. So it served as a good engineering background for what I did.

Q: What did you think you were going to do when you were going to school?

A: Well, I wasn't too sure. I knew I was involved in the undertaking business for a number of years and I knew that wasn't something that I wanted to do on a long-term basis. I really didn't have any specific interests that I was shooting at while I was going to school. I went to work first for a company in St. Louis, Century Electric, and I was doing application engineering for electric motors and motor controls. Spent some time New York and then I had a number of friends in the electrical field, electric power, in rural electrification, particularly in South Dakota. And they said that there's an opportunity with the Bureau of Reclamation in Huron, South Dakota. They need engineers, would you be interested? So I checked into it and yes, I was interested. And I moved back to South Dakota, it just happened to be South Dakota, went to work for the Bureau of Reclamation there in 1962.

Q: What was your first job with the Bureau?

A: Substation, substation maintenance actually, and I was doing testing on high voltage equipment and relay testing and those sorts of things, on the road a lot traveling from substation to substation all over the state.

Q: Did you like that first job?

A: Yeah, it was great. I really enjoyed it. I had a chance to be out with the maintenance crews and that. Learned a lot about people, a lot about management and what, usually what the blue collared people thought of management and I made up my mind at that time if I ever got into management, I wasn't going to do what the other folks had done. I think it set a good course for me for the future.

Q: Tell me a little about how did your career go then from the first job with the Bureau of Reclamation?

A: From Huron, I had an opportunity – the Bureau has a Department of Interior's Management Training Program. And they accept applicants from all over the Bureau and they select from several and you get to go to Washington DC for a year. So I applied for it and I got it. I went to Washington DC in 1964, spent about a year back there in the department going through training and so on. Spent a little time at George Washington University and it was really a great opportunity. Made a lot of connections and when I went back to Huron, I had a chance to go to Boulder City, Nevada, in the operation and maintenance in the Regional Office there and I took it and moved to Boulder City in about 1966.

Q: What was Boulder City like in 1966?

A: It was very nice. I remember when I left here in South Dakota, it was about 25 or 30 degrees below zero and when I arrived in Boulder City it was about 65 or 70. I threw my coat away and I don't think I had one again for a number of years. But Boulder City was a nice little town, and Las Vegas at that time was probably 150,000 people. The whole area was a very comfortable place to live. The Regional Office had responsibility over the Lower Colorado River, Hoover Dam, Davis Dam, Parker Dam, and all the way down to Mexico. And they also, at that time, we were in the electric power business. So the power generated by those dams was distributed over a Bureau of Reclamation transmission system then subsequently in the 70's, that was consolidated into the Department of Energy, the marketing part of it, the transmission lines. And I chose to stay with the Bureau at that point.

Q: So did your job change then?

A: Yeah, I went in 1969, I came down to Phoenix here and was Project Manager at the Parker Davis Project, which was a Bureau project at that time. I stayed with them until 1976. At which time, around in that time period, DOE was formed after Carter was elected. I chose to go to Yuma and stay with the Bureau and became Project Manager of the Yuma Projects Office, which was a complete and total shift from what I'd been doing in the electrical field at Parker Davis.

Q: What does a Project Manager do?

A: Well, the Bureau put together various congressional projects. They set them up as a project; it was usually an authorized function by congress. And Project Manager just manages that portion of that particular project. In the case of Parker Davis, Parker Davis had Parker Dam, Davis Dam and a rather significant transmission system in Arizona. The Yuma Projects Office was kind of a collection of projects that were headquartered out of Yuma. And it included the salinity control project and the desalting plant had dealt with relations with Mexico. It was rather an intriguing thing. It got into a lot of areas that were new and educational for me. I really enjoyed it. It was a good learning experience and it was a great place to be. Yuma is a nice community, a very, very nice community.

Q: You mentioned the desalting plant, was that in operation...

A: No, that was under design at that time and we were going through all the political aspects of whether we should build it, not build it, and dealing with Mexico in that area. During that period, it was decided to build it. More firmly, it was authorized ahead of time but there was still a lot of equivocation about whether we should proceed. But we decided that it was the best thing for all the seven basin states and we went ahead with the start, began construction at that time.

Q: What did you think of it?

A: The desalting plant? It solved the problem politically. It threw money at it and solved it in a political sense. I was a little bit frustrated towards the end, it didn't seem to be a great deal of interest in people divvying up their various budgets throughout the Bureau in order to operate it. And in that case, it still holds. And you try and get the money to run the desalting plant today; everybody says it costs too much. Well, we pretty well knew that back when we were building it. It took care of the political anxiety of Mexico and I think at that time that was one of things they were shooting for.

Q: So you're not surprised it wasn't a big success?

A: No, I'm not. I think we almost, we almost predicted that this thing was going to be a last ditch expenditure in order to operate it. Now, if we get into an extremely extended period of drought that we may be getting into now, that desalting plant could turn around and become very valuable. Because the salinity in the river could be going up and up usually with the reduced flows in the Colorado, the salinity does go up in the Yuma area. And maybe we'll want to use that down the road. But I think it will come at a time when everybody is suffering so much that they're willing to spend the money to operate it, but in good times nobody would really give it a thought. It's sort of a fire truck operation actually. It's not something that you build and plan on operating it day in and day out. It will serve a purpose I think, if we get into an extremely extended drought. It looks like we're heading for it. You may turn around and say this was not such a bad idea.

Q: It's taken awhile though.

A: Yes, it's taken awhile.

Q: It sounds like you got pretty involved in Colorado River issues then?

A: Yeah, very much so. Another function that the Yuma Projects Office had was we did all the river revetment work and maintained, maintained the river from there either dredges and doing the rip-rapping of various areas to reduce the erosion of the river. And so I was very deeply involved in the Colorado at that point.

Q: And you started in Boulder City so you kind of seen both ends of it through Arizona.

A: Right.

Q: Did you think when you moved to Arizona that you'd ever give much thought to the Colorado River?

A: Well, yes I did because I was in the Regional Office. I went to the Regional Office originally and the Regional Office had the responsibility for the river from Lake Mead south. And so, yeah, I was pretty well involved with the Colorado at that time. And the operation of Davis and Parker Dam would depend on the flows of the river and downstream uses and so on. So yes, I've been rather deeply involved with it.

Q: Probably traveled it a lot too.

A: Quite a bit.

Q: Probably know it better than most people.

A: I forgot a lot of it.

Q: How did you first get involved with the Central Arizona Project?

A: Well in 1980, the Project Manager's job at the Arizona Projects Office, up here, came open and I was interested in it, applied for it and go it. So I moved back here at that time from Yuma, and was Project Manager of the Arizona Projects Office which at that point was in the Valley Bank. So 1980 to 1985, I was here managing that office.

Q: Why did you want to take that position?

A: That's kind of a...the CAP was the largest construction project that the Bureau had ever undertaken. And that was a real plum as far as a Bureau of Reclamation job was concerned. You know, it was probably the best job I'd ever had in the Bureau. It was a growing organization. It was a chance to build a construction organization during a period of time when there was a lot of good construction people available. There were a number of things that were finishing up in the Bureau. Glen Canyon Dam was finished; a number of other projects throughout the Bureau of Reclamation was finished. There was a lot of good construction people that would

be available. This was principally a job of putting together an organization and getting the construction of CAP moving. It had been moving for, in the early 70's we had a construction office at Parker Davis and Andy Dolyniuk was the Construction Engineer there. It became apparent that we didn't really have that much construction at the Parker Davis Project and they just finished up the Northwest-Southwest Intertie System. And so Andy and his crew, a fairly sizable group of people at that time, probably 60 people in that construction organization, were really going to be looking for things to do. And it fit real well that the Central Arizona Project, downtown at that time, was going to be putting on a construction organization. And so Andy, and I, and Cliff Pugh who was the Project Manager of the Arizona Projects Office, got together and transferred Andy Dolyniuk and his construction crew in one whole organization over to the Central Arizona Project. So it was kind of like coming home to part of it, because when I came back to that the Arizona Projects Office, here was Andy and his construction people that I had worked with previously at Parker Davis. So it was kind of one big family, you're just moving around in the family.

Q: Why was the offices in downtown Phoenix?

A: Well, they had a rented spot down there. The GSA, General Services Administration, provides space in many cases for federal offices. And they built the Valley Bank. And there was a large amount of it available cheap. And so they, GSA, got together and put the Central Arizona Project on the 21st and 22nd floor of the Valley Bank, which is a nice place if you're, you know, in the banking business or something like that. But we were getting into heavy construction and to have a construction office in a spot like that wasn't too convenient. So it was shortly after that, that we decided that we needed to move out where we got the room. We built a facility out at Deer Valley where you find it now. We built that facility and moved from Valley Bank out there in the early 80's I gather, around '82 something like that '83.

Q: You weren't downtown too long.

A: No, I guess about four years.

Q: Talk a little bit about the construction; you oversaw a lot of the construction of the whole canal system, what were the major parts of that? How do you plan to build something that big?

A: The construction of CAP took place over a twenty year period. And so, what you did was build something that was first of all, that was useful so it can serve a purpose. So this is why Reach 11, which extends up north of Scottsdale, I think through there was one of the early ones that was built, because associated with the canal was a large diking structure that provided flood control and that for part of that area. So this is something you could build and it served a useful purpose right-of-way. The second thing you tried to do was to build something that if it didn't serve a useful purpose, it didn't take any maintenance. So an open canal takes maintenance just sitting there dry fills full of dirt, fills full of weeds, animals fall in it and various things like that. So it becomes a maintenance problem, something that you have to control and watch all the time. But there are a few things that you don't have to and that's the siphons that run under rivers, run under roads, and there's a number of structures like that. Bridges that can be built that you can kind of set aside and don't require any maintenance so that was the next thing. A number of the large siphons and that were built. The last thing you built were the pumping plants and the canal system. That's kind of a general oversight but also you wanted to get water to the place that could use it first. The Hassayampa Valley got water first, the Phoenix area second, and then it moved on down towards Tucson. Tucson was last on the list and they were at that time...

Q: Overseeing the construction was the main part of your job?

A: Not really, no it isn't. It was a part of it, it was part of it.

Q: Do you want to talk about Tucson or should we go back and talk about, start at Havasu and talk about the different challenges of construction?

A: Yeah, let me talk a little about construction organization. Because I think that's important as well and kind of the politics of construction. There was a transition in the Bureau of Reclamation that took place in the early 80's, late 70's, early 80's. That had to do with the way the Bureau of Reclamation constructed things. In the past, and I think probably all the way back to the beginning of the Bureau, there was the Chief Engineer in Denver. And the Chief Engineer not only designed things and did a lot of the detailed engineering planning but they also managed the construction. And they would then have people in the field that worked for the Construction Engineer in Denver. And yet the project was politically under the control of the Project Manager locally, who was under control of the Regional Office and worked for the Regional Director. So now you had an organization that wasn't connected right directly that had to loop back through Denver, through the Regional Office, and was connected at a distance. And it meant, in very general terms, that the construction function of the Bureau was not connected with the Project Management end, so politically there was this lengthy loop between the two. And in some cases, the construction people were not responsive to the local political situation. And I don't have any specific examples but I can see it under that function. If there was something that was politically expedient that was not expedient for the construction, that in order to get the two to talk to each other and match up would take a long route up through people and back down. And the people didn't have any authority over each other. It was a bad deal. Although I don't notice specifically of anything that happened that was particularly traumatic as a result of it or any great problems, it was an awkward thing.

So the Bureau then changed at that time and it took the Construction Engineer locally and made that person responsible to the Project Manager. Now that was a traumatic experience for the Construction Engineers. I know at Grand Cooley, I had a little experience with the Grand Cooley Operation up in Washington and the relationship between the Construction Engineer and the Project Manager there became almost untenable until the Project Manager up there ended up firing the Construction Engineer. That's really how bad it got. The Project Manager at Cooley then hired a Construction Engineer that worked for him and everything became

well again. And so there was that strain, that same thing occurred to a degree at Central Arizona Project. Andy Dolyniuk worked for the Construction Engineer in Denver. And when I came down there from Yuma, the first thing that happened was they wanted the Construction Engineer to work for the Project Manager. And since Andy and I have known each other for many years and we had been good friends, it worked. But it was still a strain; the organization always went to Denver for all their questions, their leadership, and their guidance. And here was this fellow from Yuma that didn't know "sic'em from come here" about construction telling the Construction Engineer with Andy's experienced 30-something years how to do something. Well I didn't intend to tell him how to do anything but there was always that - I work for you, yet you don't know what I do. So there was that strain there that was kind of always under the surface. And what that led to I think was Andy retired in maybe a year, year and a half, or two years of working for me. We got along fine. We're good friends yet. But there was that underlying fight. Why are you, who don't know anything about this business, telling me who does, how to do it, although I didn't try and tell him how to do it, it was there. So Andy retired which left me without a Construction Engineer. I knew a fellow who I was with back in the Departmental Management Training days, who was a Construction Engineer in California. I got a hold of him. A fellow by the name of Don Anderson and brought Don in and Don replaced Andy. The two people were quite different in their personalities. Andy was a, knew his people real well and had a great deal of faith in them. He had a wonderful staff. Andy put together one of the finest construction staff's in the Bureau of Reclamation. Don was very hyper. Don was I want it done, I want it done now, I want it done yesterday type of a guy. And he was just the personality we needed to get CAP going because we were going to be building that office up by several hundred people and having to hire a lot and so on. We put Don in there and Don had connections, in a different arena then Andy did, and he put together really the organization that finally finished CAP, was done under Don Anderson. Don retired from CAP sometime in the late 80's something like that. Both of these gentlemen did a marvelous job. They were both top grade construction engineers.

Q: Did Andy have some feelings about not being able to see the project through to completion?

A: I am sure he did. I am sure he did, although he didn't express it specifically. Andy's a first-class construction engineer. So we were very lucky, in that what I'm getting at, is over the years, we had from the time CAP begin to the time it was finished, it was done by two top notch, first class, best construction engineers in the Bureau. CAP was very fortunate for that.

Q: Would you explain to me what your role was then? Your title was what?

A: Project Manager – Arizona Project Office, Arizona Projects Office.

Q: And you call it Arizona Project, isn't it Central Arizona Project?

A: Right, it was Arizona Projects Office. It was the Central Arizona Project that was being built by the Arizona Projects Office. Have to get all these things straight. My main role was I guess to oversee the organization itself, provide leadership in what direction we went, how we functioned, how the organization functioned as a unit, what our goals were, and those types of things. One of the most critical things that we accomplished during this whole process, was in addition to construction, was the planning for the Orme Dam situation and that was led down here by Stephen V. Magnussen, Acting Commissioner, Bureau of Reclamation 1995. And when I came here in 1980, I inherited a hornet's nest of problems over the Orme Dam construction, its alternatives, and what should we do about flood control in Phoenix, and that whole arena was up in the air. We had hired a consulting firm to help us manage our way through this mess and the community was very emotional about it. Prior to my arrival, there had been a public meeting held down at the Convention Center and the "tubers" showed up in their bathing suits and tubes and it was just almost a riot about damming the Salt River and ending tubing in that stretch of the river. And then the Indians were involved by - we were going to flood

the McDowell Indian Reservation and they were fighting it. And Orme Dam was just a hornet's nest to dig in to. And we dug into it.

Q: You came right in 1980 then that was right at the time of the hundred year flood we had two years in row.

A: The second annual hundred year flood. And so here we had a situation where the City of Phoenix was extremely interested in flood control. They're trying to expand the airport over a long haul, which I think they've done some of. So flood control was a major thing in the city's eyes. And they wanted that dam there. So we were stuck with the public that was not at all happy about it. The environmental community was not happy about it. The Indian community didn't like it. We didn't find a whole lot of political support for building it except the City of Phoenix wanted the flood control. And it became a point with us that we really needed to sit down and say what if we don't build it. What do we do? And so we headed in that direction. We were kind of a victim of, I don't like to use the story of "Going to Abilene," but there's a little management tale about a group of people in Texas that one night were sitting around the back porch and they started talking about going to Abilene for something to do. And so they finally decided to do it and they climbed in their car without air conditioning and headed down the road in 90 degree heat and they went to Abilene. And they had a terrible time, the trip over was bad. The trip back was bad, it was miserable, miserable deal and they sat around the porch afterwards thinking about who wanted to go to Abilene. Well, I didn't want to go to Abilene, I thought you did. And it turned out to be that no one wanted to go to Abilene, but they did. And I think to some extent, Orme Dam was the "Going to Abilene." I think somebody sat back there, probably years ago, and said this is a marvelous site for a dam. Somebody else says, that engineer over there says this is a marvelous site for a dam. It must be a marvelous site so they started so pretty soon everybody thought Orme Dam was the only place to build a dam. Anyplace else would be silly, makes sense this is obviously the best spot for a dam takes care of all kinds of things. And only an idiot would not want to do it. Well, we thought we were getting to the point where we were really going break our pick

politically on trying to build this thing. And a number of us kind of one day sat down at a conference room and said, "Let's say we can't build it, what's our alternative?" And we started looking at alternatives. I think it maybe was the first time that we really ever seriously looked at alternatives because we had made up our minds the Orme was the only sensible thing to do. And someone said, "Well the next best thing to do would be to build a dam at Lake Pleasant to enlarge Waddell."

We started looking at enlarging Waddell and suddenly enlarging Waddell became the most obvious thing in the world. Why have we not we seen this before? One of the things that made Waddell enlargement sensible was the elevation of the lake is above the canal elevation which meant that in the summer when you have your heavy pumping load, you could release water from Waddell and actually generate electricity. Whereas, Orme, it was below the canal elevation and during the summer when you were having your peak power loads, you had to use power in order to pump it out. That itself was a terrific advantage. So we sort of jumped on raising Waddell or building a new Waddell right then. But it is very difficult to turn over a political decision that has been made and sold over all these years to the Arizona political body. I remember going through the suffering of having to talk to the delegation one at a time about we've changed our mind.

Q: Do you remember who those people were in the delegation?

A: Yeah, DeConcini was the Senator that we were dealing with, one of them. I don't recall. This was kind of around the time probably when Goldwater was not doing too well. I don't recall, he talked to Goldwater, I think he'd been talked to but I didn't do it. But we went through all of them. In fact, I recall a meeting up in the top floor of the Valley Bank where we had all of the delegation in one room and the press out there waiting for a statement. And I forget who made the statement, it was one of the delegation explained how we've changed our course. It was a tough pill to swallow for a number of those people who had sworn to their constituency that we're doing the right thing and now we're shifting gears. But we did it and we lived through it and it was the best thing to do. Rod McMullin who

used to be the General Manager of Salt River never really got over that. He felt, I think, that he had been betrayed by the Bureau, maybe by his friends in Arizona because Salt River would've, very likely, benefited from the dam at the confluence as much as anybody. I think in the long run from CAP's viewpoint, the Waddell decision is far superior. We raised Roosevelt and put in a surcharge space for flood control in Roosevelt that to a great extent takes care of some of the problems of flooding in Phoenix. So we fixed that arm, we didn't do anything with the other arm of the river at this stage. I think they had looked at raising some of the dams over there but nothing has come of it.

Q: The Verde River you mean?

A: On the Verde, yeah. The McDowell Indians, to me I haven't dealt with them since this issue has closed; they fought Orme Dam hammer and tong. And I think in a way if this is what they wanted, fine, but if they would have had a lake front out there next to their casino, they may have had a bigger gold mine than they already have – in hindsight.

Q: So what you came up with called was Plan 6?

A: Yeah, Plan 6 was the one that was finally decided upon.

Q: Was there really five others? How many plans were there?

A: I think about eight I think, I don't know. Some of them were absolutely ludicrous, they didn't really count but they were given a number anyway. It was a great job of planning. I think a number of things were learned from it. One of them is that you really need to listen to public input, as disgusting to a technical person that's listening to public input is, you know, to get any high tech input from the vast unwashed is really an insult to your intelligence, in some respects, but you need to do it. And sometimes that input is pretty good. Although I don't think the public gave us any advantages of - told us what the advantages of the Waddell were.

They did talk about how they disliked the Orme decision and it forced us into sitting down and thinking about an alternative which we did. There's something that I like to add or go back I guess in history a bit and talk about electric power that powers CAP. That electric power aspect is one of the things that makes Waddell advantageous as it is. The environmental community was active back in the 70's and the 60's, not to the extent they are today, but they were active enough to prevent the Bureau from building another dam on the Colorado River in the area below the Grand Canyon National Park. And that dam would've been built to provide electric generating energy to pump CAP. This is another decision in some respects that may have been a better one. They bought 24.3% I think it was of the Navajo Steam (sic) Plant. So they now own a generating facility that is independent of the flows on the Colorado River. Now that we are getting into a drought period, we find that they – if the CAP has to buy it, buy water or do something that is more costly to get CAP water, it has that electricity from Navajo that it's just going to be pumping with because there isn't any water on the river if you are in a drought. So you can sell it. You can generate revenue to offset possibly buying expensive water from someone else during a drought period. Whereas if you had a dam on the river and it had no water to generate with, you wouldn't be getting any revenue out of it during the drought. So you know you just wouldn't have any additional revenue. So to some extent, losing the battle of the dam on the Colorado River may turn out to be in the long run a great boom for CAP in the long run; because there is a lot of revenue to be generated when you aren't pumping power with the sale of that at Navajo particularly with the energy prices going up to where they are today. So many of these things that at the time we rung our hand over turned out to be pretty good. I think the Waddell decision and probably the Navajo Dam decision were both very good ones in the long run.

Q: When the decision was made about the dam on the Colorado at the lower end of the Grand Canyon, were you in Boulder City at that time, where you involved in that?

A: I wasn't involved in with it at all but I was in Boulder City at that time.

Q: Stewart Udall talked a lot about that.

A: Yes.

Q: How that comprised him about to everyone's surprise I think that's what he said.

A: Well, it was kind of...I guess that the story is it was made in a motel room in Flagstaff or something like that but I think it was a good decision.

Q: He said he was the Secretary of the Interior at the time.

A: Correct.

Q: I guess when he announced it, he forgot to tell his brother.

A: Yeah.

Q: That was a little rift between them. He had made this fairly major decision on behalf of the State of Arizona and Mo Udall was the congressman at the time and he really didn't consult with him. So it must have been a very...like you said made in a motel room in Flagstaff.

A: That was a story, I understand. It was a decision made among some California and Arizona...

Q: Very much a surprise to the people that had been planning that dam.

A: But it was the only way you were going to get the thing signed by Congress. That and another decision was made and that was to put CAP at the bottom of the priority list on the Colorado. So CAP takes a shortage on its million and a half of the 2.8 million first. Now that was a decision that was made as a result of the blackmail that the California delegation with their large voting block to -- we aren't going to let CAP pass unless you put yourself at the bottom of the pile. That decision to some

extent may come back and haunt California because if it puts Arizona in a position to be very firm in not allowing anybody on the lower basin states to do anything that would jeopardize Arizona. And California would like to do a few things to give them some additional flexibility that may jeopardize Arizona. So I think that puts Arizona in a position where they can become, for a good reason, quite intransigent in as far as their attitude towards California, giving California flexibility. And to that degree, I'm not too sure that California made a wise decision by forcing Arizona to the bottom of the priority list. On the other hand, I think the Secretary would allow an agreement among the three lower basin states to deviate from that priority, to stand and go through as long as the three states agreed to it. So there probably is still room to navigate through that mess. They didn't make any friends in Arizona by forcing that issue.

Q: Where you involved at that point when those decisions were being made?

A: No, no.

Q: Talking about that, you mentioned that CAP might be given permission to where it might have to buy water due to the drought. Explain that, you think that CAP has water. Why does CAP…

A: They're not too sure that CAP itself would be buying water, but Arizona may. They have to. I'm sure that either through some power exchanges or some financial arrangements, CAP may have a hand in that exchange. A lot of this is ground water that may be put in the ground and stored in Arizona. In order to get it out, in most cases you have to pump it out so that takes energy. So the CAP energy that would be used in pumping water up from the Colorado River may be using some of that energy to lift that water out of the ground for drought purposes.

Q: That's a whole other interesting aspect that CAP is putting water in the ground. Is that a part of the original plan? Where did that come about?

A: I'm not sure that any groundwater storage in itself was a part of the Central Arizona Project Act in law. But it became, CAP is an evolving animal. When it started out way back as a gloom in the eye of some of the local folks in the 40's, this was strictly an ag project in order to reduce the ground water overdraft down in the central part of Arizona. And it was a farm project and then at that time, the cities were who's going...how are you going to get a million people to even live here, you know. They never imagined this community would become the size it is. And so it was not a municipal project at all.

Tucson had no interest in it what so ever. In fact Tucson even fought it as being a big waste of money. So it has changed and evolved over that whole period in to almost now a municipal and industrial, if not a municipal project and an Indian water settlement project. So it's become a number of things. We found that the farmers that this was originally set up for are going to have a difficult time paying the cost of CAP water. If you would've said the farmers can't afford this water, you probably would've said then let's not build the project. Because the cities aren't going to be big enough to use it, well the cities are big enough to use it and they probably are going to be a lot bigger. And so this is an evolving project, part of this involves capturing water underground when it's available to some extent we're even doing some groundwater storage for the State of Nevada who has a paltry 300,000 acre-feet of water and they got that for a little town of 5,000 back in the 20's and it's turned into about a million and a half already and growing fast. So who ever would've imagined that, things are a lot different than this project started to out to be. Groundwater storage probably will be a major feature of CAP before it's through.

Q: I keep hearing more and more about that. And I remember hearing in the late 80's that when the water actually came on line to Phoenix, there was some discussion about how we're going to use this water, we got more water then we need. Where were you in that period?

A: In the 80's? First part of the 80's, I was here and the last part of the 80's, I was in Boulder City.

Q: You were part of those discussions when the water was actually flowing suddenly?

A: I probably was. In 1985, I left here to become Regional Director in Boulder City. And I was Regional Director for six years during which time I still had the responsibilities of the Central Arizona Project as part of the region. So I guess I was tied up with CAP for 1980 to 1991. And yeah, there was some discussions of those types I was probably, if not in them, at least knew about them.

Q: Let's go back and talk a little more about the details of some of the construction, we started to talk about that and we got on to other things. Why don't we talk about what was involved in building a canal, two hundred and...?

A: 336 I think.

Q: All the way to Tucson.

A: I started at the beginning. We had to build a dike on the Colorado River in order to put the Havasu Pumping Plant along the edge of the river. And the Havasu Pumping Plant then lifted the water about 720 feet up the face of Burnt Mountain and into the Burnt Mountain Tunnel. The Burnt Mountain Tunnel is around seven and a half miles long and it's 24 feet in diameter. It was bored by a mole. It was put in at the end away from the river and the mole bored its way through and came out over here right above the Havasu Pumping Plant up on the face of the mountain. Then we dismantled the mole and took it a part, took it out that end of the tunnel, and it laid down in Parker for years.

Q: How long did it take to get through a mountain?

A: I'm trying to recall, in the timeframe of 2 or 2-1/2 years something like that. It was stuck for a while, they ran into some material that had collapsed on it, and it collapsed on the mole and trapped it there for it seems like several months, six months or something like that, quite a time period. But in general it went along real well.

Q: It was in there by itself, there weren't people in there running it?

A: Oh yeah, as the mole proceeded forward it built segments of concrete and then it pushed against those segments to push it forward. And so as they built the lining of the tunnels the mole went ahead and they had conveyor belts and little cars that would take the muck out and dump it at the outside end of the tunnel. They had to haul all the material out as the mole proceeded forward; they had to haul that 24 feet of material out through the tunnel. It was a major project.

Q: It must have created another mountain…

A: The way they spread it you would never even hardly see it today. And then it opened up into the first section of open canal. That section, and not remembering my dimensions, was probably 150 feet across. Very wide and in the area of 20 miles long. That was the water storage area for the first lift station. The first lift station was the Bouse Hills Pumping Plant. The Bouse Hills plant then had a little bit of flexibility of when it operated because the water levels could go up and down in that canal. It had quite a bit of in line storage. Then it went on to, the Bouse Plant, the Little Harquahala, and the Hassayampa was the third plant, the Hassayampa was right on the Hassayampa River. It looks like a huge big open pit mine with a pumping plant sitting at the bottom of it. They had to dig just an enormous amount of material just to set the plant in there. Between that pumping plant and the river are a number of siphons under the freeway, several times under Interstate 10, and under the Hassayampa River. So those were some of the first large siphons, some were cast in place and others were preformed out of the pipe. Then you went on from there, from the Hassayampa you went to...

Q: Why don't you explain a little bit about the siphons? What is a siphon?

A: It's just a pipe. Most of the time, you think as a siphon as being a pipe that goes from one water level down to another one and drains in to...a siphon can also go under a road and up and under a river and back up again. The water level at both ends stays the same; water always seeks the same level. So a siphon will go under a freeway, it'll go down under a river and back up the other side, and there are several of them. There's the one under the Hassayampa, there's one under the Agua Fria, and one under the Salt. These are big siphons. I think there are several others on down under the Gila. And there might be another one down south, smaller.

The pipe gets a lot smaller as it goes south. The siphons are another whole big area of problems. These siphons were concrete tubes that had steel wire wrapped around them and then concrete over the top and then maybe another wrap of wire and more concrete. And they were under; put the concrete under great compression from the tension on the wires. The wires were an eighth of an inch to a quarter of an inch in diameter and they would hold up to many tons of tension. And there turned out to be a chemical problem and I don't know if we have resolved exactly what that was or not. But it became, the wire corroded. It became brittle and it broke. And a number of those wires snapped and all you have to do is imagine enough of them snapping to release the compression on the concrete and the pipe can explode. And it made us very nervous. We had a lot of investigating done and I'm not too sure to the extent of it because this took place long after I left. But a number of sections of it have been replaced. I think a piece of it under the Salt River was replaced entirely with a different type of pipe. And I'm not too sure about the Hassayampa. I think it remains in place in a number of areas that is not under high pressure. But the high pressure areas like the one under the Salt have been replaced. It's pretty expensive.

Q: Have these concrete and wires are those precast someplace and brought here?

A: Yeah, they're cast on the site but there's a whole factory set up at the site. Ameron is the people that built the pipe and they set up several field factories where they manufactured those siphons right there on the site.

Q: Sort of custom made?

A: Yeah, oh yeah, each piece was a separately engineered piece of pipe.

Q: How large are the pipes?

A: 22 feet inside in diameter.

Q: Too large?

A: About foot and a half, two feet thick, they're enormous things.

Q: Explain the idea that you're bringing water from the Colorado River, but you're bringing it up hill and all the way over here and why, that's why you needed that stuff, do you mind explaining the pumping stations.

A: The pumping stations? Good question. A question has been asked about pumping plants. Why do we need the pumping plants? The elevation of the Colorado River and the elevation of the Phoenix area is about 1,000 feet difference and Phoenix is higher. The canal, if I remember right, slopes about an inch per mile. I think that's roughly the, it has a slope to it and it's a very gentle, very slight slope. So if you've got a 10 mile stretch, you got a 10 inch drop. That isn't all that much but it adds up. So you pump the water up in to the canal and then it flows downhill to the next pumping plant, back up and down hill to the next pumping plant. All the time you've got to compensate for about 1,000 feet before you are done, you got to get it 1,000 feet higher than it was. So about 720 feet out of Havasu, it's I think about 150 out of Bouse Hills, and maybe 150 or 200 out of Little Harq, and about 300 out of the

Hassayampa Plant. So that's the amount of lift that you put on it before you get it to here. But it's all up hill to Tucson.

Q: The engineering, the plans where the canal was going to go and the slopes and all that must be incredible.

A: That piece of the engineering is probably the most intriguing. There was an organization in our Engineering, among our Engineering people, called locations. And locations really plotted that canal as to where it went. And you had to take into consideration a lot of factors. And the plotting of the canal was largely economic. There were some other options but they were nearly all economics. If you would like to find something that had a slope to it that would be heading, like the canal is, but you don't want to have to go too far because the canal cost so much more per foot if you have to extend it. But if you have to go through a hill, you have to move a great deal of material and that costs so much a cubic yard. And so they had this huge mathematical matrix, this economic matrix, to calculate what is the cheapest route between there and Phoenix. And it's an exceptionally complicated problem and they had a lot of three dimensional photography involved with it. We did some terrific engineering work with 3-D aerial photography. And the cost of material, the type of material to move it, it was really a huge problem determining where that canal was going to go. So when you see it weaving through the desert, every one of those turns was all a result of some very intense mathematics. And we picked, assuming, the cheapest route. Occasionally you had an option where you could say here or here. And then factors other than economics, who owned the land was the decision, whether it was public or private, whether some private owner would try to hold you up or not was a decision that you could occasionally make and say well sorry we're not going to let you hold us up. We're going to take this route. But that was very seldom, those you can count on a couple fingers. But generally speaking, it was economics of the terrain, and the distance, and all that made the decision. (changed tapes)

It's peaceful looking today. You see it with the size of the desert has been returned and pretty much to its normal self. During the construction, it was a lot different looking out there. There was a lot of cutting and a lot of earth moving. One of the major contractors was Ball, Ball, & Brosamer out of California and they approached the problem with equipment. They brought in huge numbers of equipment; they were moving earth about as fast as anybody could ever possibly move it. So the activity out there during construction was pretty frantic. It's now looking around the area here in Mesa, when this was built it was desert out there. Now there's houses all around it. And it's just going down almost through backyards and everything else. Fortunately, we couldn't be building it under these conditions here. If we didn't build it, when we built it, it wouldn't of gotten built.

Q: Good point, I hadn't thought about that. Did you ever think that that canal you were building through the desert would be surrounded by houses?

A: Didn't occur to us at the time. Although, we were building bridges for roads that had not been built yet so we'd be building a bridge out here in the middle of the desert and today Baseline down here goes across it. And I remember when the Baseline Bridge was built, there was no road here. There are a number of bridges off in there. One of the things, I think some of the people here would be interested in is how this system operates. It's a little different than the average canal system. This 336 mile canal has been broken up into roughly 10, 12, 15 mile sections or pools. And each one of those pools has a check structure or gate that separates it from the next pool. And so you've got a series of little lakes, basically, maybe 10, 12, 15 miles long one after the other extending the full length of the canal. As you get down towards the south end of the system, when you start to get towards smaller sections and some width of pipe changes, the evaporation changes a little bit. But in the main section of canal up there, it operates as a series of pools. And so what you've got is when you shut the canal off completely, you drop all the gates, the pools all stop right where they are, and it's a constant volume system. Those pools always contain the same amount of water. You don't drain out of one at the expense into one at the expense of the other. If you release water out of one, you

put water in that same one. So actually all that happens, when you go from zero flow to 3,000 cubic feet per second flow, which is full speed, is a surface of that pond that pool tilts slightly so it's now running at a slight slope and it's flowing from one to the other. If you have a city that is taking 150 cubic feet per second out of the canal, then you let into that pool 150 cubic feet per second more than you let out. And then subsequently, all of the upstream gates let 150 more in. So it functions really like a pipe, like a closed system except it isn't, it's an open system. But it has the ability to instantly stop and start where as a regular canal system once the water is in the canal, it goes out the other end. And that's not the case with CAP. And this whole thing is run by a computer system. It has complete control over each one of those gates and each gate has a level gauge above it and below it, so that it knows the volume of water on either side of the gate. And using that as input to a math model that's in the computer, it controls that thing completely. We went on auto pilot, I believe, in '88. And it's been essentially running on auto pilot ever since.

Q: With what you're describing it really couldn't do that without computers, I mean...

A: No, you couldn't.

Q: When it was being designed initially did they even think about being able to do all that?

A: Yes, well I don't know about the initial design back in the 40's but when the Bureau was designing this system, it was all envisioned to be operating this way. This was a computer-aged project.

Q: So it's pretty dependent then on having power to run those computers?

A: Oh, without power we're out of business. Although there is standby generation at each one of those check structures. And communications was, and I don't know if they've changed it or not, but the communications was done by a buried cable that was buried along the canal bank that ties the check structures together and

then microwave into each one of the pumping plants. And so you really got kind of a redundant system. You can feed that cable from either end and so each check structure could look either way and see data coming in from either direction. And you can cut the cable and it doesn't make any difference. It still feeds because you got feeding in from both ends. This was the way it was designed and I'm assuming that's the way it's being operated today.

Q: Talk about this, what 336 miles?

A: I believe so.

Q: It looks, the water looks calm but what you're saying is there is a lot of movement. Talk about how wide those canals are and how deep the water may be?

A: Well we're getting into some numbers that I'm not too sure I can remember. I think it's roughly about 75 feet across the top and probably about 25 or 30 feet across the bottom and they're about 20 feet deep. And it's very rough. The top edges have been roughening towards the top. The concrete is very rough so that a person could get a little bit of a grip to get out. It was done largely for the animals to get out, but it's not a good thing to fall into. It's fenced from one end to the other. There was people talking about opening it up and having fishing in it and making a big recreation area out of it and we fought it tooth and toe nail. And particularly now with the terrorists activities that we may be seeing down the road, you want to keep it as locked up and fenced off as possible.

Q: That was good foresight, you probably didn't even think of terrorists at that time.

A: No, no we didn't.

Q: Is there fencing, the whole…

A: Yes.

Q: Do you mind telling me...

A: The whole canal system is fenced from one end to the other. And it's not manned. I think there's some people at the Havasu Lift Station, but it was designed to be non-manned at all. There is nobody in a control room operating it as such in any of the control rooms. There was a hesitancy to turn something that big loose and have it remotely controlled, but supervisory remote control is becoming a very common thing these days. We remotely control Davis Dam and Parker Dam. There's nobody in the control rooms there either. It's the thing of the future, if the future isn't here already.

Q: But they do have to monitor, I would imagine, there's cameras or something.

A: There is a great deal of monitoring.

Q: Do things change when people don't follow through...

A: There's a lot of cameras. There's motion detectors in the pumping plants. The security is pretty intense, which you can do some pretty good security without people.

Q: Maybe even better.

A: Maybe better.

Q: Was that intensified with all, with the new terrorists?

A: I would assume so, but I don't know. I've been away from this place for 19 years.

Q: You've stay in touch with some of those people though don't you.

A: A little bit.

Q: I was talking to John, I was talking to somebody to do some research and they mentioned that they've seen you over there not too long ago. So you still get over there.

A: I try to keep my nose in it a little bit.

Q: Talk a little more about the computer system. Somebody mentioned to me that you were real involved in collecting and starting that first computer system. When was that?

A: Well, when we would be doing the design of the control system, you have to decide at that time whether or not you're going to be having them designing a building for a manned operation or an unmanned operation. If you're going to be building an unmanned, you still want to have a certain amount of control in each local site so that you can do things by hand. But the idea is that you don't want to put yourself in a position where you have to man it and then go through the agony of unmanning it. Because once you build an organization around a manned system, culturally changing it to an unmanned system is a real tooth pulling operation. People don't want to let go of positions, people don't want to – they just resist it completely.

I know when we converted Davis and Parker Dams to unmanned, I was there during that whole process and it was a very traumatic experience for operators. Operators say, "I've sat at this place at midnight and I've felt such and such happen to the plant just by the vibration in my feet you know. You can't unman this plant; it has to have somebody here." And once you establish that it has to have somebody here, it's very difficult to break it. So we decided to build CAP as a totally unmanned operation. But you have to have a certain amount of local control just for maintenance purposes, so it was designed to be remotely operated. And they were pretty good, or at least while I was around, and even doing the testing remotely. So if they wanted to start a pump, they'd get on a phone and call Phoenix and

Phoenix would start the pump. And so you didn't ever really establish a tradition of operating it locally under any circumstances. But it was designed with that in mind.

Now the technology was very much in transition during that period. When we built the control system for CAP, we built a large computer room that was all refrigerated, had a large uninterruptible power supply that was an enormous thing, had a large battery room, and redundant UPS systems. And this was all feeding computers that were from the 70's era. Computers during the 80's and more particularly the 90's made big changes, where you would go from a huge mainframe computer that took up the size of the closet to a desktop PC with the same amount of power. And so I would imagine today, although I haven't been in the computer room over there, that the big "mainframe" computers that we had in there at the time, have been replaced with a few Pentium 4 PCs that are now running the same system just as well. I know some power control centers have got a dozen PCs all tied together and they're using the big computer room, the air conditioned computer room with the raised floor, to store furniture in or something. It's that big of change. So I would expect that same thing has happened at CAP.

Q: So the first system, when was that installed in the early 80's?

A: It was initially installed in the early 80's, yes, probably the mid-80's.

Q: How big of a room was that?

A: Oh good size, it was a good size room. We had the computers in an area that was probably 20 feet long and 12 feet wide. They had an extra control console in the same room sitting on the raised floors with the big redundant air conditioners.

Q: Do you remember the cost?

A: No I don't. Several million, the price of computers has gone way down, size has gone down, performance has gone up.

Q: That's good thing.

A: It is good.

Q: Talking about the headquarters too, somebody said I should be sure to ask you about when you moved your offices downtown Phoenix to the new headquarters up here at Happy Valley and 7th Street, that you were adamant that you didn't want to see any trailers.

A: That was always kind of a tender spot, I guess, although I had to eat it. We had this nice operation center and headquarters. It was designed by the Frank Lloyd Wright Foundation out at Taliesin West and they were low bid on the architecture job. They designed a nice facility and we were quite proud of it. And as we were building it, I was saying we got all kind of room in here and the last thing we ever want to do is start stacking a bunch of trailers around this place. It wasn't four weeks before I moved to Boulder City; there was a whole trailer village in the back side. We just took on a whole lot more people than we ever pictured. There's another interesting aspect about CAP and its construction that I would like to raise. Tom Clark was the General Manager of the Central Arizona Project while I was the Manager of the Bureau here. Tom and I are good friends, have been good friends for a long time and we conspired quite closely during the whole period and worked together very well. I'm real proud of that. I think Tom and I did something that nobody, at least in the Bureau, had done before to that degree. And I'd like to explain that a little bit.

Traditionally, when the Bureau of Reclamation builds a project like CAP, it builds it particularly when you have something that is that large and takes 20 years to build; it has to have part of it in operation while the other part is under construction. So the Bureau traditionally hired people and built an organization, an operations organization, and built a maintenance organization, and hired a number of Bureau of Reclamation employees – a fairly large number – to operate and maintain that facility under construction. And as you got towards the end and the facility came in to full operation, the Bureau of Reclamation with its federal staff was running it. So

now you've got this enormous Bureau of Reclamation organization made up of huge construction force and then a very large operations and maintenance force with the intent that it would be turned over to the state or to a water agency to operate and maintain. Two things you are kind of faced with: one of them is it may not ever transition because the Bureau may have such a political force available with that large – that it maintains operation and maintenance over this thing a lot longer than it really should; or two, the transition itself becomes absolute agony because you got people that have internal bumping rights in the Bureau of Reclamation to move into other projects in the Bureau and move people out. And it becomes a traumatic mess for the organization to reduce the forces of this particular project getting it down in size so they can be taken over by state people.

So Tom and I got together and thought this would be something to try and avoid and at the same time, let the District build an operations and maintenance force. So we took the operations and maintenance people that we had and had meetings with them and asked them if they would be interested in going to work for the Central Arizona Project, the Water District now, not waiting until it was finished. Transitioning them over, their retirements, their medical, everything would have been transitioned. We went to the state legislature and got permission from the state legislature to give the CAP the authority to do operations and maintenance now. So then Tom and I met with those people a number of times and negotiated the transition for our employees to become their employees. So they then moved into this building at Deer Valley and 7th with us so we had the CAP and the Bureau in the same building. And it really worked out great. The transition I think has been the smoothest of probably of anything of that size we've ever built. They then hired all the operations and maintenance people. They worked with our construction people to learn how things were built, they were involved in some of the inspections and that to learn the system, and they took it right from the first turnover. And it worked out real good. The part that I feel very badly about is that in 1998, in 1988, we signed a contract with CAP, the Bureau did. And everybody was pretty much in accord with what the contract said, how it was to be interoperated. And when I left the Bureau in 1991, I was very comfortable that the transition should take place

smoothly. We then changed administrations in Washington and they put in a number of people into the Bureau of Reclamation that were allowed, I guess, haters of the Bureau of Reclamation and their design I think was to destroy it to the greatest degree possible and never let it rise its ugly head again. And so for the next eight years, those people just dismembered the Bureau. They removed us from a lot of responsibilities that we had before and reorganized us in such a way that the Engineering Center in Denver had to get rid of a large number of very talented people in the water field. One of the things that happened in the process was that interpretation of the contract that was signed in 1988 was interpreted by this administration, which administration at that time, to be quite different than a number of us felt when it was signed. It then resulted in a very emotional fight between CAP and the Bureau of Reclamation leading to a lawsuit which I believe the CAP ultimately sort of won. It sort of won because at the best you sort of win a lawsuit, they don't turn out very well even if you get the sack of money that you're after. It leaves a lot of scars and a lot of bad things. But one of the things that came out of that was, that I feel bad about, was we had a relationship with the CAP and the Bureau here. It was outstanding, extremely cooperative. We'd each bend over backwards for each other. And after the lawsuits and the smoke cleared from that, the relationship between the two was not particularly good. And it probably never will be. And I guess...I guess it doesn't make any difference since the Bureau is sort of out of it now anyway. But it was a very good thing at the time and a lot of fascinations ended up not good.

Q: Pretty good insight. I've wondered about the relationship between the CAP and the Bureau. You've kind of answered that.

A: Yeah, Tom and I still remain very good friends. Fortunately, I wasn't involved in the battle. I was working for a water district in California at that time. It was really a too bad thing.

Q: Were you called in to testify?

A: They went over and wanted me to give a deposition. And kind of a strange thing, I didn't pay much attention to the negotiations of that contract because I didn't see there wasn't any problems coming up so I kind of stayed down the hallway in my office during it and everybody that was involved was all shaking hands and happy and so, you know, whatever you guys wanted was fine. So I didn't have a whole lot to contribute. So I didn't do them much good.

Q: For either side?

A: For either side.

Q: Talk a little bit, some of the general questions I've been asking everybody about in your role of overseeing a lot of the construction, what were some of the biggest challenges that you faced?

A: Well, I think one of the big challenges, and I don't know how well we ever met it, but the construction of CAP although it stretched over 20 years had a rather heavy peak towards the end in terms of the number of people that we had. And my thought was that we need to start reducing staff quite abruptly at some point as the construction drops off so that we don't do, which rather is sort of typical of the Bureau of Reclamation, large project, have it end and have 400 people on the construction staff. And what do you do now with a certain amount of sensitivity towards these people all have families and futures and everything else, you know, what do we do with them. I thought this is one time that we're going to do this right and we're going to take it down in a matter that makes sense and when we've got some time to do it in. I think to a great extent, they didn't do that. They might have to an extent and maybe if I'd been there, I wouldn't have done anything different. But it seems they went through a lot of the same agonies that we have gone through in the past with large numbers of people and where do they go and who's left in office with a lot of nervous folks in it. I think if you can manage that better you can ease some of the nervousness. That I would of liked to seen us do better. Other than that, this was not that difficult of a project. The construction organization was

so good. We were really very fortunate but the Bureau was going down, when we were going up and we had our pick of just the best people in the whole place. We put together just bar none, the best construction organization that you can imagine. And as a result of that, we really didn't have any big agonies. I think one of the biggest agony we had was over that pipe that went bad on us but that wasn't really something we had any control over.

Q: Why don't you talk a little bit more about the siphon?

A: The siphon pipe, that resulted in a series of lawsuits. It didn't happen just with us. Metropolitan Water District of Southern California had a pipe explode on them over there. The same type of pipe and I believe other places around the country and worldwide had problems with it as well. I think they had to make some major changes as a result of it.

Q: Did you have one explode?

A: No, we never did.

Q: How did you know there was problem? Did it show up immediately or how did you find out?

A: We started seeing some sections of pipe where the concrete had spalled off the outside of the pipe because a number of areas of this pipe were exposed. The wires had either broken or expanded due to corrosion and it spalled off pieces of concrete. I know we were out there in mass, a crowd of us you know, looking at this pipe at that time. And this was a serious problem.

Q: Did that happen very soon after it was installed or was it years later?

A: Probably ten years later, something like that. We jumped all over it. I put together a little morning coffee and doughnut session in Washington, DC over in the capital

and had the Arizona delegation come over for coffee and doughnuts and broke the word to them. We got a pipe problem folks, have a doughnut. That is one way you can get that group together, if you don't get the members themselves you at least get their staff there so feed them.

Q: What could they do about it? Why...

A: Because we're going to need money. We're going to need money, this is expensive. This is purely money, purely money. Also, it's a good idea that those people aren't surprised. One thing, when you're dealing with the congressional group like that, you want to make sure that if there is going to be bad news coming out, you're the one that wants to tell them.

Q: You could remember a group of you gathered around and looking at it, where was this?

A: The first one that we noticed that was very obvious was at the Agua Fria River. The Agua Fria siphon and that was visible right there. And then we started thinking about I wonder how much of this is buried that we don't know. And we started digging some of it up and found that it was quite a bit. And then we got the experts from Denver out and they tried all kinds of things like sonar and a number of others to see if they could spot problems inside. It got the manufacturer and a number of other users very deeply involved with, a whole lot of panic fast.

Q: So how was it finally resolved?

A: I'm not too sure of the final resolution. I know that they replaced the big one under the Salt River and probably under the Agua Fria has been replaced with a new pipe, left the old one just sitting there alongside it.

Q: Where on the Salt River is the siphon?

A: Do you know where the Salt Gila Pumping Plant is? It's the first pumping plant, it's below...there's the dam there on the Salt...Granite Reef Dam?

Q: The little one?

A: Yeah, the little one, it's below that, it's just below that not very far. Yeah, I think they had to go in and put a whole pipe in. I've been kind of away from it. Speaking of congressional people that I would like to bring up a bit, John Rhodes had an office in the Valley Bank when we were in the Valley Bank. And we were going through the Orme Dam gyrations at that time and John Rhodes was an extremely unusual person. In that I don't think I've ever met anybody in my life that I had felt instantly I can trust. He's the kind of an honorable individual that you can tell anything to and say John this is really kind of something I don't want to get out. And he wouldn't, you knew it would stay with John. So we had kind of a great relationship. He would come to town, I would get a call, I'd go down and sit there with John and I would tell him about everything that he ought to know and maybe a few things that he didn't want to know about what was going on with CAP. And I have never had a problem with him ever revealing that to the wrong people, embarrassing me, and yet he felt fully informed about everything. It was a great relationship. I hope it did him some good, I know it did me.

Q: Did you work that closely with all of the congressional?

A: I had something kind of special with John Rhodes. I tried to work as close as I could with the rest of them. Mo Udall was a great person to deal with. They all were very good. There was nothing partisan about CAP. They all, all of them were marvelous to deal with. They all had Arizona's best interest at heart. Barry Goldwater was difficult to get to. He was not accessible as the rest of them. I think his health was sort of failing him. They all had Arizona's interest.

Q: What about Bruce Babbitt? I'm trying to connect with him to interview him for this series. How was he involved?

A: He was quite involved with a number of things. He set the tone for the groundwater management program and was kind of something that was off to the side of me. He was also deeply involved with our decisions with Orme. He has an environmental bent, a little bit more of an environmental bent then I really enjoyed. But he was really quite fair, he was quite fair. He was also fairly accessible for a governor. He was very busy. Then he went on to become the Secretary of Interior. He was Secretary of Interior under the administration that pretty well ripped up the Bureau. So I guess I have some mixed feelings on where he was. He was okay to work with as long as we were working on something here. But he allowed the Bureau to get pretty well bludgeoned under his administration.

Q: Anything that you would like for me to ask him about that?

A: You can tell him that you heard that he allowed the Bureau to get pretty well bludgeoned under his administration and ask him if he had anything to do with it, which I am sure he did. The person that was Commissioner of Reclamation during that period was on the staff of George Miller from California. Miller pretty well was an antagonist for the Bureau of Reclamation and he made that sort of his political...he represented an area around San Francisco and I know the folks in California didn't find him a friend and I didn't find his staff chief much of a friend. And when he became the Commissioner, it was pretty well proven out.

Q: Who are some other opponents to the Central Arizona Project that you dealt with? During Orme there quite a few people...?

A: Yeah there was you know, but it's kind of strange they didn't make that much of an impression that any of them standout.

Q: How about Frank Welch?

A: Yeah, I remember the name. I remember somebody that opposed CAP in general. And Orme in particular but I don't have any great strong remembrances of him. I

know he was on the opposition. But I didn't dwell a whole lot on those people. There were some interesting things that occurred in Tucson. Tucson was kind of a difficult place in many respects to deal with.

Q: Talk about that.

A: There was a group of folks in Tucson that didn't think they needed CAP, didn't want it. There was another group of people in Tucson that thought we were going to stop building as soon as we got water to the Central Arizona area and Tucson wouldn't get any water. So you had, Tucson was not a – it was fractured into a number of different groups and they didn't get along too well among themselves. So dealing with them was kind of difficult and holding public meeting down there was really an adventure. We finally had pretty much got the community agreeing that Tucson was going to get CAP water. And then suddenly they wanted a reservoir. They wanted the first reservoir to be built up in the mountains south west of town and we pretty well agreed to look at it. And in the process of looking at it, we held some public meetings and they brought enough opposition out so that they killed that. And then they started wanting us to build a manmade reservoir which would just cost an absolute fortune to build a reservoir. They said well Phoenix has got a reservoir. You've got Waddell up there. So what if something happens to the canal, we won't have any water. So to build them a reservoir, a man made type reservoir down there, it would have cost just an absolute fortune. So we told them, no we'll go ahead and build the thing and you see what our reliability is like and if our reliability proves to be such that you need a reservoir, we'll then look at a reservoir at that time. And they didn't like that, but they sort of settled. I'm not too sure what Tucson has done since. I know they started to take CAP water. They fed it into a part of the system where loosened up a lot of dirt in their pipes and everybody got upset over the dirty CAP water. They had even some folks that were, at least one that was on the CAP board that was against them taking any CAP water. And so I don't know whether they are yet. So I'm mighty glad that we didn't build a reservoir.

Q: What about the Indian Community? You mentioned the Fort McDowell and Orme Dam but did you deal with Salt River and Gila River? I know they have water rights.

A: Yeah, we had dealings with all of them. I'm having a difficult time getting their names of their various tribes straightened out. The ones that are down, the Gila River I guess it is, that are down south of Phoenix that had a rather ambitious agricultural system going. Those people we built, we built the canals into and so on to feed their agriculture and I assume that their using it. I'm not familiar with very many other than that.

Q: Did you get involved...

A: No.

Q: The legal water rights and all that?

A: No, I didn't.

Q: Lucky you!

A: Lucky me, yeah. But we did an extensive system into that one community down south there and they were pretty sophisticated in that agricultural. I'm sure they're going to put it to good use.

Q: I interviewed Mary Thomas who was the governor for a while there and she mentioned to me that she thought that the water rights long-term were much more important than casinos will ever be.

A: I think she's right, absolutely.

Q: Talking about CAP in general again, what accomplishments are you proudest of from the time you were at the CAP?

A: Oh I think the decision to build New Waddell Dam was probably the best decision we made. That was a good one and it was done for all the right reasons in spite of everything we had to fight up hill to get there. It was a good one. It's working out well.

Q: There is a lot of growth out there even houses and things...

A: Oh yeah, they've turned that into quite a recreation area. The dam site itself was kind of complicated dam site. They had to do a lot of grouting, high pressure grouting in order to convert that site into a usable dam site. The Bureau had just had its first dam failure which was Teton up in Idaho before we started on that. And so for the Bureau, building an earthen dam after the Teton disaster, nobody wanted a repeat of that. And the Teton Dam probably failed because of the abutment failure due to piping in the natural material. So we didn't want that to happen. So we did, I don't know how many of millions of dollars' worth of grouting pumping concrete down into the rock. All of the little fissures and everything were all filled with high pressed high concrete. You can tell that is a real sealed up area, very solid today. The dam was built and far as I know there's not a problem in the world with it.

Q: Anything you would've done differently looking back?

A: No, I don't think so, a lot of it was just culturally nature that we rode but I think we all rode it in the right direction.

Q: A lot of your job as a manager, you mentioned earlier in the interview that your first job when you were traveling around in South Dakota, you saw things about management that you said you'd never do. Talk a little bit about your management style.

A: What I tried to do for a management style was let people have their head. I think one of the most difficult things for a manger is to ask somebody to something, or tell them in the case of some managers. And then stand back and let them do it

because usually there are three or four ways of doing anything. There's your way and then there are several other ways. And what you got to get used to doing is turning people loose and letting them do it someway other than your way and saying good job, well done. And not going over and saying you know, look how you could have done it better if you would have done it my way. And nothing destroys self confidence in people like someone who is continuously jumping on them for having any ingenuity. So you've got to bring that part out in people I think. And the second one, management – I really kind of have a dislike for this program that's on TV with Trump. Who seems to make a big thing out of firing this person and firing that person and that is not the way to motivate employees. You motivate people by doing the most economic thing possible that is complimenting them and treating them like human beings and treating them with respect. That didn't cost you a nickel, that's a piece of overhead and it's free. I tried to bring that to management. I'm not sure that I was always successful but I tried very hard to operate in that manner and have my management people – that and having a lot of open communications so people tell you the truth even if it hurt. I concentrated I think more in those areas then I did a lot of the external aspects of management. The theory being that if you surround yourself with the smartest people there are and you open up communications and let them do their thing, their way; you can go take a vacation. And it gets done well.

Q: I remember I was at Channel 10 when they had the first water coming through the CAP. It was the first I think publicly celebrated, I still have the poster I think from '85.

A: It has the jar upside down, yeah that was the logo. Yeah, I remember that.

Q: Talk a little about that.

A: They had a big thing out here at our office under a tent and everything else and all the politicians were there. And I don't think there was hardly a politician in the state of Arizona that wasn't around that day. It was kind of a big thing. I guess the only thing that I sat around there and scratched my head a bit over was somehow you

never knew who built the thing when it was all over. The Bureau's design and engineering and construction was virtually not mentioned. And you sort of thought it was, the congressman all put their Levi's on on weekends and went out there with a shovel and built it, you know. It's kind of the impression that you had. Built and designed by politicians, but I got over that pretty quick.

Q: Just talking over all things, what has been the biggest surprise for you since you came to Arizona in the 60's and people were talking about the CAP, over all these years, have you been surprised by how it felt?

A: I think the thing that is surprising I guess is that it is changing constantly. The purpose for it seems to be changing. The needs that they originally envisioned aren't the needs necessarily that we have today. And that CAP is adapting itself to whatever those needs are. One of the things that concern me right now and it maybe for no reason, but it seems as though they're using CAP water today for Indian water settlements where I'm not terribly sure it is a smart thing to do. The idea being that if we give it to the Indians, the Indians don't have any use for it but to sell it back to the cities and to whoever can pay for it. And so it's just a way of keeping the water tied up so that some environmental group in Mexico doesn't get it in order to take care of the Gulf or something like that, which is a concern.

Here we are in the middle of a drought on the Colorado River and they're still people thinking we need to release water into Mexico so that we can return that whole area of the mouth of the Colorado back to its natural self again. Now for some of us that's been in this business think that's about the most insane thing you can ever imagine doing. Because even Mexico wouldn't use that water for that, once you released it into Mexico it would get diverted into the Mexicali Valley pre-irrigation, you know. They'd be nuts in order to leave farms dry in the Mexicali Valley so a couple birds down there can live there that aren't alive yet today. I think that's sort of insanity is something we can expect to be going on. But CAP has been completely adaptable but whether having it become an Indian water settlement project is the thing to do – I question. However, it might well be the way to hold the

water until they need it in Arizona, because nobody is going to take water away from the Indians, even for birds. So it could very well be a means of locking it up and keeping it out of the hands of somebody with a lesser use. But CAP is very adaptable if we get into groundwater storage, CAP can do that. It's being handled very well I think.

Q: What about Nevada, you mentioned about how small Nevada was when you went up there the first time to go over the city. Did you ever think Nevada would grow like it has?

A: When I was living there from 1985 to '91, one of the things I did a lot of was go over to Las Vegas and preach to them about you people are going to run out of water one of these days and what are you going to do about it because I knew what they were going to do about it and that was come to the Bureau and try and get their 300,000 acre-feet raised. And we weren't in a position to, you know, do anything in that regard. And here they are they haven't slowed down one bit. I think they're having some interesting times ahead. Although they seem to be doing a pretty good job, they're looking up north for water; they're looking to the ridge and basin for water. They're dealing with Lincoln County and some of those people up there that 15-20 years ago were coming down to Las Vegas to lynch a few people for even talking about their water. And their talking to Lincoln County about Lincoln County water so there's some progress being made there too, those people aren't asleep.

Q: What do you think Arizona's greatest challenge is going to be in the future for water?

A: Oh, I think this urbanization. In a way, Arizona's water I don't see it's going to be a big problem for a long, long time. You've got a lot of ag water in CAP. You've got some Indian water. As we grow into these areas the agricultural areas, as we spread in to those if we do water conservation where we don't put in lawns, do the things right on our future expansion, have the developers build right so we don't waste a

lot of water. I think we can go for a long, long time before we have a water shortage. And that's outside of the fact though that you might have a shortage on the Colorado River. If you have a shortage on the Colorado River that's a different color but if we don't, if we have the normal 2.8 million out of the Colorado going to Arizona and with the Salt putting out a normal flow, and agriculture's the one that going be taking the hit in terms of that whose land is going to be built on. So were going make a megalopolis between here and Tucson and all that ag water would be going into housing. I think we can last a long, long time.

Q: Did you ever think you would see that when you came here?

A: I don't think I did because you just don't think in those terms but it's happening. It's here. It's about 60 miles between where we live here in Mesa and our daughter's house in Surprise and its solid city in between. This is a lot like Los Angeles.

Q: It's getting more like it every day.

A: Even with the freeways, we're building a freeway system. I remember back in the 70's we didn't build some freeways here because we don't want to be another Los Angeles. Well, we didn't build the freeways and we weren't but we're now building some freeways.

Q: When you came here in the 60's did you ever think you'd make Arizona your home?

A: I don't think I thought about it all one way the other. I know I liked the desert after being raised in 20 below zero snow, I know what I didn't like.

Q: Did you decide to retire here if it was right? (1:58:33)

A: Yeah, we retired here from California to get out of the crowded conditions. So I'm not sure where we're going next, probably move east.

Q: Do you have any advice for the people that are running the CAP today?

A: I think it would be very presumptuous to give them any advice. They have been raised with the project almost as much as anybody in the Bureau's been raised with the project. In fact, a number of the people that are on their staff today are staffed folks with former Bureau people. I think it's in great hands. I have absolute total faith in their ability to run that project.

Q: It does look like that people come to work there and stay there.

A: Oh I think so. It's a great place to be out there.

Q: Something I always like to everybody, looking back over your life and your choice of career, do you have any advice for young people today that are just starting out trying to decide what they're going to do with their life.

A: I really like the technical fields and I think that's kind of where it is. I also like management. I like that management offers a real good future. The old theory that if a person's a good manager they can manage anything, there's a little bit of truth to that; not a complete load of truth, but a little bit. I think that management has got a ways to go in terms of its social responsibilities. There's got to be mix between the bottom line dollar and having some social responsibility. I think some companies are finding it and some aren't. But there's got to be a blend there. I think some young people today searching for that, working towards it would be good for everybody. One of the reasons that you end up with a lot of harsh laws is because you can't get management to do it by themselves. I guess you could say there's never been a union that wasn't caused by management. Management was wrong creating unions. With the proper attitude on the part of management, you don't need a union. And that I think is a good goal for any good manager.

Q: I think that covers the questions I had for you. Anything that you wanted to tell me that I didn't ask you?

A: I don't think so, we covered everything pretty well. I guess the only thing that I would like to add I've been to California and Nevada and Arizona and I think of the three states, Arizona probably has the best handle on its future with water of anybody and probably is the most secure. California has the capability of doing it and it has the resources to do it but there's a lot of intransigents in California that is really preventing it from doing itself like it should be done. Nevada is doing the best with all of what they've got. It's an uphill fight, but I think their doing it well. But Arizona, I believe, has had about as much foresight, we haven't had a lot of in-fighting here.

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