ORAL HISTORY INTERVIEWS

Manuel (Manny) Lopez

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STATUS OF INTERVIEWS:
OPEN FOR RESEARCH

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Interviews Conducted and Edited by:
Brit Allan Storey
Senior Historian
Bureau of Reclamation

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In accordance with the provisions of Chapter 21 of Title 44, United States Code, and subject to the terms, conditions, and restrictions set forth in this instrument, I, Manuel Lopez, Jr., (hereinafter referred to as "the Donor"), of Jefferson County, Colorado, do hereby give, donate, and convey to the National Archives and Records Administration (hereinafter referred to as "the National Archives), acting for and on behalf of the United States of America, all of my rights and title to, and interest in the information and responses (hereinafter referred to as "the Donated Materials") provided during the interviews conducted on December 12, 1995, and on January 16, February 23, and March 7, 1996, at my home at 6342 South Pierson Court, Littleton, Colorado, and prepared for deposit with the National Archives and Records Administration in the following format: cassette tapes and transcripts. This donation includes, but is not limited to, all copyright interests I now possess in the Donated Materials.

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Date: Mar 7, 1996 Signed: Manuel Lopez Jr
Manuel Lopez, Jr.

INTERVIEWER: Brit Allan Storey
Brit Allan Storey

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Date:_____ Signed:_____
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Brief Chronology

January 6, 1923–Born in Tampa, Florida

1941–Graduated from high school in Tampa

1941–Briefly attended Tampa Business College studying accounting

1941–Went to work for the Office of War Censorship in Miami

February 1943-1944–Served in the Army but discharged because of asthma and pneumonia

1944–Began night school after leaving Army and continued until 1950

1944-1945–Worked for Bureau of Labor Statistics which was contracted to the Office of Price Administration (OPA)

1945–To Reclamation as a clerk

1950–Moved to full time student at the University of Colorado at Boulder

June 1951–Graduated from the University of Colorado in Civil Engineering and went back to Reclamation

April-October 1952–Worked at Hungry Horse in Montana doing field engineering and construction inspection work

January-August 1953–Worked at Coors as an engineer due to the RIF in the early Eisenhower Administration.

August 1953–Back to Reclamation to work on Glen Canyon Dam bridge, circa one and one-half years.

1954-1966–Mechanical Branch working mostly on gate design.

1966–One year assignment with Reclamation to work with the Office of Saline Water where he headed a San Diego flash desal project

December 1967-Mid-1969–Left Reclamation to head the Bolsa Island Project in Huntington Beach, California, for the Office of Saline Water.

1969-1971–Transferred to Washington, D.C., to the Office of Saline Water as chief of project development to get demonstration projects built

1971-December 1973–At the Western U.S. Water Plan or the Westwide Study and Chief of the Western Field Office for the Office of Saline Water in Denver

1973-1974–Assistant Chief of Planning at Reclamation working for Will Reedy

1974-1975–Assistant Regional Director, Lower Colorado Region

August 1975-April 1979–Regional Director, Lower Colorado Region

1980-1989–Consulting engineer with CH_2M Hill

Introduction

In 1988, Reclamation began to create a history program. While headquartered in Denver, the history program was developed as a bureau-wide program.

One component of Reclamation's history program is its oral history activity. The primary objectives of Reclamation's oral history activities are: preservation of historical data not normally available through Reclamation records (supplementing already available data on the whole range of Reclamation's history); making the preserved data available to researchers inside and outside Reclamation.

The senior historian of the Bureau of Reclamation developed and directs the oral history program. Questions, comments, and suggestions may be addressed to the senior historian.

Brit Allan Storey
Senior Historian
Land Resources Office (84-53000)
Office of Program and Policy Services
Bureau of Reclamation
P. O. Box 25007
Denver, Colorado 80225-0007
(303) 445-2918
FAX: (720) 544-0639
E-mail: bstorey@do.usbr.gov

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Oral History Transcripts
Manuel (Mannie) Lopez

Storey: This is Brit Allan Storey, senior historian of the Bureau of Reclamation, interviewing Manuel Lopez, a former employee of the Bureau of Reclamation, at his home in Littleton, Colorado, on December the 12th, 1995, at about nine o'clock in the morning. This is tape one.

Mr. Lopez, I'd like to ask you where you were born and raised and educated, and how you ended up at the Bureau of Reclamation.

Born in Tampa, Florida

Lopez: I was born and raised in Tampa, Florida. After World War II, I came to Colorado and got a job in the Bureau as a clerk. Became interested in the work that was going on, and so I started going to the University of Colorado-Denver Extension Center at night, and eventually I got my degree at the University of Colorado–~~natural science and~~[1] civil engineering.

1. Note that in the text of these interviews, as opposed to headings, information in parentheses, ( ), is actually on the tape. Information in brackets, [ ], has been added to the tape either by the editor to clarify meaning or at the request of the interviewee in order to correct, enlarge, or clarify the interview as it was originally spoken. Words have sometimes been struck out by editor or interviewee in order to clarify meaning or eliminate repetition. In the case of strikeouts, that material has been printed at 50% density to aid in reading the interviews but assuring that the struckout material is readable.

(continued...)

Master's Degree in Civil Engineering

Later on I went back and got a master's, also largely at night at UC.

Storey: And also in civil engineering?

Worked in the Mechanical Branch at Reclamation

Lopez: Also civil engineering, yeah. I was kind of in a peculiar spot. I worked in the Mechanical Branch, and the Mechanical Branch actually did a *lot* of work that required structural analysis.

I "gravitated towards structural analysis just simply because for me it was more interesting. . . ."

For me, that was more interesting than gears and hydraulic pumps, so I more or less gravitated towards structural analysis just simply because for me it was more interesting. And actually at various times in my career, I was able to use it. I was on the design team that designed the Glen Canyon Bridge. So there it was very useful. But most of the time I worked for the Bureau, my title was mechanical engineer.

Storey: Even though you had a degree in civil engineering?

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1. (...continued)
The transcriber and editor have removed some extraneous words such as false starts and repetitions without indicating their removal. The meaning of the interview has not been changed by this editing.

"But, you know, what your degree is in isn't quite as important as what you are interested in and what your capabilities are. . . ."

Lopez: That's right. But, you know, what your degree is in isn't quite as important as what you are interested in and what your capabilities are. We had people that were *mining engineers* that had graduated from the Colorado School of Mines. They were very good mechanical engineers. We had a lot of mechanicals as well, but I think we had quite a variety of disciplines.

Storey: Could I get you to tell me when you were born?

Born January 6, 1923

Lopez: Yeah. 1923. January sixth.

Storey: When did you move to Colorado?

Left U.S. Army in 1944 Due to Asthma

Lopez: I actually got out of the service early. I developed asthma in the service and I got out in 1944, came out to Colorado, and worked for~~=what was it=~~ [the] Office of Price Administration (OPA).

Became a Clerk at the Bureau of Reclamation's Mechanical Branch in Denver

When I saw that the war was ending, and they were closing up my office, I went over to the Bureau, interviewed Harold Sheda, who at that time was the assistant chief of the Mechanical

Branch, and got a job as his clerk. Part of my job was to go around and see what people were doing, taking time, and also to find out how they were progressing on the jobs.

"I would ask questions, what they were doing, and eventually they began giving me little jobs to do that required a small amount of knowledge in mathematics . . . So that's when I started going into engineering. . . ."

Being nosy, I would ask questions, what they were doing, and eventually they began giving me little jobs to do that required a small amount of knowledge in mathematics, but not in engineering, and I liked it. So that's when I started going into engineering.

Started to Train as an Accountant

Before the war, I had started as an accountant. I'd gone to school for one year. When I came back, I went to DU and tried to pick it up and something had happened during the war. I just *could not stand* accounting. The *tediousness of it* just drove me insane. So after about one semester, I dropped out.

Storey: At DU?

Lopez: At DU.

Storey: That was while you were working for OPA?

Lopez: Yes.

Working at the Office of Price Administration

Storey: What were you doing at OPA?

Lopez: Mostly checking prices. We would take trips into towns and check to see that they were not *gouging* people, that they were maintaining a level price structure, because that was part of the purpose for that.

Actually, I was really working directly for the Bureau of Labor Statistics, but we were kind of under contract to OPA to make sure that the prices were not being inflated because of the shortages. So I had trips to Durango, to Colorado Springs, various areas, checking prices.

Storey: You must have liked it. You retired here, I guess.

In Colorado His Asthma Didn't Bother Him

Lopez: Oh, yes, yeah. Well, when I came to Colorado, I discovered that I could do anything I wanted to do and never get asthma. I've never had asthma in Colorado, *never*. And I want to tell you, if you've had asthma for a while and you find it's even difficult to walk across a room, being able to go hunting and fishing and hiking and all of those things is wonderful. Colorado has been very good to me.

Storey: That's why you moved to Colorado was because of the asthma?

Lopez: Yes, that's right.

Storey: Do you remember who recommended it?

Sent to Spain for Two Years to Try to Get Over Asthma

Lopez: I just looked it up in the library. I had asthma when I was a child, and my father, who was a Spaniard, sent me to Spain for two years to see if I could get over it. ~~When I got to Madrid, he had sisters in northern Spain where he was born in Madrid, but~~ I lived in Madrid for about nine months, and in Madrid I had absolutely no problems at all. I had some problems in northern Spain, because northern Spain is very wet.

Researched Areas Where Asthma Would Not Bother Him

So when I got discharged and went back to Florida and found that I couldn't live there because I was sick all the time, I starting researching an area that was similar to Madrid, and two of them popped up–Phoenix, Arizona, and Denver, Colorado. My wife, who was a librarian at the time, had a cousin living here in Denver, and that's really what did it. Not very scientific, but that's what determined our coming here.

Storey: And how long did you work for OPA?

Lopez: Just a year.

Storey: Then you went over–is it Sheda? Am I hearing this correctly?

Worked for Harold Sheda, Assistant Chief of the Mechanical Branch

Lopez: Yes. Harold Sheda. S-H-E-D-A. He was the assistant chief of the Mechanical Branch.

Storey: Did you have to fill out a 171, or how did you get a job?

Lopez: Oh, yeah. I filled out a 171.

Storey: You went over and interviewed?

Lopez: Interviewed, got the job, and was hired within a couple of weeks.

Storey: Tell me about Mr. Sheda. What was he like?

Lopez: Well, he was a very quiet, very good engineer. Quiet, intelligent man, who I think was really a very *traditional* engineer. By that I mean that if you had done something in a particular way on one job, he felt you ought to do it about the same way on the next job. There was a lot of *continuity* in his work.

". . . an *excellent* writer, which is *unusual* in engineers. . . ."

He~~'s~~ [was] an *excellent* writer, which is *unusual* in engineers. One of the things I think that attracted me *to him* was that also I was able to write. So as soon as he could, he shifted over

the letter-writing chore that he had over to me, and for probably about three or four years I wrote practically *all the letters* that came out of the Mechanical Branch. He was glad to get rid of *that*, because for most engineers that's not a pleasant thing to have to do.

Storey: And how long did you have this position as a clerk?

Became an Engineering Aide after about Three Years

Lopez: I started in 1945 ~~and probably~~ [for] about three years, and then I was able to get a position as an engineering aide, held that for about a year, and then became a draftsman for a year. Then I went off to the University of Colorado in 1950, in June of 1950. In four quarters, I finished up my engineering degree up there.

Graduated June of 1951 in Civil Engineering at the University of Colorado

So I graduated in June of 1951 as an engineer.

Storey: Sounds to me like it was on the Boulder campus.

How the Degree Program Worked at Cu in Those Days

Lopez: It was. In that time, you could *not* get a degree in Denver, because Denver was an extension center. It was not a campus. So you *had* to take your final year at the university. And there was another practical reason for it[:] ~~is that~~ there

were a lot of labs that were not offered at Denver, and you *had* to go up there to take many of your labs, which made it very complicated to get your schedule together, because you were taking some sophomore courses along with your senior courses. But it could be done.

Storey: And you did it in four quarters?

Lopez: I did it in four quarters.

Storey: Basically a year and a quarter, is it?

Lopez: Yeah. Basically a year and a quarter. I took twenty hours a quarter, piled up eighty hours, and was able to get through with it pretty easily.

Storey: That's quite a strenuous schedule.

Lopez: Well, it was, but I was interested in getting rid of it. I had been going to night school since 1944, and by that time I was tired. I knew that if I couldn't get rid of it quickly, I would probably just drop out from just being burned out.

Took Night Classes from 1944 to 1950

Storey: So you were taking night classes from '44 on?

Lopez: On to 1950.

Storey: And then in '50 you went full time as a senior?

Lopez: Full time at the senior year.

Storey: You weren't working at all?

Worked Part Time at the Blue Parrot Restaurant in Denver While Taking 20 Hours in Engineering at CU

Lopez: I had a part-time job parking cars at the Blue Parrot Restaurant here in town.

Storey: Oh, the Italian restaurant.

Lopez: Blue Parrot.

Storey: Am I not--

Lopez: No, the Blue Parrot--

Storey: Tell me about it.

Lopez: Well, the Blue Parrot was a restaurant down on Broadway that had a parrot that was reportedly something like eighty years old, in a cage, and that was the main attraction it had, was this parrot [that] was very, very old. Its clientele were older people who liked *basic* American food, and it had a tremendous clientele, a tremendous clientele. Eventually that building was torn down and they had to move over to Cherry Creek and they only lasted a year or two and they were out of business. But they were in business for probably twenty-five, thirty years downtown.

Storey: So while you were going to CU up in Boulder–

Lopez: Up in Boulder. I came down twice a week–parked cars. That gave me my pin money. The rest of it I was getting on my GI Bill.

Storey: And Reclamation held a job for you?

Lopez: Oh, yes. Yeah. Yeah, they did.

Duties as a Clerk in the Mechanical Branch

Storey: Tell me more about being a clerk in the Mechanical Branch. You took over letter-writing and did some of the mathematical stuff.

Lopez: Yeah, the simple stuff, not the–

Storey: Payroll stuff.

Lopez: That's right. Keeping track of time. How long did it take to do a particular project, for example, how long per drawing. Eventually they set up an Office of Production Control, which was really ~~what they were~~ trying to ~~do was to~~ control the expenditure of time and be able to allocate it properly to each project, because since each of our projects were reimbursable, it was important to know exactly how much to charge each project for the engineering work.

"Skip" Noonan Was Appointed Project Production Control Officer

They brought in another engineer who became the project production control officer. His name was "Skip" Noonan, Norbert Gene Noonan. Skip was a real character. He's a very outgoing person and actually helped me, I think, quite a bit in getting my degree, because he *encouraged* me. It was pretty easy to get discouraged when you're going to night school,

just biting off six hours a quarter or eight hours a quarter when you've got 220 hours to amass. That was about what you needed to do at that time in the engineering school. So Skip was kind of a mentor.

I had several mentors, actually. Harold Sheda, Skip Noonan, and later on Warren Kohler, who were people that recognized that I had some talent, I suppose, and were very encouraging and helped me keep my nose to the grindstone, because it's pretty easy to get discouraged.

Storey: I take it being an engineering aide was a promotion?

Lopez: It was.

Storey: How did that come about?

Lopez: Well, because they needed, in this production control setup, ~~they needed~~ *a* person who would keep rigorous records on *all* the work that had been done, who could then see how much time was being spent per drawing, and could then make comparisons. Why did this job take so much more than this job? Were we doing something *different*? Could we cut down the amount of time we're spending per drawing? So it was a little more than just note-taking. You also had to, you know, use a little bit of *analysis* to do that. And also because they were trying to help me, push me towards my engineering degree. This way, when I became also an engineering aide, I was able to do some simple

computations on some of the *designs* that were being done.

"One reason I *never* had any problem in seeing how important school was was because frequently I would learn something one night, and the *next* day I could apply it. . . ."

One reason I *never* had any problem in seeing how important school was was because frequently I would learn something one night, and the *next* day I could apply it. I really could see the applicability of, say, statics and structural analysis, strength of materials, *all* of the basic courses in civil engineering. I could see how they were useful. Some of the people that I think don't have that opportunity to work while they're going to school tend to *question* the utility of many of their courses because they don't see how they're useful, but if you're using them, you don't have any questions about it. You're pretty sure that they're useful all right.

Storey: Tell me about what you were doing. You were taking the classes, and I have the sense that you were a fairly ambitious young man. Were you coming back in and saying, "Gee, yesterday we talked about this," and making sure that they understood what you were doing at the time so that you were being *offered* these opportunities? How did that work for you?

"Once I started engineering, I knew *that* was my field. . . ."

Lopez: Well, you're right, in I was pretty aggressive. So whenever I felt that I could *do* a particular job, I tried to get that job assigned to me so I could do it. I enjoyed engineering. I never had any problem with it. Once I started engineering, I knew *that* was my field.

Graduated as the Top Boy in His High School Class

And *why* it took me that long to find out, I have no idea, because when I graduated from high school, I graduated as the top boy in my class., and there was a class of 440 people. I was tenth in my class of 440. There were nine girls ahead of me. (laughter)

". . . *nobody* in my particular circumstance was going to college. . . ."

In those days, *nobody* in my particular circumstance was going to college. I was a Latino in a high school that was probably a third or fourth Latino, and the Latins just simply *didn't* go to college. You went to work. And that's what I did. I went to work.

". . . I never *knew* that I was able to, you know, translate the abilities I had into something like engineering. . . ."

So I never *knew* that I was able to, you know, translate the abilities I had into something like engineering. It just simply didn't cross my mind.

". . . there's a great deal of satisfaction in designing something that performs a *useful* function and performs it well. . . ."

I thought I could probably do bookkeeping, accounting, and that's what I started out doing. Then when I got here and I found out, you know, how much *fun* engineering was, because there's a great deal of satisfaction in designing something that performs a *useful* function and performs it well. There is a tremendous amount of satisfaction in doing that–that's creative.

Did a Tour of Duty at Hungry Horse During Construction

I also had a tour of duty up at Hungry Horse while they were building the project. I was there the last year. We topped it out. I remember when we went up there, the dam was about halfway up, and we worked *seven* days a week, three shifts a day, and finally topped out the dam about September. I remember, as I was leaving–I left the last of October when the snow finally drove us out of there–looking back at it and getting a real feeling of satisfaction. "Well, by golly, we did something, and it's going to be there for a long while."

High School Population in Tampa

Storey: You raised the issue of your high school class. What was the rest of the composition of the population of the high school class?

Lopez: Well, like I say, about a third to a fourth of us were Latins. There were Spanish and Italians, primarily. A few Cubans. The rest of the class were mostly Anglo kids whose families had, in many instances, migrated down from other parts of the South, Georgia and Alabama. We only had *two* public high schools when I was there. We had about 100,000 people [in Tampa]. One Catholic high school. And the last three years that I was there, they put in *another* high school. So they had three public high schools and one Catholic high school for probably about 100,000 people. So the high schools were very large.

Storey: What about Negroes?

Lopez: No blacks in our high schools. It was totally segregated at that time. In fact, one of the pathetic things about it was that the single *black* high school had *burned* down three or four years before I went to high school, and they had *never* rebuilt it. They didn't rebuild it until after World War II. So essentially, if you were black and you got to junior high, you stopped and that was it.

Storey: You graduated from high school when?

Lopez: In 1941.

Storey: And then you went pretty much straight into the army?

Went to Work in Miami for the Office of War Censorship

Lopez: No. I actually went to work down in Miami, Florida, for the Office of War Censorship right after the war started, and I worked there until *I* went into the service.

Storey: Doing what at the Office of War Censorship?

Censored Mail Going to and from South America

Lopez: Well, censoring mail going *to* and *from* South America. We, the United States, intercepted *every piece of mail* that either originated or was going to South America. We did that illegally. We had no legal right to do it. We'd slit the letters open, we read them. Most of them were in Spanish or Portuguese, and if there was any information that was useful to the United States or *harmful* to the United States, we made note of it, sealed the letter back up, and it went its way.

Storey: When you say you sealed it up, so that it couldn't be detected?

Lopez: Oh, no, no. It was obvious. In fact, each of us, each censor, had a number, and it was a transparent tape with our number. You sealed the letter back up and put your tape number on it, so that if anyone had any questions about it, they could come back to you. Each of us were assigned a narrow segment of the alphabet in one or two countries down there. I happened to have something like M through R and I had Bolivia and Chile.

Storey: Now, let's see. If I'm recalling, those did not go Axis during World War II.

Simón Ituri Patiño Was Trying to Get Tin to the Axis

Lopez: No, but there was a tremendous amount of sympathy for the Germans down there, because there was a very large German population. The Bolivian tin king, by the name of [Simón Ituri] Patiño[2] was part of my assignment, was trying to find ways to get tin to the Axis countries. We had embargoed it, so they would constantly find ways of sending it in some other direction or finding some subterfuge to try to get tin to the Axis countries.

Storey: Really? That's interesting.

Lopez: Argentina went Axis.

Storey: Yeah. Argentina and another country, and I've forgotten which one right now.

Lopez: I can't think of the other one either.

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2. Simón Ituri Patiño (1868-1947), owned rich tin mines in Bolivia and invested his enormous fortune, thought to have been among the world's largest. Called the "Tin King," Patiño exerted considerable influence on his country's governmental policies even though he spent most of the latter half of his life abroad. Many of his Bolivian holdings were nationalized after the revolution of 1952. Author not available, *The Columbia Encyclopedia*, Sixth Edition 2006, accessed at http://www.encyclopedia.com/doc/1E1-Patino-S.html on December 20, 2006, at 7:10 **A.M.**.

Storey: [Floyd] Dominy[3] was on a Latin American group headed by Nelson Rockefeller, and one of their primary jobs was to try and prevent the *rest* of the countries from going *Axis*. He had a big project in Paraguay, for instance, and various other places in those early years.

Lopez: Yeah. South America, the only country, I think, that was *really friendly* to the United States was Brazil, but the rest of them were, *at best*, lukewarm.

Storey: Well, were there postal inspectors around while you were doing that?

Lopez: No. This was an agency set up by the United States Government, the Office of War Censorship. and they had offices in Miami and somewhere on the Texas border. I can't remember where. El Paso, I think it was.

Storey: Did you find money and things in these?

Lopez: At times people would send money. We were all *bonded*, and we all had been very carefully investigated by the FBI, so the people who worked there were, I think, pretty reliable. The FBI had an office right next to us, and we also had G-2.

Storey: Military intelligence.

3. Floyd E. Dominy has been interviewed by Reclamation's oral history program and discussed this activity.

Lopez: The military intelligence branch had an office there. Whenever you had a question, something that was questionable, you would take it to them and they would work with you. If it had code, try to break the code or whatever. And the reason I got the job was strictly because I was bilingual. I knew Spanish and I also learned Portuguese while I was down in Miami, so I was able to translate the two languages.

Storey: How many folks were there doing this?

Lopez: Oh, hundreds.

Storey: You know, nowadays, of course, the mail, it seems like it would just be impossible.

Lopez: Yeah. Yeah.

Storey: Even then I imagine there was large volume.

Lopez: Tremendous. Tremendous volume, yeah.

Storey: How was the office set up? Was it big bull pens?

Lopez: Well, yes. In fact, they took over the old Burdine's Department Store. That was not really right in downtown Miami, but just on the outskirts. The store had moved as the town had moved. And they had something like three or four floors of people that were all segregated by country and by alphabet.

My particular section was certified mail. So we worked in a bull pen, literally, with a wire

cage around us, because we were the people handling money and handling mail that was certified. But the others handled it pretty much openly. They got a stack of mail every morning and they read through it and put it out, and the next morning they had another stack of mail.

Storey: Now, when I think of censorship, I think of marking out things.

Lopez: We actually cut them out. We cut out anything that we thought was incriminating or of *use* to the enemy.

Storey: You mentioned earlier that you studied accounting for a year before you went into the service, I believe.

Lopez: Right.

Storey: Was that while you were working for the censorship group?

Lopez: I had started before that. Right after the war I went to school at Tampa Business College. Then when the war started and I was recruited by the Office of War Censorship, I went down to Miami.

Storey: So your accounting was before you actually went to work for them?

Lopez: Yes. I actually took one night course down there.

Storey: And then which branch of the service were you in?

Served in the Infantry in the U.S. Army

Lopez: Infantry.

Storey: The army?

Lopez: Yep. I had tried to get into the Air Force. I tried to get into the Navy, and I tried to get into the MATS, Military Army Transport Service. Each time I'd pass the physical exam and the mental, and then they'd start investigating. [Telephone Interruption. Tape recorder turned off.]

Storey: You were talking about trying to get into the various branches of the armed services.

Lopez: Then after I'd passed the test, several days later I would get called to go back again and they'd ferreted out my health record at the high school and the schools where I'd gone to. I had asthma all the time I was going to school, so they would kick me out. So I figured that probably, "Well, since I have asthma, nobody's going to be too interested in me," and I got drafted.

Asthma Attacks in the Army

I went in and they put me into the infantry, probably the *worst* branch they could have put me into. I had pneumonia twice in a period of about, oh, about a year. I had pneumonia twice. The second time we were on maneuvers and I got pneumonia so badly that I passed out. They

put me in an ambulance, took me to the base hospital, and I was there for almost six weeks trying to knock it down. Finally, when they did, they decided to discharge me.

Storey: Where was it you went for training?

Lopez: Well, I started out in Camp Robinson in Arkansas. After I finished my basic training, I applied for OCS [Officer Candidate School] and got accepted, but they didn't have a billet at this point, and so they named me an assistant instructor in the infantry camp over at Tyler, Texas. I stayed there for about seven or eight months.

Storey: So you were drafted when?

Lopez: In 1943, in February.

Storey: So you had been working on the censorship for maybe a year or so?

Lopez: About a year.

Storey: And then you were discharged in '44?

Lopez: In '44. I was in the service for about a year.

Storey: And then came to Colorado. How did you come to Colorado? Physically, I mean.

Took the Train to Colorado

Lopez: Oh, took the train. That was about the only way you could do it in those days.

Storey: And you were married by then?

Lopez: I was married by that time, yeah. My wife and I had known each other from junior high. We had been engaged from about 1942 on, and finally in 1943, in October, we got married in Tyler, Texas.

Storey: And you took the train.

Lopez: Yeah, I took the train.

Storey: How did the train come? What was the route in those days?

Lopez: Oh, it was a lousy route. I remember we went from Tampa, Florida, to Louisville, Kentucky. That took about a day. From Louisville, Kentucky, up to Chicago, Illinois, that took a day. It took us almost *two* days from Chicago, Illinois, to Denver, Colorado, because we got sidetracked. Anytime there was a military train coming by, we would get sidetracked, and you'd have to wait until it came by. So it was about three and a half, four days from Tampa, Florida.

Storey: Did you have any trouble getting travel authority?

Lopez: No. No. As a civilian, you could get on any train, if you had the space. But the trains were pretty full, because there were not many of them and that was about the only transport that was available, that and *buses*.

Storey: Where was your office when you worked for OPA, was it?

Lopez: Yeah. Actually it's Bureau of Labor Statistics, really is the agency, but we were contracting out and worked with OPA. You know, I can't remember the building. It was in–

Storey: Was it downtown?

Lopez: It was downtown Denver, yeah.

Storey: Where did you live when you came?

Lopez: I lived in north Denver. We rented a house.

Storey: Now, when you say north Denver–

Lopez: On [Douglass] ~~Scott~~ Place, about 2800 block on [Douglass] ~~Scott~~ Place, which is just–

END SIDE 1, TAPE 1. DECEMBER 12, 1995.
BEGIN SIDE 2, TAPE 1. DECEMBER 12, 1995.

Storey: I had just asked you about where you lived in Denver.

Lopez: I lived in north Denver just across the street from North High School.

Storey: On [Douglass] ~~Scott~~ Place.

Lopez: On [Douglass] ~~Scott~~ Place. Well, actually, Scott Place was from the north. That was the second time I lived there. The first time, I can't remember the name of this place now.

Storey: But it was right up in that neighborhood?

Lopez: Yeah, right up in that neighborhood. The neighborhood is called the Highlands. It had been a very, very ritzy neighborhood at one time when Denver was growing up, because *from it* you had views looking into downtown Denver.

Storey: Did you have trouble finding a place?

Lopez: Oh, yes. Yeah. Very difficult. As a matter of fact, about the first year we lived with a family who just had taken *a room* and put a kitchen on the end of it, and we lived in this one room and we shared the bath with the family, the Lunds.

Storey: How did you get to work?

Took the Trolley to Work in Denver

Lopez: Took the bus. In those days, they had the electric trolleys in Denver, and they ran *all over* town. They were really very efficient and very quiet, non-polluting. We ought to be thinking about it. From where I lived downtown, it was about fifteen minutes. Very simple. I didn't own a car until 1949.

Storey: Then you moved over to Reclamation. Where was their office?

Reclamation Moves into the Golden Eagle Dry Goods Store Building and Then to the Federal Center

Lopez: Well, when I first moved to Reclamation, they were in the old Federal Building. Within about three months, they moved to the Golden Eagle Building, because they were anticipating expanding, and they did. They had engineers coming in *every* day. That building had been condemned. ~~as a=~~ It was a [dry goods] store. ~~Dry goods.~~

Storey: Golden Eagle Dry Goods.

Lopez: Golden Eagle Dry Goods. And we, I think, occupied the second or third floor. I remember when we moved in, that I took a ball and rolled it across the floor, and the floor had *mounds* in it where the floor had heaved up, and you could not roll a ball across the floor without it bouncing and becoming airborne, the floor was that irregular. But we set up the office there. It was infested with mice. The only way you could get any [air] ~~heat~~ at all, of course, was to open the windows wide open and you'd get dirt and dust. And we were in there probably for about a year before they finally fixed up the old Remington Arms plant and moved us over to Building 53 at the Remington Arms plant.

Storey: Out at the federal Center.

Lopez: Out at the federal Center.

Storey: So now I presume when you were officed downtown in the Golden Eagle, you were still using the streetcar.

Lopez: Oh, yes.

Storey: How did you get out to the Remington Arms plant?

Carpooled to the Federal Center

Lopez: Well, when we first got out there, I didn't have a car, so what I did is talked to people who lived in my neighborhood and carpooled with them. I actually paid them to let me ride with them to work. Then eventually, as I said, by 1949 I finally got a car, and then I was able to carpool. But all the time I worked at Reclamation, I was in a carpool, never drove by myself.

I found the carpools to be *extremely* interesting, because the people that I was carpooling with were the people in other parts of the Bureau. We had some wonderful discussions going to and coming from work. In fact, we got to be good friends with each other. So we would start celebrating. First we would celebrate each other's birthdays. If it was a four- to five-man carpool, you had at least four to five birthday parties you would celebrate every a year. Then we began celebrating unbirthdays, because we wanted to just get together. But it was very good. I really enjoyed the carpools.

Storey: Do you remember any of the people that you carpooled with?

Lopez: Oh, yes. Yes. Wes Holtz [phonetic] and Ernie Johnson and Dick Brown. The four of us were the steadies. Every once in a while we would get someone to come in for two or three weeks and

then they would leave. But those are the four of us that stayed together.

Storey: Well, now, of course, you came to Reclamation in '44 just as Pick-Sloan Missouri Basin Program was being approved and as we were approaching the end of the war. What effect did you see on Reclamation when the war ended and people began to reclaim jobs and those sort of things? Do you remember anything about that?

Effects on Reclamation at the End of the War

Lopez: Oh, yes. Oh, yeah. It was a very *vibrant* time in Reclamation. We had *lots* of projects to work on. There were new people coming in all the time, some that had left and were reclaiming the jobs, but a tremendous number of new hires, some of whom worked out and some of whom were not so good and didn't work out. But it was a very dynamic time. There was *something* going on all the time. I think there was a sense of mission. There was a *job* to do and we were going to do it, you know, that kind of thing. There was a tremendous amount of pride in getting the jobs out and getting things *built*.

Two Very Serious Reductions in Force (RIFs)

We also, unfortunately, though, went through two very serious reductions in force (RIF) that I think had a very bad effect on the Bureau, because people had moved here and started *building* houses, and then they got fired because they were lowest on the totem pole. I remember on the first R-I-F I was a clerk, so I

wasn't really very affected by it because my position was not one of those that was being reduced.

The second time was in 1952, the so-called [Dwight D.] Eisenhower RIF, because it happened right after Eisenhower was elected president. That was a pretty deep cut and it affected a lot of people. There was a bumping system going on where if you had more points than somebody else on another list that you could qualify for, you could *bump* somebody who was above the red line. Every day you'd come in and there would be a list of names of all the people in your group, your section, with a red line underneath the name. Everybody above the red line was staying. Everybody below the red line was leaving. And that red line would shift as you'd find someone to bump into. You could bump someone who was above the red line, bump him down, because you had more points, and then that person would have to find either someone to bump or he would eventually lose his job.

"It was a *very, very* bad time for the Bureau. . . ."

So very little work was being done. It was a *very, very* bad time for the Bureau. And I went through this. I was above the line and below the line and above the line and below the line, and finally I said, "The hell with it."

"I went over to Coors and got a job as an engineer . . ."

I went over to Coors and got a job as an engineer over at Coors and stayed there until August of the following year. From January, I think, '53 to August of '53 I worked at Coors as an engineer.

Storey: That's about seven months.

Recruited Back by Reclamation to Work on the Glen Canyon Dam Bridge

Lopez: Yeah. About seven or eight months. Eventually the Bureau recruited me back, because by that time they'd gotten a new appropriation and they were going to design the Glen Canyon Bridge. So they recruited me as one of the team to design the Glen Canyon Bridge.

Storey: Let's go back, if we may, to the first RIF. Do you remember an approximate date?

Lopez: No, I don't. I remember I was still going to school, so it had to be probably '48, '49, somewhere in there. But the one I do remember very much was the '52, because I was affected by it.

Storey: What part did personnel have to play in this? Personnel wasn't doing all this? You had to go *find* somebody you could bump?

Lopez: Oh, yes.

Storey: Is that what I'm hearing?

Lopez: Yes. Correct. You did.

Storey: So everybody was wandering around looking at these lists?

Lopez: Well, not quite that badly. But, yeah, in essence, you did a lot of wandering because you had to find the list that you thought you could qualify. What personnel did is they gave you the number of points you had, and those were figured on the number of years you had there, whether you were a veteran or not, and what your efficiency rating was, the last efficiency rating. They gave you the number of points. Personnel also set up lists of, I guess you'd call it M-O-S, your military serial numbers or occupational serials, telling you that you could qualify for this position here or you could qualify on this list. So it gave you the lists that were compatible with your M-O-S. So when you were below the line, what you did then is you'd look around to some of these other lists, find someone that had less points than you had but who was above the line, and you could bump him down below the line, which made you a lot of friends.

". . . morale just went to rock bottom. . . ."

That was, I think, one of the worst parts about it was just it was totally disconcerting to everyone. I mean, like I said, very little work done, and morale just went to rock bottom. When we started working there, we all felt we were doing something that was worthwhile. We, I think, had a sense of intense loyalty to the Bureau. And then when this came along, there was a lot of disillusionment. I had built a house on the expectation that I would have a steady

job, and so did most of the people that I worked with.

It affected primarily those people who had come to the Bureau *recently*, young people with families who could *least* afford not being employed. So it was tough. But it also affected a lot of the old-timers. The guy who was my boss, Howard Pound, left because he was a non-veteran. The vets had priority, so he had to leave, and eventually got a job as a chief engineer for Willamette Iron and Steel in Portland, Oregon. A very, very good man. The Bureau lost a lot of *very good* talent, very good talent.

Storey: RIFs aren't designed to protect the people who are doing good work.

Lopez: No, they're not.

Storey: Let's go back to when you were an engineering aide. Do you remember the grades or the salaries that you were getting in these various positions?

Lopez: I remember my first salary. I was a–

Storey: At Reclamation?

Grades and Pay at Reclamation

Lopez: At Reclamation. It was a CAF-4. $1,667 a year.

Storey: $1,667?

Lopez: A year.

Storey: And a CAF-4 is?

Lopez: I guess equivalent to a GS probably a 3, somewhere in there. Then I got a promotion and I got $1,800 a year. When I got to be an engineering aide, I think about that time–turn that off a minute and I can look it up. [Tape recorder turned off.]

They had a raise. CAF-4s were making $2,100 a year. I was promoted to CAF-5, $2,320 a year.

Storey: That as when?

Lopez: August 24, 1945. And then in March of 1946 I was promoted again and made $2,650 a year. (Sound of pages turning) Then when I came back from college, I got a P-2, what they called a P-2 in those days, which is a professional degree. I'm trying to see what that was. It was a little over $3,000 a year.

Storey: Was that when you became a draftsman?

Lopez: No. I became an engineering aide first, and that was what they called an SP-6, $3,146 a year.

Storey: And that was when?

Lopez: '47.

Storey: That's the engineering aide.

Lopez: Right. (Looking through documentation.) As you can see, there were a lot of small actions. Well, I can't find it in here, but it was about that same grade. In 1949. I was making $3,601.80 a year.

Storey: And that was still as an engineer?

Lopez: [No,] ~~Yeah,~~ as P-6, as an engineering aide. Most of those were due to what they called in-grade raises or because the federal salary schedule was changing. Engineering draftsman was a GS-5, and that was in–I'm trying to get the date–in May of 1950.

Storey: That would be after you got your degree?

Lopez: No, that was before, because I went up to school in 1950.

Storey: Well, we had started to talk about what you did as an engineering aide, and I think you had mentioned some calculations.

Working as an Engineering Aide at Reclamation

Lopez: Yeah, the simple calculations. The Bureau had what they called a rotation program, and they would take starting engineers *or* engineering aides and rotate them to the various branches, actually to the various *sections* within the same branch. If you were in the Mechanical Branch, you would rotate, say, from large gates and valves over to pipe and penstocks or miscellaneous metalwork. There were three

sections in there. You would work in *each* section about four months.

The purpose of that was to *broaden* the engineers so they would know what was going on and also to give you a chance to *pick* where you think you would like to work and to let the people who were making the selections *also* have an input into it. If you went to work in a particular group and the head of that section really liked what you were doing, he would *request* that you be assigned to him. [Telephone Interruption. Tape recorder turned off.]

Storey: You were talking about the rotation for an engineering aide.

Lopez: Right. Like I say, it also allowed each of the supervisors to have a look at a variety of people who were rotating and then decide who they would like to have in their section.

Storey: What were *your* assignments?

Chose to Work in Large Gate Design

Lopez: Well, I worked in large gates and valves for four months, and then to pipe and penstocks, and miscellaneous metalworks. The one I really liked was the large gates and valves, because we were designing very large gates with high heads on them, and there were very meaty design problems. So when my rotation assignment was over, that's what I picked.

Storey: Tell me about the design problems.

Lopez: Well, some of these gates, you know, are under 400-, 500 feet of water, and water weighs 62.4 pounds per cubic foot. So the loads– [Tape recorder turned off.]

Storey: We were talking about design issues.

Lopez: Well, the high head gates are, like I say, very large and under a tremendous amount of pressure. So it's difficult to design a gate that will operate well under that kind of environment. It takes a good mathematical analysis and you have to understand something about frictions and hydraulic forces. So it's just not a straightforward cookie cutter type of design; each gate is a problem all of its own.

Some of the gates had several million pounds of load on them, and you'd have to hoist them up. If they're an emergency gate, in those days we had to be able to close the gate without power in a minute and a half so that it would not destroy the turbine if you had a runaway condition on the turbine. So there were interesting designs.

Storey: Any other issues that you think of?

Lopez: You mean in design?

Storey: In terms of design, things that intrigued you.

Issues related to Downpull on Gates

Lopez: Well, one of the things that intrigued me, too, and something I *had not* intended to get into as

part of my rotation, I got into the hydraulics of these gates. Gates that are under high head have what they call downpull. When the gate starts to go down, the velocity of the water underneath the gate decreases the pressure underneath the gate, but it still has full pressure above, so it tends to be slammed down. A tremendous amount of work had already been done before I got there in trying to design the *bottoms* of gates in such a way they would *minimize* the downpull.

But you could also use that force to *pull* down a gate that weighed a lot so that it could be [more] ~~both~~ beneficial than harmful to you, and also you could use that differential in pressure to move the seals in and out. You could [design] ~~get~~ them so that as the gate was moving, the seals were retracted, and that meant you had much less friction and much less wear on your seals. Then once the gate is seated, you could use the pressure to push the seals back out and seat them against the seats. So there were, like I say, just kind of interesting little design problems that I enjoyed doing.

Storey: Which branch were you in at this point as an engineering aide?

Lopez: In the Mechanical Branch.

Storey: In the Mechanical Branch. How was that set up and who participated in which parts of the design process? You understand what *I think* I'm asking?

How the Mechanical Branch Was Set Up

Lopez: Yes. If I don't, you'll correct me. At that time, the chief of the Mechanical Branch was a fellow called J. K. Richardson, and Harold Sheda was his assistant. There were three sections. There was the Pipe and Penstock Section, the Large Gates and Valves Section, and the Low Head Gates and Miscellaneous Metalworks Section. Work was assigned to each of these sections in a very routine way, because each section did only *a* particular thing.

"Everybody in a section really was a specialist. That's a strength and that's also a weakness. . . ."

Everybody in a section really was a specialist. That's a strength and that's also a weakness.

The people who were designing the structure, the overall structure, usually made the determination of what kind of gate they wanted in that particular structure or a valve or whatever, a penstock, and the size of it, the head on it, and, in essence, just *dictated* those terms to the Mechanical Branch. Then it was up to the Mechanical Branch to design a gate that fit that specification.

Issues about Design of Projects

I was a little frustrated by that, frankly, because it meant that the Mechanical Branch had virtually no input into the basic design decisions

that needed to be made: what kind of a gate, what the size was, or the head. All those were already dictated to you by, say, the Dams Branch or the Canals Branch or one of the other branches that were the lead in the design of it.

At that time, and I think maybe even today, the Bureau was an assembly-line design organization. By that I mean that the design came through, somebody designed the dam, and then somebody else designed the penstock, and somebody else designed the gates and the valves, but there was very little communication between each other. We did *not* have a design team. *I think* that that works very well when you're doing essentially the same thing over and over again. It works very well for the organization, because it's an efficient [arrangement] ~~design~~ and you get a chance to *learn* from what you did before. It does *not* work very well for the engineer, because it makes him a very, very narrow specialist and he knows *very little* of what else is going on around him. It does *not* work very well when you have structures that are different enough that they don't fall into this cookie cutter type of process.

"I think it was one of the reasons why we had a failure on Teton Dam, because *each* of these specialists were *cutting* the margin for error, or the safety factor, very, very thin in their own particular specialty. . . ."

I think it was one of the reasons why we had a failure on Teton Dam, because *each* of these specialists were *cutting* the margin for

error, or the safety factor, very, very thin in their own particular specialty. When you *compounded* that over all of them, we really exceeded the safety factor in the overall design. But because there was so little communication going on back and forth between the designers of each of these separate elements, it was *missed* that we were *cumulatively* creating a problem. Individually, each of them could just get by, but when you put them all together, it was more than that particular site could take and we had a failure.

"It makes them into very, very narrow specialists. It was one of the reasons why I *ultimately* left the Mechanical Branch. . . ."

Like I say, I think it was very *bad* for engineers. It makes them into very, very narrow specialists. It was one of the reasons why I *ultimately* left the Mechanical Branch. ~~, is because~~ I could *design* these things in my sleep, and I think that anytime you begin getting bored with what you're designing, it's just not good for the engineer and ultimately not good for the organization.

Storey: I think I'm hearing that on each individual project you were designing new gates?

Lopez: Every individual project had gates that were *slightly* different than the ones before, because the head is different, the requirements are different, the amount of water you need are different and that sort of thing, *but* they are similar to what you've designed before. So you

could take an old design and increase it, enlarge it, *use* the information that you had originated for the previous one to cut the amount of time down that you needed for the new design.

Because most of these designs were known as indeterminate structures, you can't do calculations that tell you what the sizes and the spans are, for example, in a gate. You start out with a preliminary design and then you check the stresses. If they work out, fine, you've got it. If they don't, you have to modify something. Well, if you have one that's *similar* to it, you can pretty well say, "Well, if I beef the plates up a little bit or if I cut down the spans a little, it's going to be within where I want it to be." And so it *did* reduce the total design time, because you could use what you'd done before. It's like designing automobiles, you know. You don't design an automobile from scratch. You use what you've already done as a basis, and then you start making modifications on it. And, in essence, that's what we were doing.

Storey: But each one is a custom job I expect.

Lopez: Each one is a custom job. There were a few that were not. Especially in the low-head type of gates, they had standard designs where you could get a three-by-five, a three-by-six, or a four-by-six that had *already* been designed for, say, 100-, 150-, 200 foot heads. You could pick one of those out and just put it out for bids and get a gate that would fit in your particular installation. But that did *not happen* in the high-head gates. Number one, there weren't that

many of them. Secondly, they were all individually designed because the conditions were different.

Storey: How many people would work on–did you say it was the gates and valves section?

Lopez: Yes.

Storey: How many in that section, do you recall?

Lopez: It varied, because it varied with the workload. But maximum probably fifty, and minimum, while I was there, maybe thirty.

Storey: Who was the section head?

Lopez: Well, it started out with, when I was there, Bill Webber, and he retired probably about 1948-, '49. Then Kenneth Waltermire took over. Then he retired probably about 1950-, '51, somewhere in there. Then Warren Kohler became the head of that group, the section, and he didn't retire until, oh, golly, about 19--

END SIDE 2, TAPE 1. DECEMBER 12, 1995.
BEGIN SIDE 1, TAPE 2. DECEMBER 12, 1995.

Storey: This is tape two of an interview by Brit Storey with Manuel Lopez on December the 12th, 1995.

I was just asking you to tell me about these men and their management style as section chiefs.

Lopez: Well, Bill Webber was an *old*-time engineer, very authoritarian, top-down-type manager, brooked no questioning or anything of the sort. Very competent but also very authoritarian.

Waltermire deviated from that. He was still a very good engineer, but he entertained questions. He was, unfortunately, ill from the time he took the job, and he eventually died of leukemia. Didn't last very long.

Warren Kohler

The one who took over for him was Warren Kohler, and Warren was more of a modern manager in that we had an opportunity to differ from him. We didn't always win. In fact, we had a term we called the "Kohler Compromise." When we'd get into deadlock, totally deadlocked, and he wanted it one way and we wanted it another way, he would say, "Okay. Let's compromise. Let's do it *my* way." (laughter)

Storey: That was the "Kohler Compromise." (laughter)

Lopez: That was the "Kohler Compromise." We had some very, very *heated* technical discussions, but Warren was the sort of fellow that you could disagree totally with him technically, and it would never get personal. It would still be strictly on a technical basis. When it was all over with, we went and *usually* did it his way, but amicably. There was no bitterness or anything.

Storey: And the issues had been aired.

Lopez: And the issues had been aired. But he permitted and encouraged free thinking. "Take a look at it. Just because we've done it this way since Grand Coulee doesn't necessarily mean that this is what we need to do *now*. We've got *new* materials. We've got new techniques." Our designs were–well, we had new equipment to design with, you know, and so it was no longer a slide rule. Computers were beginning to come into being. So he encouraged people to take fresh looks at things. Up until he took over, we had *riveted* all our gates. Kohler was the first person who *allowed* us to look at welded designs. We were probably the last group in this country to change from riveted to welding.

Storey: Why?

Lopez: Conservatism. "It had worked before. *Why* change it now?" That sort of thing. Both Waltermire and *definitely* Webber did not brook changes easily. That was one of the problems, I think, with the traditional engineers is that they went primarily by what had worked before. "If it worked before, *don't* change it." With the newer engineers, they were more willing to look at new materials and new techniques and actually take a look at it–do it differently. And also because I think the older engineers didn't know how to design with welded. They were riveting men. You design differently with rivets than you do with welded. So they felt uncomfortable.

Storey: With welds?

Lopez: With welded. With welds. The other ones are essentially pins and the welds are joining the two together with heat.

Storey: The thing that got me off on all of this originally was who did what. One of the things I'm trying to get at is what does an engineering aide do as opposed to what an engineer does. Is there such a thing as a difference between a designing engineer? You know, I don't know.

Lopez: Well, there is, but not in our group. There are a lot of engineers who do no design at all. If you were an engineer in the Mechanical Branch, you were a designer. The engineering aides usually did the simple calculations, the weights, for example, how much does the gate weigh. The design engineer actually did the design of it and he passed off to the engineering aide those types of calculations that were pretty much rote-type calculations. There was *a* way of doing it and you just did it that way.

The draftsmen took the engineer's sketches or rough designs and then made the final drawings. Very often the design engineer would make not a full-sized but a *large* drawing of the particular equipment that he was designing, and *then* the draftsman would take sections through it and blowups and things like that to show the details. In the Bureau, the design engineers did many more drawings than are normally done anywhere else or were done anywhere else, so you *had* to be a draftsman to be a design engineer, because you had to draw.

Storey: When you became a draftsman in '50, this was a promotion?

Lopez: Yes. It was a promotion in title but not in money. I didn't get any more money, but at least I got a chance to do some drafting.

Storey: But a draftsman is more skilled than an engineering aide?

Lopez: Yes, because you had to take the sketches that were given to you and develop them into drawings that could be used for bidding. So they had to have a lot of detail in them, and they had to be structurally correct. So you had to have a little more of the knowledge of what the equipment was like than an engineering aide.

Storey: Did you have any special training in order to become a draftsman?

Becomes a Draftsman

Lopez: On the job.

Storey: You just learned it?

Lopez: I learned it. Well, I had taken drafting in college, you know. Like I say, you were able to apply almost everything you learned immediately. So I had engineering drawing as a course in college. But that just gives you the techniques of *how* to draw. It also helps you read drawings. That's a very, very important thing for engineers to be able to do is to *read* a drawing. If you *cannot build* the structure in

your mind when you're looking at a drawing, if all it is is lines, you're not reading the drawing. You have to, in your mind, *construct* the structure so that you see it in your mind in three dimensions. If it stays *flat*, you have not read the drawing, and you can get into a lot of trouble if you do not see that structure in three dimensions in your mind. That's one of the things that I was able to do as a draftsman that helped tremendously.

I remember when I took the course, I was having a *hell* of a time until the midterm. It looked absolutely flat to me. Absolutely flat. I *could not* build the things in my mind. Then something–I remember when it happened. It happened one night. I was taking the midterm and having a hell of a time with it, and *suddenly* the thing *snapped* and I saw the thing in three dimensions. I *actually* saw it in three dimensions. And once that happens, then you can *really* read drawings. They just jump out at you. So not everybody can be a draftsman. Some people never successfully are able to construct the structure in their mind. So it's very hard to do. It's almost impossible to be a good draftsman unless you actually see it in three dimensions.

Storey: Was it typical that engineers would have to go through this draftsman step?

Lopez: Not at all. No.

Storey: But they still had to be capable of being draftsmen.

Lopez: They did. They did. And like I say, in those days, every engineer had a engineering drawing course that they had to take. Usually it was a year. And so they came equipped with at least the academic knowledge of it, but virtually no engineer went through the route I went. They came there as graduates, and they immediately became junior engineers. They may not be the lead person in the design, but they were starting to do designs.

Storey: Then you graduated, what, in '50 or '51?

Lopez: In 1951, from CU.

Storey: And you went back to–

Lopez: Well, I went back to the Mechanical Branch as an engineer.

Storey: As an engineer.

Lopez: Right.

Storey: A junior engineer?

Lopez: A junior engineer. Well, actually not a junior engineer, because by that time I had enough experience in drafting and an engineering aide that I was able to get what they called a P-2, which was one step above a junior engineer.

Storey: Did you go into a rotation program?

Lopez: No, I had already been through the rotation program as a draftsman, so I didn't do that. And I went back essentially to where I had left.

Storey: As a draftsman or as an engineering aide?

Lopez: As a draftsman.

Storey: So you went through it twice, a rotation twice?

Lopez: No. Just once.

Storey: As a draftsman?

Lopez: Well, no, actually it was as an engineering aide, because I didn't become a draftsman until the last year of the rotation program. Essentially, the distinction, in my case, between what I did as a draftsman and what I did as an engineering aide was not really very big. As I was becoming more and more proficient as an engineering aide, I was beginning to get drafting assignments, and so eventually when I became a draftsman, it was just a very natural progression from what I was doing as an engineering aide to actually becoming an engineer.

Storey: Before we go on to being an engineer, when I think of gates and valves, I think of like gates on spillways and things, too.

Lopez: Yes.

Storey: You weren't designing those?

Lopez: Yes, we were.

Storey: Okay. Did those require as much individual attention as the gates that were under high heads and so on?

Spillway Gate Issues Were Different than High Head Gate Issues

Lopez: Well, not because of load but because of size. Spillway gates are *very* large. Like at Glen Canyon they had gates that are fifty-by-fifty feet. That's a *very* large gate. So although they don't have the head on them that a high head gate does, they are very, very large. So it has a different kind of a problem. We used to try to have a gate that will operate with a minimum of hoisting effort and seal as well as it can being as large as that. Because when you've got a gate fifty-by-fifty, you begin to get deflections in the middle of the gate that affect the seals. So it has a different kind of a problem.

Storey: So still, though, custom design type of work.

Lopez: Yeah. Yeah. Well, one of the things is that every structure has its own individual design flood. The spillway gates, for example, are designed to *pass* that design flood. So each of them requires a different setup. Also the location of the structure, whether it's in a narrow canyon or a wide canyon, helps determine what kind of a gate you have. I think also there's some preferences that are in existence while things are being designed. Some gates are more *popular* than others at different times.

It used to be, for example, that the Bureau designed a lot of drum gates, and drum gates had a big advantage in that you could design them without having to use power, so that if your power system went down during a big flood, you could still operate the gates. That's very important. Otherwise, you overtop the dam. That was very essential when there were fewer transmission lines around. It was *easier* to knock out a power system during a flood.

Later, as the [transmission] grids built up, it became less likely that you would knock out the entire power system for a dam. So they went to gates that were simpler to design and simpler really to build, like radial gates or fixed-wheel gates or roller gates, because those are more positive. If they jam, you can push them down. With a gate that operates strictly on flotation like a drum gate, if they jam, you haven't got any other way to get them up and down except flotation.

So we opted for things that were more positive when it was less likely that we would lose power. So that's another thing that happens. The type of gate that is used changes with time depending upon the situation. And I have no idea what they're using now.

Storey: Did you see any of those changes while you were there?

Changes in Gates While Working for the Mechanical Branch

Lopez: Oh, yes. Yeah. Well, we went from riveted to welded, and then we went from drum gates to fixed-wheel and radials.

The concrete work and the structural work for drum gates is quite complicated. It has to be very, very precise, and it means that you are spending a lot of time and money in what surrounds the gate in order to make it work. Radial gates are pretty foolproof. They're big, but they're pretty foolproof. Infrequently does one fail.

Storey: Yeah, infrequently. (laughter)

Lopez: Nothing is ever safe forever, you know.

Storey: Yeah. How did your job change when you came back as an engineer?

Became Lead Gate Designer

Lopez: I actually got a better job. I became the lead designer then on gates, where I was responsible for the design, where before I did what other people asked me to do.

Storey: Do you remember any specific assignments?

Twin Buttes Dam

Lopez: That's interesting. I cannot tell you right now of. Well, yes, I do, as a matter of fact. Probably one of the most interesting ones of all was on Twin

Buttes Dam down in Texas.[4] We were looking for a regulating gate in the middle of a very large tunnel.

Storey: You were looking for what?

Lopez: A regulating gate in the middle of a large tunnel that would allow us to regulate the flow out of Twin Buttes with a minimum of power need, because we're down in a kind of remote area. So I designed a radial gate that would operate submerged underwater, with seals that would move in and out as the gate sealed, using some of the forces that we were talking about earlier that normally operate on gates, changes in pressures as the water flows underneath it. That was a very interesting job.

Supervised Installation of a Gate

Then I got the chance to go down and install it, which, to me, is the optimum. I think that an engineer has the most fun, and does the best work, when he is able to effect what he's doing from design through fabrication and in the installation.

Storey: So were you doing installation inspection then?

Lopez: I was actually doing installation. I was going *down* and being in charge of installing the gate.

4. Twin Buttes Dam is on the San Angelo Project which is near the town of San Angelo, Texas.

Storey: Oh, okay. So this was a thing that Reclamation was doing in this tunnel rather than a contractor?

Lopez: No, the contractor was doing it and we were in charge of it. We would tell the contractor what to do and how to do it. It didn't last long, because there are not too many engineers who want to do that. Unfortunately, most engineers want to be in an office where it's nice and clean.

Storey: Was this the first time this technique had ever been used, that you recall?

Lopez: To my knowledge, it was, yes.

Storey: How did it work?

Lopez: It worked wonderful. Yeah, it worked wonderful. In fact, we were thinking of patenting it, because I think it could have applications for valves that you buy in the store. In essence, we have valves now that operate like a ball with a hole through it. You rotate them. It seals. You open them up and they open. This valve would have required very little force to lift up and close. But something else came along, and we never patent[ed] it. The Bureau just decided it wasn't interested in pursuing the patent, so we didn't patent it. But it's working fine.

Storey: So how long were you down there?

Lopez: Well, I was down there at various times. I went down for, I think, about two weeks when we put in the trunions, which are the things that the gate

operates on, and then I went back down for about, I think, three weeks when we had the gate *totally* arranged or assembled and were putting it into the trunions and installing the seals and getting it adjusted.

Storey: You mentioned fabrication. How were you involved in fabrication?

Inspection of Fabrication of Gates

Lopez: I was one of the inspectors on the fabrication of it.

Storey: Where was it fabricated?

Lopez: It was fabricated in Rock Island, Illinois.

Storey: So you went to Rock Island?

Lopez: Yes. And I only went there for a week at a time two or three times. I'd wait until *a* gate was fabricated and then I'd go in and inspect it. If it passed, then we shipped it.

Storey: How did you get to Rock Island?

Lopez: By train.

Storey: By train.

Lopez: Both times I went. I went twice and both times I went by train.

Storey: And to–was that Twin Buttes?

Lopez: Twin Buttes is down in Texas. I flew there.

Storey: Oh, you did?

Lopez: Yeah.

Storey: Commercial flight?

Lopez: Commercial flights, yeah. Continental. The only reason I went by train to Rock Island was because it was in the middle of the winter, and they'd had lots of problems in not making the flights. It was one of those winters that was a *nasty* winter. ~~So I went down.~~ Both times I went by train so that I could be sure of getting there. In those days, it didn't take *much* longer, really, because you'd get the train at night here, and by about ten or eleven in the morning I could be at the plant. With a sleeper, you'd get a good night's sleep and so, you know, you were ready to go. If I had gone by plane, I probably would have left, say, early in the morning and gotten to Rock Island about the same time, because I'd have to land in Chicago and then find transportation from Chicago over to Rock Island. So truthfully it wasn't, you know, a much longer trip and we had assurance, pretty good, that I was going to get there.

Storey: That would probably have been one of the Zephyrs.[5]

5. Either the California Zephyr (originally operated March 19, 1949, to 1970) or the Denver Zephyr (operated May 26, 1933, to 1971) of the Chicago, Burlington and Quincy Railroad.

Lopez: Yes, it was. It was one of the Zephyrs.

Storey: One of the classic old trains.

Lopez: Yeah. Yeah. Wonderful trains. Wonderful trains.

Storey: Did you run into any problems in the fabrication?

Lopez: We did originally. The fellow that had the contract had never built gates before and didn't understand they required a lot of care. So the first time I went there was when we had a fiasco. So I had to kind of help them set up their manufacturing procedure in such a way that we got the results we were looking for. The second time was to inspect one that he had already done going by the new procedure that we had agreed to do.

Storey: And it worked out?

Rebuilding a Gate

Lopez: And it worked out. Well, yeah, it worked out. We had to do some modification to it. The first one we had to completely rebuild it [it] was so bad, and we had to rebuild it down there in San Angelo, Texas.

Storey: Now, how many gates are we talking about?

Lopez: Two.

Storey: How long was the process, beginning of design to completion of installation?

Lopez: Oh, sometimes years.

Storey: Yeah. But on the Twin Butte Project.

Lopez: On that particular one?

Storey: Do you have any recollection?

How the Design Process Developed

Lopez: Oh, I would say about a year and a half from the beginning of design to installation. In fact, let me see. The design process and writing the specifications usually took three to six months, and the reason for that is not that the job itself took that long to do, but because there were a lot of jobs going on at the same time. So we did all. We didn't work on one and finish it. You worked on one for a while and then you went over and worked on another one and brought it up to where somebody else could do something to it, and then you'd come *back* to yours.

For example, all the jobs were checked, and so you'd get your design done and your drawings and send it to the checker. While the checker was checking it, you would be doing something else. Well, when he checked it and brought it back to you, if you were not finished with the one that you were doing, that one waited until you were finished what you were doing.

Then it had to go over to the drafting department where they were inked and made into permanent drawings on [cloth.] ~~vellum.~~ That took a while. Then they had to come back to you and you checked them to be sure that they had inked them right.

Then the specs were written and the specs were issued. It was kind of a chain of specs. You didn't issue too many specifications at one time, because they couldn't be processed properly. So you had to get in line for when your own specification could be done.

So it was not unusual to start a design at the beginning of the year and not have a specification *awarded* until the end of that year. That was not unusual at all. It took a year many times. And then, of course, it's issued and they give them thirty to sixty days' bidding time. The bids came back. You had to evaluate them, and then an award was made. That usually took a month or so because there were several in the mill. Then you allowed, say, six months to a year to build. So it was not unusual to have a job from inception to installation go two years.

Storey: The people who drafted were different than the people who inked the drawings?

How the Drawings Developed

Lopez: Yes. You made your first drawings on vellum in pencil, because they're easy to change. You could erase and modify and that. Then when *those* had already been checked and so they were

okay, then they were sent over to the Drafting Department and they were inked on [cloth.] ~~vellum.~~ Those became permanent record then.

Storey: When you say they were inked on [cloth,] ~~vellum,~~ does that mean they went in and they drew ink lines over the pencil lines on the [cloth?] ~~vellum?~~

Lopez: No. They traced them. They traced them. They put [cloth] ~~vellum~~ down and then they put the– well, you put your paper down and then you put this vellum down~~, which is a cloth, actually– well, I'm wrong~~. Vellum is the paper. That's the technical name of it. And cloth is what they use. They put a cloth that's semitransparent over the vellum, and then they inked over the drawing that you had made.

Storey: They traced it.

Lopez: They traced it. They traced it.

Storey: How many copies did they have to trace?

Lopez: Only one, because then you could make as many prints as you wanted. And the nice thing about it, see, vellum is a paper that with time gets so brittle that it will actually fracture and break into little pieces. The cloth, I'll bet you they've got cloth drawings from Hoover Dam that are still totally usable. So, much more durable.

Storey: So then they would make copies of the inked one to provide to the contractors for–

Lopez: They had to put them into specifications and for whatever use they needed.

Storey: Okay. Now, who did the specs?

Specifications Branch

Lopez: There was a different group that was called the Specifications Branch that actually wrote the specs.

Storey: And that's what they did for their specialization?

Lopez: That's what they did for their specialization.

Storey: And then when the specs came back, did you as the designer have to check them?

Lopez: You did.

Storey: Did you ever run into situations where it didn't match the way you thought it should?

Checking Specifications

Lopez: Occasionally you had discussions with them on changes that *they had made*, they thought that would read better or whatever, and you had to wrestle around until you agreed on what the wording should be or some of the conditions. What liquidated damages, for example, they ought to charge on late delivery, how important was it to get it to the project any particular time, because sometimes if you have very high liquidated damages, it affects the *price* that you're going to get. So there were minor

changes, but there was nothing really major, I don't think, that I ever recall, a major blowout where the spec came out that was totally different than what you thought it would be.

Storey: So then you had the drawing, you had the spec, you had to put that together into a package?

Lopez: Right.

Storey: To go out for bids?

Lopez: Correct.

Storey: Who did that?

Lopez: The Specifications [Branch] did.

END SIDE 1, TAPE 2. DECEMBER 12, 1995.
BEGIN SIDE 2, TAPE 2. DECEMBER 12, 1995.

Storey: . . . had the specs out for bidding, the bids came back. Who took care of that?

Specifications Branch Initial Evaluation of Bids

Lopez: The Specifications Branch took care of the initial evaluation, comparing one bid with the other, because rarely does a bid come back exactly like another. They have little nuances of changes in there. They would give you a sheet that had an evaluation of *all* the bidders and final numbers at the bottom, and you, as the designer, would go through and check the evaluations. If you

differed from what *they* had done, then you would reconcile the differences.

Evaluating the Technical Competence of Bidders

The other thing that the designer did that was very valuable is you evaluated the technical *competence* of the bidder, and occasionally we would toss out a bidder because he wasn't technically competent. It was very difficult to do, incidentally, because frequently if you threw out someone who you didn't believe was technically competent, they would protest and write their congressman and do all sorts of things that created havoc with the process, because you had to stop the award until you got all these things settled. Sometimes they'd drag on for months and you needed this equipment somewhere. So it was important not to have too many complaints if you could.

Frequently we would go out to the shop of the manufacturer and explain to them the process that he was going to have to go through in order to build a satisfactory piece of equip-ment. Frequently people would bid on these things that had *never ever* built a gate. We had one fellow who was a wrought iron manufacturer and wanted to build a gate, because the shop didn't have much wrought iron work at the time, wanted it as a filler. Well, he just simply did *not* have the know-how on how to build a gate that would work, because the tolerances were *very, very* tight on these gates.

So what we did in this particular case, I remember, we went over and just scared the hell out of him, and he withdrew his bid, and it was both to his advantage and ours. He would have lost his shirt on it, because he would *never* have been able to [build] ~~design~~ a gate that met the specs. He just simply *did not* have the know-how or the equipment.

Other times you'd go out and try to scare them or try to convince them that they should *not* bid on the gate, and they insisted they wanted to and then it turned out to be a fiasco, because you required a tremendous amount of time there at the shop trying to get him to do what needed to be done, and very frequently we had to rebuild the gate when it got out to the field. That was the *main* input of a design engineer in the awarding process, is this technical evaluation.

Storey: You mentioned twice, I think, that we had to rebuild out in the field. When did we accept the gate as adequate?

Rebuilding a Gate in the Field

Lopez: We accepted it–well, it was accepted for *shipment* at the plant by inspectors. One of the difficulties that the Bureau had in inspectors is that the inspectors we had were, *by and large*, overloaded. They had *more* work than they could handle, and so they didn't spend an awful lot of time at any one plant. They'd come in, kind of take a look at the gate, and, "Yeah, okay," and they'd ship it off. When you got it

out to the field, if it didn't fit, then you had to do something to make it fit and so we had to rebuild it. We had provisions in the specifications that did *not relieve* the contractor of responsibility until it had *been* successfully installed.

Storey: So they were doing the rebuilding?

Lopez: Well, sometimes not. Sometimes they said, "No, you do it. We don't have anybody out there, so you do it." So we would do it. We'd take it out to a shop, find a shop that we thought was competent, and supervise it very carefully, get the work done, and then *bill* the contractor for whatever the cost was. We didn't always recover. Sometimes we did and sometimes we didn't, because by that time, very frequently, it had been paid for.

Storey: Now, who would accept the gate finally when it was installed? Was that a chief engineer responsibility?

Gates Were Accepted by the Chief Engineer on the Recommendation of the Mechanical Branch

Lopez: Yes, it was.

Storey: So it would be done on the recommendation of the Mechanical Branch.

Lopez: Right. And the people out in the field who installed it.

Storey: The construction engineer.

Lopez: Correct. But the chief engineer had final responsibility for signing off.

Storey: You mentioned reconciling evaluations between the design folks and the specification folks.

Lopez: Right.

Storey: What do you mean? What was involved in that?

Lopez: Well, it was mostly a matter of mathematics. The specs had provisions for assessing liquidated damages. The specs also came, many of them, with a particular delivery date. If he had a separate delivery date than the one *you* had, then there was an adjustment made in the price. Frequently, because of the long time span between when the specs were written and when they finally were being evaluated, conditions may have changed out in the field as to when that was needed, and so you needed to reconcile that. But they were very minor. Like I say, the major thing we did was the technical evaluation.

Storey: What else should we be talking about your first–what was it, about a year and a half, two years as an engineer before you went to Coors?

Lopez: Well, then, I spent one construction season at Hungry Horse, Montana.

Storey: That was in that period?

Lopez: That was in that period.

Construction Field Engineering and Inspection at Hungry Horse

Storey: And were you doing construction inspection?

Lopez: Yes.

Storey: On?

Lopez: Well, I did both. I was doing construction inspection and I was doing field engineering, because what happened was that during that period the Bureau would take people from the chief's office and move them to the field and use them wherever they needed them. I was in Hungry Horse from about the end of April to the end of October, and for about the first three or four months I worked as a field engineer actually doing the surveying and the layout for the construction forces. In the second three months, I worked as a mechanical inspector inspecting mechanical equipment that was being installed.

Storey: What year was that?

Lopez: That was in 1952.

Storey: 1952. Well, I'd like to talk about that more. However, we've been talking for almost two hours now.

Lopez: We have, yes.

Storey: I'd like to ask you now whether you're willing for information on these tapes and the resulting

transcripts to be used by researchers both inside and outside Reclamation.

Lopez: Sure. I have no objection.

Storey: Great. Thank you very much.

END SIDE 2, TAPE 2. DECEMBER 13, 1995.
BEGIN SIDE 1, TAPE 1. JANUARY 16, 1995.

Storey: This is Brit Allan Storey, senior historian of the Bureau of Reclamation, interviewing Manuel Lopez at his home in unincorporated Jefferson County, Colorado, on January 16, 1996, at about nine o'clock in the morning. This is tape one.

Last time we did an interview, we were just beginning to talk about your work at Hungry Horse, I believe. Could you tell me about that, please?

It Was an Experiment to Send Design Engineers to Hungry Horse for Field Work

Lopez: Yes. That was the first formal field assignment that I had, and actually it was an experiment by the Bureau to use design engineers *in* the field during the height of the construction season. Several of us were recruited from the Denver office to go to Hungry Horse and serve as field engineers or inspectors for what was to be the last year of construction at Hungry Horse.

Many of us who went up there were, in essence, inspecting or *helping* to install equipment that we had ourselves designed. So it

was *extremely* valuable experience for a designer to be able to go out to the field and see ~~how~~ something that he had had a hand in the design of, actually go together, and to, I think, understand better what the functions were, some of the limitations that you have in the field in putting things together. It's not a shop, and so you had to rig up a lot of ways to do things that were kind of unique.

Looking at a Gate in the Construction Yard

For me it was very humbling, because I remember going up there, and I had a few minutes before the bus came for me to go up to the dam, so I was in the office and I said, "Can you tell me where my gate is, the gate for Hungry Horse that I had had a hand in designing?"

And they said, "Well, it's out there in the yard. It's only about fifty, sixty yards. Why don't you go over there and take a look at it. When the bus comes, I'll send him over there." So I did. I went over there and I'm looking around trying to find my gate. I saw this fellow standing by this *huge* pile of steel. So I walked over there and I said, "I'm looking for the fixed-wheel gates. Can you tell me where they are?"

And he looked at me like I was just from outer space. He points behind him at this huge pile of steel and says, "What the hell do you think this is?"

The last time I had seen that gate it was on a piece of paper that was, you know, about 24-by-30 inches, and it was a little part of that piece of paper, and here was this gate that stood way up in the air. I think it was something like twenty feet high or something. It really hit me how *big* these things were and how *hard* they were to move around.

I remember when we were trying to install the wheels. They were 42-inch wheels made out of solid steel, cast steel, and they weighed probably three to four tons each. We were trying to put them in little slots in the gate and adjust them so that they were all perfectly aligned within a thirty-second of a inch, a tremendously difficult job, and it had seemed so simple when I was designing it. From then on, anything that I designed I designed with a view to how *easy* I could make it for the people out in the field to be able to put it together. Up until that time, no one had really thought about it, because we were the first designers to spend *any* time in the field at all.

Like I say, for me it was a *tremendously* educational experience, and I think that everybody else that went up there, even the people who were working with concrete and all of that, realized how *hard* it was to maintain tolerances in a field environment. You're really working rather primitively. I think it benefitted the Bureau's design, definitely. I think it helped in giving us an opportunity to design something that would work *better* than it had up until that time.

Storey: How many people went on the program? Do you have any idea? Was it everybody?

Lopez: No. Well, they asked for volunteers and only the young engineers went. The older ones didn't want to have any part of it. But from the Mechanical Branch, three of us went.

Storey: Out of?

Lopez: Out of about a hundred and–at that time probably about 150. Then the interesting part was that when we came back with this message of, "Let's try to accommodate the field people," it took us a while to convince the engineers who had not gone that they *had* to modify their designs to make it *easier* to install them in the field.

Reclamation's Engineering Attitude

One of the problems when you don't allow yourself to be influenced by change is that you're very prone to not want to change anything. The attitude, *I think*, in the chief engineer's office at that time was that *we* were the premier engineering organization in the world. *We* knew *all* there was to know, so *don't* come back and tell me that we have to change it. And like I say, most of us who went were young engineers. We were just a few years out of school. So it took a long time before we were able to effect change. Ultimately, it did, and I think it resulted in better designs. Certainly things have been much better able to be installed.

Storey: Did you do any other kind of inspection while you were up there?

Work at Hungry Horse in 1952

Lopez: Well, I did two things. I inspected the erection of mechanical equipment. I also was a field engineer in setting up the form work for the big ring gate, spillway ring gate, that we were going to install. So I actually had a chance to go from just literally a hole in the ground to having the gate fully completed. We set the forms for the concrete.

And I did a lot of surveying. I surveyed a road where all the notes had been lost, and we hadn't paid the contractor, so we had to come in and bring the road in, the survey for the road in, after the fact. Many of the stakes that had been driven to show the alignment had been lost, so we had to kind of come in and rebuild the road, at least on paper. That was a very interesting assignment.

Surveying the Side of the Canyon to Determine the Quantity of Rock Removed

Another one was that we also had to pay the contractor for all the blasting that he had done on the sides of the canyon. We had the survey of what was there originally, and then we had to do a survey of the final alignment or final shape of the canyon. The difference between the two was the amount of rock that he had blasted off and that's what he was getting paid for, getting paid for on unit prices on how much he cut.

That required high scaling. They lowered us off the top of the cliff on ropes, and you held a rod showing the elevations, and some transit men on the ground would actually be able to map the profile of the canyon walls. It was kind of exciting because, like I said, you were hanging from this rope. We did that for about four weeks. By the time I got through, I had pretty strong arms, because you had to pull yourself up and undo what they call a little pigtail. You have two ropes, the big rope coming down and then another rope around you with a harness and it had a slip knot. The only way that you could move was you had to take the load off the slip knot and slide the slip knot up the rope or down the rope. But that was kind of an interesting assignment at that age. At this age, it wouldn't be interesting in the least bit.

Storey: Seems an interesting way to measure quantities from a contractor instead of standing there and counting dump trucks or something.

Lopez: Well, the reason you do that is because when you are counting dump trucks, you are counting the rock after it's been blasted and it occupies a lot more space because there's air between. You want to pay him *just* for the amount of rock he's blasted, *not* for the amount of rock he's hauling away. So by being able to profile the canyon before and after it's been excavated, you actually get the mass of the rock in place, which is what he's getting paid for.

"All construction contracts then, and I suppose even today, are slanted. The

contractor actually attempts to outguess the designer. . . ."

All construction contracts then, and I suppose even today, are slanted. The contractor actually attempts to outguess the designer. For example, if he looks at the rock and he thinks that there's more rock to be excavated than the designer has estimated, he will *up* the price per yard on that and decrease it in some other area where he thinks that the designer has *over*estimated the amount of quantity that's involved. That way he's able to still come in with the bid he wants, but he's slanted it in his own favor, so that he can make a little more profit on it.

". . . its kind of a big guessing game between the contractors and the designers as to how much work there is to be done in any one area . . ."

So it's kind of a big guessing game between the contractors and the designers as to how much work there is to be done in any one area, and rock is one of the areas in which there's a great deal of indecision. I mean, it's pretty hard to know accurately how much rock you are really going to have to remove, because it's all up in the air and it's hard to measure. All this work was very intently reviewed by the contractor, because that was one of the areas in which he had believed he was going to make more profit per yard than in any other place.

Storey: So how–let's see. How should I phrase this question? What kinds of checks and balances are going on here? The contractor obviously wants to make sure that you give him his full due. (laughter)

Lopez: Yes, he does.

Storey: And that he isn't shorted. But at the same time, you want to make sure that he isn't *over*paid.

Lopez: That's right.

Storey: So what kind of a check and balance is there in your survey system, for instance?

Checks and Balances in Surveying for Materials Removed

Lopez: Well, he could review the survey notes anytime he wanted to. He did *not* have his own surveyors, although he could if he wanted to. So he accepted what we did.

". . . the government, I think more than any other owner, is in a position where he has to be scrupulously honest. The government is in a peculiar position in that it wants to get its full value for the dollar. . . ."

Because the government, I think more than any other owner, is in a position where he has to be scrupulously honest. The government is in a peculiar position in that it wants to get its full value for the dollar. But on the other hand, the people that are doing the work are also citizens.

So you don't want to cheat them *either*. I think that's always a very peculiar aspect of government contracting, is that you *want* to be scrupulously honest.

I'm not sure that that's necessarily true in private-industry contracting where you want to get the best value you possibly can, and if you can outguess your contractor, then you do so. And the government very frequently, if there was a mistake by the government, there was no question about it, we corrected it instantly, because we didn't want to cheat the contractor. The contractor, after all, is a citizen paying taxes. There's, I think, a slight difference in the way a government job is run as compared to a non-government job.

Inspecting Ring Gate Forms

Storey: Tell me more about the ring gate forms. What do you have to *inspect* when you're *inspecting* them?

Lopez: Well, this is a gate, it was a spillway gate, and it's shaped like a donut, literally like a donut. It has a hole in the center and curved sides on the outside. The gate floats up and down in what is called a glory hole spillway. The water comes in over the sides and flows down the center, and so to keep this thing from wiggling around, you have guides that go down. I think we had eight guides all the way around this ring.

As the water rises in the dam, it *floats* this ring gate up so you can hold the water in the

reservoir. If you want to spill water, you have to fill this ring *partly* with water to sink it a little. It had no ~~electrical~~ forces on it other than just the flotation of this gate. So it's very important that it be *free* to move up and down, because you can't force it. We don't have any ram, hydraulic ram, or gears or anything to push it up. So you *had* to set these guides very, very precisely.

I remember that we were *setting* the supports for this thing, and we couldn't see more than two supports at any one time, because there was kind of a concrete pillar in the middle. So you had to set these supports within a sixty-fourth of an inch.

Storey: The guides?

Lopez: The guides. Which is very difficult to do in the field. I mean, you can't hardly pick that up. So it took us a very long time of constantly making passes around it until we *finally* had this thing set. The other thing that happens, of course, is that while you're out there the sun is shining, and it affects all steel work because it heats it up. So we finally wound up by shading everything so that we didn't have the effect of the sun. It was probably as precise a field survey job as you get.

Storey: Now, these guides are steel guides or they're–

Lopez: Yes. They're steel. They're set in concrete, but they're steel.

Storey: So you were placing them in the forms for the concrete to be poured?

Lopez: No. What you do is you leave blockouts with bolts sticking out.

Storey: Setbacks in the concrete?

Lopez: In the concrete. And then after the concrete sets, you come back in and put *these* in and precisely line them up. You cannot get them close enough if you embed them in the concrete and then place the concrete. You just can't do it. There's too much "wiggleness" in the form-work. But by leaving blockouts and bolts, then you can come back in and with the bolts adjust them going, you know, in and out, up and down.

Storey: To a sixty-fourth of an inch?

Lopez: To a sixty-fourth of an inch. For a circle that was forty-two feet in diameter. That's very close, very close.

Storey: And then were you there for the installation of the gate?

Lopez: Yes. Yes, I was. That's when I changed over then from being a field engineer and became a mechanical inspector. So I was able to take it from raw concrete until the finished product.

Storey: How high would a ring gate like that be?

Lopez: Oh, I'm trying to think. Probably about six feet, about six feet high, about forty-two feet in diameter. The center of it was forty-two feet in diameter. The outside was probably about

another twenty feet. So it was probably about sixty to sixty-two feet.

Storey: And then did you also install the equipment to control the ring gate?

Lopez: Yes. Actually, the equipment was very simple, really. A valve. A manifold of pipes going to pipes that went into the gate and that were on a scissors so that as the gate went up, they were like this, on a scissors. As the gate went up, the scissors opened up, and as the gate went down, the scissors closed again. They were actually brass pipes so that they wouldn't corrode. We had to install all of these around the periphery of the gate, and these were the things that regulated the amount of water *inside* the gate and affected its flotation. When you wanted it fully up, it had no water. When you wanted it fully down, you filled it full of water so that it was *heavier* than the water.

Storey: I can understand how it would be easy to fill the gate. Is there a way to empty it also?

Lopez: On, yeah. You had drains, other pipes, that were connected to a drain that took the water out of it. It was a simple plumbing problem. Like the float on your toilet, virtually, you know.

Storey: Did you ever get to see it operate?

Lopez: Never did. Never did. Because the only time that it would operate was when you were spilling water. I have seen *pictures* of it. Several years later, when the reservoir was full and it did spill,

the people who were at the project whom I knew, the project manager, sent me pictures of the gate to show me that–and with some snide comment, "Well, by golly, in spite of everything you did, it still worked." And it did.

It's a very elegant flow in one of these glory holes. You actually get a swirl because of the rotation of the Earth. And so with the proper light, it makes a very attractive picture, when you're taking a picture of the flow going into one of these, because it has kind of a little helix in it. As it goes down the tube, it continues that all the way down, and it makes a very attractive spillway.

Storey: Now, I didn't get the impression that you designed this kind of gate.

Lopez: I did not design that gate myself, no. The one that I had been involved in the design of was a fixed-wheel gate that was on the face of the dam and regulated the flow of water into the turbines, actually did regulate the flow of water, because you opened up the gate completely when the turbines are running and the only time you close it is when the turbines aren't running. But this other one was the one that I got assigned to and helped install it.

Storey: Did you run into any issues on the installation of the gates *you* had designed other than the–

Lopez: Well, just that it was difficult to put in.

Storey: –problems of putting together?

Lopez: Yeah, that was the big problem. It was so big and heavy and unwieldy that we needed to *facilitate* how we could put these things together.

Storey: Now, let's see, you were up there for about a half a year, a little more maybe?

Lopez: A little more, yeah.

Storey: About seven months.

Lopez: And we left. The dam had been topped.

Storey: That means the last concrete was put in?

Lopez: The last concrete was put in. They were *just* finishing the powerhouse when I left. One of the fellows that went up with me, Jack Allen, had gotten assigned to the powerhouse. So he stayed through the winter and helped finish installing the turbines. We had butterfly valves in front of the turbines, and he finished that installation. They started operating the next spring. It did not start operating when we left because it wasn't quite finished.

Storey: Did they continue sending Denver office folks out?

Lopez: They did for one more, at Palisades Dam.

Storey: Up in Idaho.

Lopez: Up in Idaho. Which was a year later. I didn't go, because by that time I had left the Bureau to

work at Coors. We got back and within two weeks we had a reduction in force. Since those of us who had gone were the youngest engineers, we were frequently below the line or above the line. You know, they had a bumping process.

Storey: You told me about that briefly.

Lopez: Which is disgusting. Finally, I decided I'm not going to go through this anymore, and I got a job at Coors and was a design engineer at Coors.

And then the Bureau, when they started building Glen Canyon Bridge, asked me if I wanted to be on that team, and I did, and so I came back.

Storey: So from what, late '52 or early '53?

Lopez: Actually, I started at Coors in January of '53 and worked through August of '53.

Storey: And then you came back to work on–

Lopez: On the Glen Canyon Bridge.

Storey: Had you ever designed a bridge before?

"The thing that I have *always* enjoyed doing is designing indeterminate structures . . ."

Lopez: No. No. But, you know, I graduated as a civil engineer, a structural engineer. The thing that I have *always* enjoyed doing is designing indeterminate structures, because an indeterminate structure, you have to *start* with a

conceived design and then you check the stresses. If you are *wrong* somewhere, you have to come back and modify it. So it's a much more creative process than trying to design something where you can *calculate* the shape of the structure you want as you're going along. With this one, you don't do that. And that's true with any indeterminate structure. You have to start out *with* a conceived structure, you check the stresses. [Tape Interruption. Tape recorder turned off.]

Storey: You were talking about indeterminate structures. I'm still not quite sure I understand what an indeterminate structure is.

Lopez: It's one that you cannot solve by using statics, just the simple design processes of statics. You can't predesign it. A simple beam, for example, one that's supported on two ends, you can go in and *calculate* the cross-section, the modulus. You [determine] ~~need~~ the moment of inertia that you need at the middle, which is where the greatest bending occurs. And so with that, then you can go into a handbook and find out an I-beam, for example, or a wide flange beam or any number of things, that has the requisite moment of inertia.

With an indeterminate structure, you cannot do that. What you have to do is to guess at, say, the size of the beam you want in there and then figure the stresses out and see if it meets your needs. And if it doesn't, then you go back and beef it up or decrease it, whichever one you

want. Bridges, in general, are that way, particularly arch bridges.

Storey: Which is what we have at Glen Canyon.

Enjoyed Working on the Glen Canyon Dam Bridge

Lopez: Which is what we have at Glen Canyon, right. So it was a very interesting job. I enjoyed it tremendously. And like I say, you know, it's just that if you know the basics in engineering, you can be pretty mobile. You can move around from one type of design to another. All you have to do then is to learn the peculiarities of *that* particular type of design, but the basics are the same. Now, of course, all of this has probably changed today with computers, I'm sure, because you can do a lot more.

Storey: Do you recall who came after you, as it were?

Bill Nalder Recruited Him to Return and Work on the Glen Canyon Dam Bridge

Lopez: Yes. Bill Nalder, who was the chief designing engineer.

Storey: And his name is N-A-L-D-E-R?

Lopez: N-A-L-D-E-R. He called me up and asked me if I wanted to get on this team. So I came down, interviewed him, or vice versa, one or the other. We interviewed each other, found out what the job was going to be like, and what I was going to do when I was through, because I didn't want to

just get hired for *a* job and then not be able to do anything else. So he told me that when I got through with the job that I could either stay in the bridge section or I could probably move back to the Mechanical Branch. When we did get through–it took about a year and a half–I had been talking with the people in the Mechanical Branch, and they wanted me to come back, and they had a job for me. So that's what I did.

Storey: Before we go on, would you tell me quickly what you did at Coors?

Work at Coors

Lopez: I was a designer and I designed several things, a conveyor system for the spent grains. I designed–

Storey: Out of the brewery.

Coors Mixed Spent Grains with Molasses to Create Cattle Food

Lopez: Out of the brewery. Designed walkways. Well, actually, I designed a visitors' center for them that included a way to get out over the brewery and be able to see the operation, a fountain inside the room where the visitors came in. I designed a conveyor system. I designed a grains roasting oven. The spent grains came out of the brewery and had to be dried and then mixed with molasses, actually what's left of the sugar operation.

The Coorses, apparently, were also directors of one of the sugar companies, and they had some molasses left over that they couldn't use for anything, so they combined the spent grains and the molasses and made pelletized feed for cattle. That was a very profitable thing for them. So I was in that part of the operation. They used me for just about anything that came up.

Storey: Was there a reason you didn't want to stay at Coors?

Didn't Have Much Design Freedom at Coors

Lopez: Yes, there was. I didn't have as much design freedom, frankly, at Coors as I had at the Bureau. It was a very paternalistic organization. The Coorses ran *every* inch of it. You just, I don't think, had as much freedom as an individual at Coors as I had at the Bureau. And I liked the kind of work I was doing at the Bureau better. I've always enjoyed difficult, big, design problems.

END SIDE 1, TAPE 1. DECEMBER 16, 1995.
BEGIN SIDE 2, TAPE 1. DECEMBER 16, 1995.

Lopez: You're going to ask me the question again.

Storey: Yes, I'm going to ask you the question again, which was why you chose to leave Coors to come back to Reclamation.

Lopez: Because I think I had more freedom at the Bureau, more design freedom. Coors is a very paternalistic organization. It was run by the

Coorses. They dictated *everything*–materials, sizes, and everything.

"At the Bureau I felt that I had more interesting design, and it was more difficult design, and I've always enjoyed that. . . ."

At the Bureau I felt that I had more interesting design, and it was more difficult design, and I've always enjoyed that. I liked the work I was doing at the Bureau.

Storey: Tell me about the design problems on the Glen Canyon Dam.

Issues in Design of Glen Canyon Dam Bridge

Lopez: Well, Glen Canyon, you know, was another one of those very, very high head dams that was built on rather porous rock. The Navajo sandstone is a relatively porous formation. So there were, I think, a lot of problems in the dam design itself.

Issues with the Spillway Tunnels

The part of it that affected me personally was that because it was a very high head dam, the velocity of the water leaving the outlet gates was very, very high. After about a year of operation, they shut the gates down and went down to see what the outlets looked like, and there were holes the size of boxcars in the tunnel. Although the tunnel was concrete-lined, the water had, because of cavitation, peeled off the concrete and had started chewing away at the sandstone. The holes were *humongous*,

absolutely *very, very* big holes, almost *scary* holes. They had to be repaired.

Issues with Finishing Outlet Tunnels and Cavitation at Glen Canyon Dam

I think we knew before then that you had to be *very, very* careful about offsets in the concrete of an outlet work. This really *drove* that lesson home that the normal construction tolerances were inadequate to prevent this kind of damage. We *had* to be much, much more careful. We had to have glass-smooth surfaces with no offsets below an outlet gate because of the high velocity [that can cause] ~~when it comes to~~ cavitation. So I think that was really *the* major lesson for me that came out of Glen Canyon Dam.

Designed the Radial Gates for the Spillway at Glen Canyon Dam

I had not designed the outlet [gate.] ~~works.~~ They had been designed by someone else. I had designed the radial gates, which were the spillway gates at the top. Those went together pretty easily, really, and to my knowledge, we've never had any serious problems with them. But we didn't have the heads on those gates that the outlet works had. The outlet works had–oh, there was something like, I think, very close to 700 foot of head on them, and the velocities were very high.

So, yeah, it was a good experience. I didn't spend an awful lot of time at Glen Canyon. I

went down two or three times, but I didn't *spend* a lot of time myself at the dam.

Storey: You didn't do inspection or anything?

Lopez: No, I didn't.

Storey: But, now, you did work on designing the bridge?

Lopez: I designed the bridge, yes.

Storey: Were there any particular design issues related to the bridge?

Glen Canyon Dam Bridge Was Unique as the Highest Arch Bridge Ever Built

Lopez: Oh, yeah. The bridge was a unique bridge, because it was the highest arch bridge that had ever been built, the greatest distance from the floor.

Storey: Of the canyon.

Lopez: Of the canyon, right. And it went in together remarkably easily. I was just amazed–we got the reports back–at how easily it went together.

Dealing with Vibration in the Completed Bridge

But after it had been put into service, they noticed that it would vibrate very rapidly. Bob Sailer, who was the head of the bridge section and an *excellent, excellent* designer, went down to see what the problem was. When he came

back, he said, "I think the problem is the wind. I think the wind is so strong up and down that canyon that it's causing the bridge to vibrate." But the bridge was vibrating at right angles to the wind.

So we set up a model in the lab and we discovered that the bridge was being transformed, the columns, the long columns that are called stiffbacks that go all the way down right at the very edge, were being transformed into air foils by the wind. The wind would blow at right angles to the face of the column and it would form a vortices around the side of the column which would suck the column over towards that vortice. As soon as it did, it filled the space up and so it pressurized that side of the air foil again and shoved it back into the opposite direction, and so it vibrated like a piano string, back and forth.

The solution was to put in spoilers, very much like the spoilers you see on the wings of airplanes, to break up those vortices. And the minute they did that, the bridge quieted down. It didn't vibrate any more. It was interesting, a very interesting problem. Those vortices are called Von Karmen Vortices. It's a problem that normally is *not* a problem in structures, it's a problem in airplanes, but the same technology applied here.

Storey: Are these the little flat things that you see sticking up on the wings?

Lopez: Yes. Yes.

Storey: Mr. Sailer? S-A-?

Bob Sailer, Chief, Bridge Section

Lopez: S-A-I-L-E-R. Bob Sailer. He was Swiss, had been born and raised in Switzerland and educated in Switzerland.

Storey: And he was the head of the bridges?

Lopez: He was head of the Bridge Section.

Storey: And you worked for him?

Lopez: Yes, I did.

Storey: What was he like?

Lopez: Well, he was, like I say, an *extremely competent* engineer. Very creative. He actually could see a structure in his mind before he ever put it together. He really was the chief designer on the bridge. The rest of us worked on details or, you know, just tweaked it here and there, but he actually dreamt this thing up in his mind. When he came and gave you, "Well, I think we ought to make this about this size," and you'd make it that size and then you'd start checking stresses, they were right on the money. Just an absolutely wonderful ability to synthesize the structure in his mind. Very, very good.

Harvey Olander was "the *best practical* mathematician I have ever known. . . ."

He had with him a fellow called Harvey Olander. O-L-A-N-D-E-R. Harvey was probably the *best practical* mathematician I have ever known. He would dream up ways of checking the structure that were very unique, using mathematics, because he was such a tremendous mathematician.

The two made a *marvelous* team, because Sailer was the *artist*, if you will, because there's a lot of *art* to designing bridges. Bridge designers pride themselves in making artistic structures. They want the bridge to *look* good as well as to be functional. And Sailer was the artist. Olander was the practical mathematician that could check and translate this *art* that Sailer was dreaming up, into steel. And the two made just a great team.

Storey: Do you happen to know if they were involved in the bridge at Auburn?

Lopez: I do not. I don't know. But I would think if it was done during the same period, yes, because all the bridges were designed by this group. All the bridges by this group. Did something happen to the bridge at–

Storey: No, it's fine, as far as I know.

Lopez: Oh, is that the one that goes over water, a good deal of it?

Storey: No. It's off to the side to reroute a highway around the proposed Auburn Dam. You know, it was never built.

Storey: Well, then I'm sure that Bob did, because it was during that period, that period of time.

Storey: I don't remember exactly when it was. It's sort of a spectacular bridge, too.

Lopez: Well, he did a lot of them that were just absolutely beautiful. I think the Glen Canyon Bridge is a beautiful bridge. You come out there, here's this humongous hole in the ground and this very slender thing goes across and it carries all the load.

Storey: Some of the photos are quite spectacular where it's only half built, you know, sort of reaching, and you think it's got to fall. (laughter)

Lopez: Yeah. Yeah. It was actually designed as two bridges. It was designed as a three-hinged arch during construction. Then when the last pin was put in in the middle, then we riveted the thing together so that it was no longer flexible there, and it then became a two-hinged arch.

Storey: Meaning from both ends?

Lopez: Meaning from both ends.

Storey: From either end?

Lopez: From either end.

Storey: Up against the sandstone.

Lopez: Right. That's right. So it was designed both as a three-hinged arch during construction and then as a two-hinged arch during operation.

Storey: But they couldn't entice you to stay in the bridges section?

Moved to the Mechanical Branch to Design the Radial Gates for Glen Canyon Dam

Lopez: Well, that was the last big bridge. (laughter) The rest of them were going to be back to, you know, crossing canals and things like that, which is okay. I mean, they're necessary and all that. But it's just that the Bureau then had big gates to design. The Glen Canyon radial gate, for example, was going to be designed, and so I wanted to get in on that because those were going to be big gates. So I, in essence, went up to Mechanical Branch and kept on working in Glen Canyon with the radial gates this time.

Storey: When you were working on the radial gates, did you wholly design the radial gate, or was it a team effort, or how did that work?

Lopez: No. Gates generally had a lead designer who did the major design, virtually all of it, and then used either lower-grade engineers or draftsmen to flesh it out~~, because it's a smaller structure~~. With a bridge, one man could do it, but it would take a tremendously long time to do it. With a radial gate, you can design a radial gate in probably four to six weeks.

Storey: One person?

Lopez: One person. The design, not the drawing. Then it has to get drawn up.

Storey: How many people were working on the Glen Canyon Bridge?

Lopez: Let's see. Eight of us.

Storey: That would include Mr. Sailer and Mr. Olander?

Lopez: That would include Mr. Sailer and Mr. Olander, yes. There were eight of us.

Storey: For a year and a half.

Lopez: For a year and a half. Not all eight of us for the whole year and a half, because sometimes, you know, there wouldn't be enough work for everybody, or some other little job would come in and you'd have to get on it. *I* worked on it for a year and a half, but not all eight of us worked on it for a year and a half.

Storey: Now, what about the gates at Glen Canyon? How many folks would be working on those? Would you do *one* gate and then Jim would do the next one and Ralph would do the next one?

Lopez: No. No.

Storey: How did this work?

". . . as far as the radial gates were concerned, you designed *a* radial gate and then you put in three of them . . ."

Lopez: Well, as far as the radial gates were concerned, you designed *a* radial gate and then you put in three of them, you know, that's the way it goes. They're all *identical*, so all you have to do is design one and then replicate it. But one person would do the design work, would do the calculations and do a layout on a full sheet. Then, like I say, lower-grade engineers or draftsmen would take that layout and start breaking it down into its component parts, because each component part has to be detailed because that's how it's built. It's built in component parts and then they're put together.

It depends on how big a rush you're in. If you're in a *big* rush, you break it up into many, many small parts and put one individual on each small part and it gets done quickly. If you're not in a big rush, then you might have just two people working on it. Or sometimes if the structure is not very large, one individual would design it, lay it out, and detail the whole thing, so you'd have only one person working on it. Those were *not* usually the case. Usually more than one person would work on it, because you have a schedule that you have to meet.

Storey: So you went back and started working on the Glen Canyon radial, I guess.

Lopez: Yes.

Storey: Being a dumb historian who doesn't understand a lot of this stuff, why couldn't you just take the radial gates from somewhere else and drop them into Glen Canyon?

Why You Couldn't Take a Gate from Another Job and Drop It into a New Dam

Lopez: Well, because the concrete work itself is different to match the topography. Each dam is matched into where it's set. You don't, you know, get cookie-cutter type dams and shove them into each place. The flow is different. A gate to handle the spillage, say, at Glen Canyon is definitely different than a gate to handle the spillage on the Columbia Basin, the Columbia River, where you have a much, much larger river. So those two elements, particularly, are what dictate the configuration of the gate.

If you have a narrow canyon and you can't spread out the dam, then you're going to have to spill water vertically rather than horizontally, and so you wind up with *tall*, narrow gates. If you have a very wide canyon or cross-section for the dam, well, then you probably want to spill them horizontally, and that's, in essence, what they do in the Columbia River. If you go up to Grand Coulee, you have the drum gates spread out all over the dam, because you have a lot of width. You get over at Glen Canyon where it's a narrow canyon, and you're trying to reduce the amount of rock you blast out of there, you have narrow, *tall* gates.

That's really it. It's a matter of configuration of the site and the flow requirements that dictate it. ~~Occasionally you can.~~ Occasionally you can just take one from one place, put it in the other, and it works just fine, but not normally. It's just–the sites are too different.

Storey: Did you get in on the beginning of the design of the gates for Glen Canyon?

Lopez: On the beginning of the design for the gates I did, yes.

Storey: How long did you spend on that then?

Lopez: Oh, golly. I cannot remember. ~~I cannot remember.~~ I'm sure it was probably several months, because in addition to the design and the layout, I did a lot of the detail work. Yeah, I'm sure it was several months, but I don't remember.

Storey: And then you stayed in the Mechanical Branch.

Lopez: Yeah.

Storey: Doing what?

Stayed in the Mechanical Branch until 1966 Working on Various Designs

Lopez: Well, other designs that came up. Let's see, this was in the fifties, and I stayed with the Mechanical Branch until 19–I'm trying to think–1966. I stayed in the Mechanical Branch and doing various designs. I designed some

gates for Flaming Gorge and for Twin Buttes Dam, went on various field trips to Twin Buttes because some of our gates were down in there.

Storey: Twin Buttes is?

In 1966 Given a One Year Assignment to the Office of Saline Water in Washington, D.C.

Lopez: Is in Texas. And then in 1966, I got a one-year assignment to Washington, D.C., to work with the Office of Saline Water.

"The Office of Saline Water was a spinoff from the Bureau of Reclamation . . ."

The Office of Saline Water was a spinoff from the Bureau of Reclamation, but over the years a lot of animosity had built up between them. I think the Bureau felt that they should have *kept* the research on desalting, since they had started it, and the Office of Saline Water felt that the Bureau was trying to gobble them up again. So I was sent kind of as a *peacemaker* to see if there was something that the Bureau could *help* the Office of Saline Water with and to show them that we put our pants on one leg at a time, etc., that kind of thing.

Office of Saline Water Was Starting a Big Desalting Plant Project in San Diego

So I went over there ostensibly as a liaison between the two organizations, and because the Office of Saline Water was so overworked in the area of projects, they were starting a big project

down in Southern California, in San Diego. They were going to build a million-and-a-half-gallon-per-day flash distillation module, a plant, and they had very, very little experience in construction and in putting projects together and that sort of thing because they were essentially a research organization.

Named Project Manager for the San Diego Desalting Project

Within about three weeks, I was named the project manager for this project, and it was a most peculiar project. The design work was being contracted out by the Office of Saline Water to a firm in New Jersey, whose prime contractor was in Seattle, Washington, and the construction was in San Diego, California.

". . . it was like trying to shovel quicksilver with a fork. . . ."

And I want to tell you, it was like trying to shovel quicksilver with a fork. It was *very, very* hard to keep things together.

The contractor had pretty healthy liquidated damages tacked onto the schedule, so he was very insistent that we turn around, whenever he had a question, to come back to him with an answer very quickly, so we had to set up a system that allowed us to track correspondence. Added to that, I had the problem that I was dealing with the engineers at the Office of Saline Water, who were not used to working under a tight schedule. They were researchers primarily.

You don't schedule research. "Tomorrow I'm going to get an answer."

Project Engineer for the Bolsa Island Project in Huntington Beach, California

So it was very *difficult* to get them working together, but we finally did. We built it and it was successful. As a consequence of that, when the next big project came up for the Office of Saline Water, which was the Bolsa Island Project in Huntington Beach, they asked me to become their project engineer on that project. So I left the Bureau then and went to Southern California as the project engineer for the Bolsa Island Project.

Storey: When was that?

Bolsa Island Project Failed by Was to Be a Large Desalting Plant Powered By a Nuclear Powerplant

Lopez: I left in December of 1967. The Bolsa Island Project was going to be a 100-million-gallon-per-day desalting plant tied to a nuclear power-plant that at that time was scheduled to have about 2,000 megawatts nuclear power built on an artificial island off the coast of Huntington Beach, California. The money was appropriated by Congress, and the design was started on the reactors, and it died, aborting. There were just too many partners. There were seven partners in this thing, and they couldn't get together on anything. They all came in with axes to grind that were all different axes to grind, and so the

project finally failed. After about a year and a half of trying to keep it together, it just finally toppled.

Became Chief of Project Development for the Office of Saline Water in Washington, D.C.

By that time, the Bureau didn't have an opening for me, and so I transferred back to Washington, D.C., and worked in the Office of Saline [Water] ~~Manager~~ as the chief of project development, trying to get projects built, demonstration projects. That *lasted* about two years. We did get a couple of projects built, one in Orange County and one down in El Paso.

Did not Like Washington, D.C.

Then I really wanted to get back out West. I just *did not like* Washington, D.C. I didn't like the *work* in Washington, D.C. It's a lot of paper-pushing and it's very political. You're working for people who have been appointed to that job and they're looking for the next job, and they know that they're not going to be there very long, so their interest in your own particular agency agenda is much less than the interest in promoting themselves. That's an opinion, but it's my opinion. And I just didn't like it. I didn't like the work.

"I just didn't like all the politicking going on and all the infighting and knifing, you know, things that are endemic in Washington. . . ."

I just didn't like all the politicking going on and all the infighting and knifing, you know, things that are endemic in Washington.

Westwide Study Was Beginning

At that time, they were starting a study out here in the west called the Western U.S. Water Plan or the Westwide Study [Report of the Critical Water Problems Facing the Eleven Western States].

Storey: Before we go on, can we digress back to the Mechanical Branch?

Lopez: Sure.

Storey: Did you ever get any promotions or anything there?

Group Supervisor in the Mechanical Branch

Lopez: Yes, I did. I eventually became a supervisor, group supervisor, GS-12. A peculiar thing happened about six months after I got it is that the Bureau decided that they needed to *reduce* the numbers of supervisors they had, so they changed my title back to engineer, instead of supervisory mechanical engineer, but none of my duties changed. I was still a supervisor[y] ~~and~~ mechanical engineer. But that was the last

assignment I had was as a GS-12 supervisory mechanical engineer before I left.

Storey: Did you have career plans at that point?

Thought He Might like to Become Chief of the Mechanical Branch

Lopez: I did. I had thought that maybe some day I would probably get to be the chief of the Mechanical Branch. That was my goal. But I became discouraged that I would ever get it, because it was like being the caboose on a train, and there was just a certain number of cars ahead of you, and it would take, I thought, probably a very, very long time before I would ever get it, *if* I ever got it, because there were other competitors for it.

I always felt that in the Mechanical Branch, particularly, not later on in the Bureau, but in the Mechanical Branch particularly, I was not in the mainstream. The reason for it is that I was kind of an innovator and a risk-taker, and that was an alien philosophy in the Mechanical Branch. They wanted to pretty much continue doing as they had been doing, and you can't *innovate* unless you're willing to take risks.

My other competitors that I had were very standard Mechanical Branch engineers in that they did *exactly* what had been done before in *exactly* the way they had been told to do it.

"I was constantly *pushing* the fences out trying to see if there wasn't a better way of doing it . . ."

I was constantly *pushing* the fences out trying to see if there wasn't a better way of doing it, which, fortunately for me, I had a boss that understood that, Warren Kohler. He didn't mind the *stirring* around I did as long as we wound up with something that was better, but it disturbed others.

Issue Regarding Hydropower Inlets and Their Design

I remember I became aware that one of our dams during the war had a half a gate built into it with the gate halfway down and a turbine on the other end of it so that they could conserve steel. When the war ended, we went ahead and put in a full gate. I was talking to the fellow that was up at the dam who came down to Denver, and I said, "Boy, I bet when you put in that full gate, you saw a tremendous increase in your power," because ~~the gate was halfway down.~~ now we could raise the gate all the way up, and you had the full opening to operate the turbine.

And he said, "We didn't see any increase."

I said, "Oh, you've got to be kidding. You can't possibly operate half closed and have as much power as you would with the gate fully opened."

He said, "None."

So he sent me some records to show it, and, indeed, that was exactly correct. It didn't matter whether the gate was half closed or fully opened, we were generating the same amount of power. Well, immediately that told me that our opening was too big, that we had just *overbuilt* the opening. About that time, the Bureau had–

END SIDE 2, TAPE 1. DECEMBER 16, 1995.
BEGIN SIDE 1, TAPE 2. DECEMBER 16, 1995.

Storey: This is tape two of an interview by Brit Storey with Manuel Lopez on January the 16th, 1996.

So what this told you was that the opening was too large.

Lopez: That's right. If you can get the same amount of power with the gate half closed as you can with the gate half open, you've got too much of an opening. So something else is controlling it, but not the opening.

Proposes a Value Engineering Study for Inlets to Hydropower Units

At that time, as I say, the Bureau had a program called value engineering. So I proposed a research project into finding out whether these openings were the right size, because if you can reduce the size of an opening on the dam, you reduce the size of the gate, you reduce the trash racks in front of it, you reduce the size of the *hoist* to handle all of this, you decrease the amount of space you need to put in a gate, so you're able to not squeeze them so much. And

so they're tremendous savings, potentially, if you can do this.

So I proposed this project. I remember that when it got up to my boss in the Mechanical Branch, Harold Sheda, he said, "Manuel, I can't submit this." He said, "The openings for these things are a time-honored tradition, and the Bureau of Reclamation is the leader in the world. We are *right*. We *cannot* look at this." I got back to my desk and I got to thinking, you know, this is ridiculous.

So I went back up to him and I said, "Harold, I'm going to ask you if I can't go around you. I want to submit this to Bill Wolf (who was the assistant chief designing engineer at that time) because I really feel very strongly about it."

He says, "Well, I can't stop you from it, because that's part of the program. You don't have to send it through me. But I'll tell you right now that this isn't going anywhere." And so I knew *he* would oppose it.

So anyway, I took it up to Bill Wolf, and Bill was one of these rare engineers who was able to see the potential for change some-times with very, very little hints. When I showed him the fact that we had the same amount of power, he said, "The opening is too big."

I said, "That's what I've been saying. The opening is too big."

And so he said, "We're going to do it."

Proposal Become Value Engineering Project Number One

So that was value engineering project number one. It was very interesting because the Mechanical Branch opposed it; the turbine people opposed it; the *dam* people opposed it; *everybody* opposed the project. We were attacking something that was just too close, too well proven, and it bothered them. It really bothered them.

Well, eventually, they assigned individuals. Each of these branches had to assign an individual to my team. I was made the team leader. It was a very interesting psychological problem. For about six weeks, all we did was argue about what a *dumb* problem this was, because each of these people that been assigned from these various branches had come in there with an agenda, and the agenda was to torpedo the study.

We also had one from the labs. About six weeks into the study, he came in one day, he said, "You know, after our last meeting, I went home and I started doing some calculations." He said, "Damn it, Lopez, you're right." He said, "The opening is too big."

Well, that's what we needed as the catalyst. Slowly, one by one, we won over *each* of the branch representatives. We started doing some research, and we discovered that these openings,

the *design* of the opening, was modeled after some work that had been done on the Panama Canal. In the Panama Canal, what they had were outlet works, in essence. They didn't have a *turbine* at the end. They were just getting water *in* and out of the docks. When you do that, the control for the flow is right at the opening, because there's nothing downstream to control it, and so what you *want* is you want to lose your energy quickly.

They had opened these things up in order to get as much water through there as they could, but when you build a turbine, the control is at the turbine, it's *not* at the entrance. So it's an entirely different flow condition than you have at outlet works. But they had just taken the outlet works design, and through the years, not just the Bureau but the *entire* world had just accepted it and put it into all the structures they had.

Well, when we found this out, then it began to make sense *why* the structures were too big. The structure was too big because we had designed the intakes for outlet works and we had turbines, an entirely different flow regime. So we modeled it in the lab and found that we could cut the size down fifty percent and not affect the turbine operation at all, but we also knew nobody was going to buy that, so we cut it down. I think we finally wound up with something like sixty percent of the total opening.

Results of the Value Engineering Study Were Used at the Third Powerhouse at Grand Coulee at Considerable Savings

The first place where this was actually built into a structure was on the third power-house at Grand Coulee, and there I have been told that they saved a million dollars a turbine by doing this.

So that's probably, you know, one of the more controversial of my assignments, but that was one of them. I really enjoyed that because it shows that in engineering, especially, you should *never, ever* accept anything. Question it. If it's sound, questioning will just prove that it's sound. You're not going to damage it. If it's not sound, you'll be able to improve it. I really think that an engineer has to be a skeptic.

Storey: Did you have any other assignments? When was that, first of all?

Lopez: Oh, it stretched out over–well, let me see. It started in about 1965.

Storey: So this was right at the end of your tenure with the Mechanical Branch.

Lopez: It was. It was. As a matter of fact, I didn't get to finish the report on it because I left. Yeah, it was either the very end of '64 or the beginning of '65. It took us about a year and a half or so before we were able to finally wrap it up. We would meet once every week or once every two or three weeks in the beginning, just kind of because we had so much opposition to this. But when we finally got to where the team was all on

board, we'd meet more frequently and things moved along pretty well.

Storey: How do you spell Mr. Sheda's name?

Lopez: S-H-E-D-A. Harold Sheda.

Storey: Do you remember any other things like this from your days in the Mechanical Branch, any special things?

Lopez: No, none that was as controversial as this.

Storey: Were you ever pulled in for repair, for instance, on dams?

About 1960-1966 Served as a Troubleshooter

Lopez: Yes. Yes. From about 1960 to '66, I kind of gravitated into kind of a trouble-shooter position, informally. It just kind of happened. We had some gates that were being built in Illinois for a project, for Twin Buttes, as a matter of fact, down in Texas. They shipped the first ones down there, and we got a call from the project, "Come down here. We can't put these things together." So I went down and, sure enough, they were just so *sloppily* built that they *would not* go together. So I went ahead and took them into a shop down there in Texas and showed them what had to be done to make them installable, because they just couldn't be installed they way they were.

So then I went back up to Illinois. The name of the company was Bennett Industries.

I'll never forget it. They had been a company that had been making drums for the paint industry. They made holders for the drums and things of that sort, but they had never made a gate. I got down there and when I saw how they were building them, I thought, "My God. I mean, it's no wonder."

So I spent about a week or so trying to see if we couldn't help them set up so that the gates could be installed. Well, they finally improved, but it was still pretty, pretty crude. And, again, I had to modify them when they got down to Twin Buttes.

So that's, in essence, what I did. This was not the norm for design engineers to go out and do this. Normally a design engineer went out, tried to stay in his business suit, and pontificated, but didn't get his hands dirty. We were instructed many times to, "Don't tell them what to do. Just tell them what's necessary. Because if you tell them what to do and it's not right, then *you* are responsible." But when I saw these gates at Twin Buttes, there was *no* way that I could just leave them that way, because they couldn't be fixed unless you knew something about the design of them and how to adjust them. So I got my hands dirty. *Once* that kind of got around, then I began getting called to go help things when things needed to get helped. So I would go out and help fix gates here, there, and everywhere.

Troubleshooting a Gate Problem at Navajo Dam

I remember one memorable deal. On a Good Friday we got a call from Navajo Dam down in New Mexico, and they had dropped a gate that we had on top of a tower 100 feet, and it had hit this concrete, and it had plugged up the only outlet to the Navajo Dam. The water was rising and they didn't know what to do. So I jumped in a plane and went down there. They took me out the next morning to the site. and there was the gate blocking the opening. By that time, the water was already up about, oh, I'd say a foot and a half, two feet, and there was *no* water in the river, none.

So they had gotten an oil rig outfit to come in, and they set up this oil rig over on the side of the reservoir, because this tower was out in the middle of the water. They were the only ones that had enough cable to handle a job like this. They strung cable out with a boat, put a six-part line–that's six pulleys–down to the gate, and this way we were able to magnify the pulling force of this oil rig by six to get the gate up. We worked all day Saturday, all night Saturday night, and Easter morning at about, oh, ten or eleven o'clock we had our own sunrise service. We got that gate up, and the water began to flow through the river again.

Storey: So this was on the upstream face.

Lopez: Oh, yeah. This is the only outlet out of that reservoir.

Storey: This was during construction?

Lopez: Well, it was right after construction. What had happened was that the project construction engineer, name was Brenner, was retiring from the Bureau and this was his last job, and so he wanted to see how the structure worked. They had just *blocked off* the bypass tunnels, so there was no water going around the dam. It was all coming in this way. The water had come up high enough now so that they could start operating through the dam. So he went down to the valve house where we had some hollow jet valves, and there was a little sign that said *do not open these valves beyond, I think it was, 10 percent unless* the water is at this elevation. Well, he ignored that sign completely. Opened the valves all the way.

Well what had happened was that he changed ~~then~~ the control point on this long pipe–it was a very, very long pipe–from the valve end. As long as you had the valve just 10 percent open, you kept the tunnel full, and so the intake was able to satisfy that demand. When he opened the valve up *all* the way, he couldn't keep the tunnel full and it started sucking in air through this intake. When he closed the valve again after he'd been playing with it, he suddenly shifted the control from the intake back down to the valve and it acted just like a hydraulic ram.

All this air that had been trapped inside this long tunnel suddenly started to compress, and it compressed to the point where it shot a column of water up this intake 100 feet in the air, dislodged the gate, and the gate came down. The only thing that saved us from a real catastrophe

was that the gate had guides all the way around it to keep it straight. As it came down, it did just like a piece of paper does when it goes down. It weaved back and forth and it would hit one guide, then another, ~~control for another rack~~ and it would slow it down and just kind of wobbled all the way down. [Telephone Interruption. Tape recorder turned off.]

Storey: I take it this was a ring valve.

Lopez: Well, actually it was kind of a circular gate, almost like a cone. It was built like a cone. And it's purpose was that if at any time you wanted to repair the tunnel, you would lower this thing under balanced conditions; that is, there would be no flow going through this outlet. You would just lower this thing over the outlet and let it sit over the outlet. You would open up the valve downstream *slowly* and it would seal against that intake, and then you could work down below it.

[When the valve was opened downstream, air was sucked into the pipe. When the valve was shut down, the gate opening refilled with water which compressed the air ~~When it fell down, of course, there was underflow, and all this air and everything else that had been coming through here had, by this time—well, before it fell, I mean, this air had just compressed~~ inside the [pipe,] ~~thing,~~ actually very much like a pellet gun, and it just threw this projectile of water up in the air and dislodged the gate and it just fell 100 feet down.

Storey: I'm confused. If this thing was designed to seal the opening, how did it fall down *in* the opening? Am I understanding it correctly?

Lopez: Well, it was in a tower that was 100 feet high. The opening was at the bottom of the tower. The gate was at the top of the tower [and would stay there] ~~. This was to be used~~ when the reservoir was being operated to provide water for downstream usage. The only time they intended to use [the gate] ~~it~~ was for repairs of [the tunnel or valves.] ~~that.~~ So it was supposed to have a hoist put on it and then slowly lowered down and close off the opening. But we had at that time probably about a foot or two feet of water coming into the opening, and the gate was still 100 feet up in the air. See, there's nothing in between them. And when this slug of water came up inside this tower, it dislodged some catches that this gate was hanging on and just let it free fall, but because there were *guides* all the way around, it didn't fall straight down. It wobbled as it fell down, and that slowed it up enough so that when it hit the sill down [at the] ~~for this~~ opening, it didn't damage the gate or the sill.

One of the things I had to do after this, I called [Denver] ~~them up~~ and said, "Okay, we've got the gate up now. I can come home."

They said, "Not yet." (laughter) "We want you to see if there's any *damage* on the sill."

I had already checked the gate and the gate had no damage. I said, "Well, you know, I

checked the gate. The gate doesn't have any damage and it's a lot more vulnerable than the sill, because the sill is made out of stainless steel but backed up with concrete. So if I don't have any damage in the gate, I don't think I have any damage in the sill."

They said, "We're not sure. You *have* to find out if there's damage in the sill."

Well, now, the reservoir is coming up. I have no way of unwatering it. So we got to talking about it. I said, "Okay." We went out and bought *all* the tarps that we could in Farmington, New Mexico. And this things is probably–I don't remember what the diameter of it is, but it's probably forty or fifty feet in diameter, this column, and it has trash racks all the way around it. So we took plywood and we shoved plywood down around the sides of these trash racks, and then we took the tarp and we laid over this whole thing. I got a one-man rubber raft, because [the tarps were] ~~it was~~ leaking like you can't believe. If you looked up, you drowned. I mean, we couldn't keep it sealed off.

So I took this one-man rubber raft, and I had the presence of mind to tie myself *and* the raft to one of the trash racks. They lowered me down into this humongous hole, you know, which is probably twenty feet in diameter, but still full of water because the water is just flowing in like mad. So I told them, I said, "Okay. Now, what we've got to do is you've got to open the gate just enough so that you lower

this raft down to where I can feel the sill, because I can't see the sill. There's just too much water coming in here."

So we set up ~~a~~ telephone communications [with the valve house to] ~~field where down at the bottom they would~~ crack the valve open, "Well, not enough. A little more. A little more." Finally, they got it down to where this boat of mine came down to just about at the level of the sill, and I groped around the sill with my hands feeling for damage. I couldn't feel any damage. By this time, of course, the rubber raft had filled full of water, so it sank. And I'm tied on to a rope underneath my armpits, and they're hauling me back like a trout. But we found out that it wasn't damaged, and that was it.

Storey: Well, that's an interesting *repair* experience.

Worked with Ed Lundberg During the Navajo Dam Repair Work

Lopez: It certainly was. (laughter) But actually it's funny how things work out in this world. The assistant project manager was Ed Lundberg, and Ed Lundberg and I became very good friends as a consequence of this thing.

Ed Lundberg Suggests Lopez Apply for Job As Assistant Regional Director

Through the years we stayed in touch, and when he became the regional director down in Boulder City and needed an assistant regional director, he called me up. He said, "Manuel, I'd like for you

to apply for the job. I'm not promising you that you'll get it, but I'd like for you to apply for the job," which I did, and I got the job and that's how I went down to Boulder City.

Storey: Is Mr. Lundberg still alive?

Lopez: No. Unfortunately, he isn't. He died about three years after he retired, from cancer. Fine guy. I really enjoyed him. We used to fish together after he and I both retired. Let's see. No, he lived longer than that. He lived seven years after he retired.

Salmon Fishing with Ed Lundberg

Because after *I* retired–I retired four years after he did–we used to fish together up on the coast of Washington. Go salmon fishing.

Storey: Salmon fishing. At Westport, maybe?

Lopez: No, we went out of La Push, which is a little Indian village up there.

Storey: Tell me, did you have any other interesting repair experiences, emergencies?

Travel Problems While Working on Twin Buttes

Lopez: Well, a humorous one was that we were fixing the gates at Twin Buttes. And like I say, I went down there several times. On my first trip down there, they lost my bags, Continental did, so I got down there probably about ten o'clock at night.

The next morning I went by the airport to see if they had found my bags and the guy said, "I found your bags."

I said, "Good. Let me have them, because all I've got on is this suit and I don't want to go on an earth dam with a suit because the dirt's flying everywhere."

He said, "Well, we found them, but they're in San Antonio."

So, anyway, I went on this earth dam with my business suit on. They brought in most of their labor from Del Rio, Texas, and from across the border in Mexico. I was working underneath this concrete work where they were going to put my gates. There were workmen up above putting in the anchors, and I heard one of them talk to the other one in Spanish and said, "Hey, take a look at that clown from Denver. What does he think this is, a business office? Look at him with his suit." You know, and they were just yakking back and forth about my business suit. And I didn't let on I knew–

Storey: Not realizing you understood Spanish. (laughter)

Lopez: That's right. And I didn't let on I knew Spanish at all. So when I came back about two weeks later to install the gates themselves, we were working on the gates, so I had been with them for probably thirty-, forty minutes, speaking in English all the time. So I needed a wrench. So I said, "Well, this is time now." And so I asked

him, I said, "Give me the monkey wrench," in Spanish. And he reached for the wrench and then he realized that I had talked to him in Spanish. And he turned over, his eyes big, and he said, "You speak Spanish?"

I said, "No, I do better than that. I understand it." (laughter)

He was really flustered. From that time on, they were absolutely my best source of information. They would come over and kind of come up to me and tell me quietly, "You know, the foreman made us do this over here and it's not right. We should have done this."

"Don't worry about it." So I'd wait, you know, maybe half a day, and I'd wander over to wherever this was going on and I'd look at it, and I'd call the foreman over and say, "You know, this isn't right. You shouldn't do it this way. This is the way that the specs say and this is what we should have done."

"Oh, oh, okay. We'll fix it." But they kept me informed on everything that went on. (laughter) That was kind of a fun one.

Storey: You had started, I think, to talk about the Westwide Study coming up.

Westwide Study

Lopez: Yes.

Storey: That would have been under the guidance of–I'm trying to think of that assistant commissioner who was brought in from Nebraska.[6]

Lopez: Oh, yes.

Storey: Why can't I think of his name?

Lopez: Yes. And me either. Darn. I know who you mean.

Storey: Well, anyway, that will come to us.

Wally Christensen Headed the Westwide Study

Lopez: Actually, that's right. And the fellow who was put in charge of it was Wally Christensen. The Bureau was the lead team. It was a very interesting study, because the Bureau decided that rather than just the Bureau doing the study themselves, that we ought to bring in *all* the agencies that would have interest in the study, which really involves practically every agency out here in the West. You know, we had EPA [Environmental Protection Agency]; we had the Corps of Engineers; we had Fish and Wildlife; Bureau of Land Management; *and* the Office of Saline Water, because one of the ways to supply water in the West was to try to desalt some of the brackish water that we have. So that's why *I* came out. I was part of the team, but I was

6. Warren Fairchild who has been interviewed for Reclamation's oral history program.

actually representing the Office of Saline Water. It was interesting in many respects because, here again, every agency came in with a mission, and the missions weren't necessarily the same missions.

Storey: Or even compatible.

Lopez: Or even compatible missions. That is correct. That is correct. And they collected this bunch of mavericks in this one area and tried to get us to move in the same direction. Well, Wally Christensen was an absolutely master psychologist. He never, ever got–

END SIDE 1, TAPE 2. DECEMBER 16, 1995.
BEGIN SIDE 2, TAPE 2. DECEMBER 16, 1996.

Storey: You were saying that Wally Christensen was very good at ramrodding the study. He never got angry.

Lopez: No. He never got angry and he never impugned anyone's motives or cast any doubts. He always assumed that they were there for the higher purpose of getting the study underway and getting something accomplished. So it took Wally probably six months to finally get people kind of marching in the same direction, and we got to be very good friends, all these people. I still exchange Christmas cards with several of them that have since retired and moved and are in different places. We finally got a study. We got, I think, a good piece of work done. But that's what moved me back out to the West.

Offered Job of Assistant Chief of Planning with Reclamation in Denver

About the time that the study was done, the Office of Saline Water was also done. Congress had decided not to fund it. And I was *stuck* out here in the West and didn't want to go back to Washington. I had the opportunity to go back to Washington, but I *really* didn't want to go back to Washington. So the Bureau of Reclamation offered me the job as the assistant chief of planning in the Denver office and I took it.

Storey: That would have been about 19--

Worked with Will Reedy

Lopez: It was 1973. I worked for Will Reedy[7] as his assistant.

Storey: Before we go into that, tell me more about the Westwide Study.

The Westwide Study

Lopez: Well, the Westwide Study was supposedly a study to try to assess *all* the water supplies and water *needs* in the West extending to that elusive year 2000. At that time that looked like a long way away. It doesn't today. They were just trying to just kind of take a look and see, okay, here's how much water we have available, and

7. William (Will) W. Reedy has been interviewed for the Reclamation oral history program.

have various scenarios. If we have a moderate increase in water use, here's how much we're going to need. If we have a medium, here's about how much we're going to need. And then try to see what ways could be arrived at to *meet* the water need or, in some cases, you couldn't meet the water need, and to try to give planners some long-range information. There's not much point in planning a project that is going to get implemented in the year 2000, if by the time you get to the year 2000, there isn't going to be any water for it.

We also were looking at the possibility of could you *trade* water to meet needs. That was sacrilegious back in the seventies. Even today some people don't like the idea of trading water, being able to *buy* somebody's water from one state to the next, for example. But that was part of the study.

The States Didn't Like the Westwide Study

There was a tremendous amount of opposition to it from the states. The states didn't *want* anybody looking at this sort of thing, because we're very different in the way we look at water resources than at other resources. There's an awful lot of *passion* involved in water supplies that you don't see with other resources. The upper basin states are *very afraid* that the lower basin states are going to take away *all* the water from the Colorado River. They just *simply* are panicky about it, because they know that the lower basin states have *more* political power than they do, they have more *money* than

they do, and they can show that they can produce *more* national revenue with water than the upper basin states can. So an awful lot of the water in the upper basin states is used to irrigate hay. Well, you compare that with someone growing tomatoes down in the lower basin, they can show a much higher yield. So there's that psychological problem. When you start talking about allocating water from area to another, it makes *most* of the states very, very nervous.

And we were also, you know, looking at the possibility of diversions from one basin to another. Well, after all, that's another one of the ways you can supply water, and that wasn't particularly popular with the states either. So the study was done and, as far as I know, it probably hasn't been read by more than a handful of people.

Storey: Well, I read it. (laughter)

Lopez: Good. (laughter)

Storey: I think it was published in '72, maybe?

Lopez: Yeah. I think so.

Storey: What kind of tensions showed up between the various agencies?

Lopez: Well, for example, between the Corps of Engineers and the Bureau was, "Who's going to control this?" Does the Bureau think they're going to build the structures that go with this, or is the Corps going to build the structures that go

with this? So there was *that* tension between the Bureau and the Corps.

Between, say, the Bureau and Fish and Wildlife, the problem that when you build a dam, for example, you inundate habitat, or when you build a canal you affect habitats, or if you're trying to *reduce* the amount of *loss* by *clearing* growth along a canal or along the river, you affect habitat. There's virtually *nothing* that the Bureau does that does not affect habitat. Sometimes beneficially, incidentally, not always adversely. But that, I think, was the major concern there.

And a lot of jurisdictional problems. Every agency has its own *turf*. Sometimes the *turf* they think they have is different than the turf they really have. But if you perceive you have a certain *turf*, than you protect that perceived turf. So there was an awful lot of turf protection going on. It was an interesting study.

Storey: I think Terry Lynott[8] was one of those that–

Lopez: Yeah, he was. He certainly was, yeah.

Storey: What was Terry Lynott like?

Lopez: Well, Terry was, at that time, our information officer, and it was his job to keep everyone informed as to what was going on, not just

8. Terry Lynott has been interviewed for Reclamation's oral history program.

internally within the group, but the states and the feds and other people who were interested in it. Also when we wrote reports, Terry helped a great deal in smoothing them out, because, *by and large*, engineers are not the best writers in the world. That's not true of all engineers, incidentally. [Telephone Interruption. Tape recorder turned off.]

Storey: I think we were about at the end of Westwide.

Lopez: Yeah. I think we were, too. About the problems it had, like I say, a tremendous amount of opposition to it even within the Bureau, because the study was done *outside* of the normal planning disciplines. No, not so much disciplines but the normal planning routines. It was done that way deliberately because we felt that unless the study involved all these other agencies, that it didn't have the type of legitimacy that it should have to be accepted, and we were trying to avoid that. But we ran into other oppositions. Like I say, they were opposition from the states and even from within the Bureau itself, because it wasn't done within the regular routine of the planning people. Like I say, you may have read it, but not too many other people have, unfortunately. (laughter)

Storey: Well, a number of folks have been involved in it. Do you think it had any effect?

Doesn't Believe the Westwide Study Had Any Effect

Lopez: No, I do not.

Storey: Why?

Lopez: Well, I think just simply because no one really has used that information to either plan water use or to affect anything that's being done today. So I really don't think it has had any effect.

Storey: Warren Fairchild's name finally came to me. Did you meet him?

Lopez: Oh, yes.

Storey: What was he like?

Warren Fairchild

Lopez: I knew Warren very well, as a matter of fact. I knew Warren even after he went back to the World Bank, because I was in Washington at the time that he was back at the World Bank.

Warren was primarily a politician, and I don't mean that in the derogatory way at all. I think that we tend to bad-mouth politics, but in a democracy, the *art* of politics is the art of getting things done, and Warren was a good politician. He, I think, was also a little naive about how the federal government *worked* when he first came into it. He had great plans and great ideas and was *frustrated* because they didn't get done. The reason they didn't done is because there's a certain inertia inherent in big organizations, and the government is one of the biggest of all, and so it takes a very long time to get anything accomplished. He was impatient with that, because he came from a smaller government like

the state government in Nebraska where you *could* get thing done a lot quicker. But I think it was primarily a function of size. And I think he was happy when he left and went to the World Bank because, again, he went back to a small organization where things could get done.

Storey: Is there anything else we should talk about about Westwide?

Lopez: No. I can't think of anything, unless you have some questions.

Storey: Well, I can't think of anything myself. We've spent two hours now talking, I think. So I'd like to ask you whether you're willing for the information on these tapes and the resulting transcripts to be used by researchers.

Lopez: Sure. I have no problem with that.

Storey: Good. Thank you.

END SIDE 2, TAPE 2. DECEMBER 16, 1995.
BEGIN SIDE 1, TAPE 1. FEBRUARY 23, 1996.

Storey: This is Brit Allan Storey, Senior Historian of the Bureau of Reclamation, interviewing Manuel Lopez, at his home in Littleton, Colorado, on February 23, 1996. This is tape one.

Assistant Chief of Reclamation's Planning Division in Denver

Mr. Lopez, I think we had just gotten you to the position of assistant chief of the Planning

Division in Denver, working with Will Reedy. Could you tell me what that was all about, please?

Lopez: Well, when Westwide started unraveling, I was working for the Office of Saline Water. I figured that the Office of Saline Water was also unraveling. In fact, Congress had just voted to deauthorize it.

So Jim O'Brian, who was the Chief of Planning for the Bureau, called me up and asked me if I would be interested in coming back to the Bureau. He wanted me to come back to Washington, and I told him that *I was not interested* in going back to Washington, but I would be interested in staying out West, anywhere out West. He said, "Well, let me talk with Will Reedy, because Will Reedy needs an assistant, and he's been looking. Maybe we can just transfer you directly into that job." And so that's what happened. I went out of Westwide and from the Office of Saline Water back to the Bureau and was Will Reedy's assistant.

Storey: Am I forgetting? You were with the Office of Saline Water for quite a while, weren't you?

Lopez: I was with the Office of Saline Water from the latter part of 1967, about December of '67, to 1973.

Storey: And you were the head of that office?

Lopez: I was the head of the office *in Denver*. We had a regional office in Denver that dealt with all of the Western states.

Storey: How did you relate to Reclamation in that office?

How Reclamation and the Office of Saline Water Worked Together

Lopez: Well, we worked together in several areas. We worked together, of course, on the Westwide Study. I was the representative of OSW in Westwide. But also there were several–like we were working on the salinity of the Colorado River at that time. Desalting was one of the many alternatives that were being discussed to try to fix the problem, as far as *Mexico* was concerned especially, and ultimately desalting was the solution decided upon to correct the high salinity of the water that Mexico was receiving, and that was the genesis of the Yuma Desalting Plant.

So we worked together, and I had been in contact with the Bureau people all the time that I was working with OSW. OSW was spawned by the Bureau, and there was still a lot of ties between the two organizations. And we were working in the same general areas. The truth is that most of the *bad* water that we were trying to deal with was out in the western states. There were not many instances of bad groundwater, for example, in the Eastern states. So it was fairly natural for the two agencies to be working together.

Storey: What kind of title did you have when you were at the Office of Saline Water?

Lopez: When I was in Washington, I was the chief of planning development, and my job was to try to find places to put the demonstration plants that we were authorized to build. And I did find one place down in Fountain Valley, California– they still have that plant down there–that treats tertiary-treated sewage, desalts it, pumps it back underground, and it's being used as both a saltwater barrier to keep the salt from intruding into the Santa Ana Aquifer and also to replenish the groundwater. Approximately three-fourths of it is reused by the basin water users. It's probably the first practical example of recycling sewage water. It has one intermediate step, and that's putting it in the ground, but that's a relatively small step.

Storey: Is that a purification process, putting it in the ground, I mean?

Lopez: No. It's a psychological process. [Laughter]

Storey: Now where is this? I want to make sure not to drink the water.

Lopez: In Fountain Valley, California. EPA has looked at it very, very critically over the years, and it passes all the tests. Desalting the sewage water does a lot of things to it. Not only does it take out a good deal of the salts, but it also acts as a pathogen barrier. Microbes don't pass through the membranes. And so if there are any that are

unknown, they stay on the reject side of the barrier. It has that added advantage.

Storey: And then your title when you were in Denver?

Chief of the Western Field Office for the Office of Saline Water

Lopez: In Denver, I was the chief of the Western Field Office for the Office of Saline Water.

Storey: When did you move to Denver from Washington?

Lopez: In 1971, at the very beginning of the Westwide Study. In fact, I moved to Denver because of the Westwide Study. I was the representative here.

Jim O'Brian

Storey: Tell me about Mr. O'Brian. He's a name that keeps *popping* up everywhere.

Lopez: Oh, yes. Jim O'Brian was a very *dynamic* person who was very, very comfortable working in Washington. He knew a lot of people and was held in, I think, esteem because he usually told it like it was. He was a diplomat, but he was able to, I think, convey to people that he was a fairly straight shooter.

". . . when he hired me as the assistant chief of planning here in Denver, his ultimate goal was to get me back to Washington to work for him. . . ."

But he was also a schemer. He could arrange to see what was going to happen, say, two or three years hence and would try to position himself and other people so that they could take advantage of circumstances two or three years hence down the field. In fact, when he hired me as the assistant chief of planning here in Denver, his ultimate goal was to get me back to Washington to work for him. It was just that he didn't quite have it all arranged at the time, and he thought by putting me in the assistant chief's office that that would take care of it. And, of course, I didn't want to go back to Washington.

Storey: You'd been there, done that.

Lopez: I'd done that twice, and I figured that was enough for any man. I didn't want to do it the third time.

Storey: What was the job like working with Will Reedy?

Will Reedy

Lopez: Well, we actually had to create the job, because it hadn't ever existed before. Will is a very, very capable guy who has a lot of trouble, or had a lot of trouble, in delegating work. He did it all himself, and as a consequence, he had this humongous *volcano* of paper on his desk.

When I came over, I was hard charging and willing to help everybody, and so after about four or five weeks, I came into Will and I said, "Will, I think I'm going to quit."

He said, "Why? Don't you like it here?"

I said, "Well, I like it here, but I'm not *doing* anything. I'm stealing the money. Look at this pile of work you've got there. You don't let me do any of it. So you don't need me. And if you don't need me, I don't want to be anywhere where I'm not needed."

And so we talked for a while. He said, "You know, you're right. I have this very bad habit. I seem to not be able to delegate. But let's see what we can work out."

And so we did. We eventually worked it out so that I got some of the load and he didn't have to do it all. But it took a bit of adjustment for Will, because Will was one of these hands-on people who liked to do it all. And we're still very good friends. We were able to overcome that and move on.

Storey: What was it you were doing in the Planning Office?

Responsibilities of the Planning Division in Denver

Lopez: Well, the Planning Office actually *reviewed* all the planning reports that were done by the regions. They also, I think, from time to time were Washington's staff in preparing reports for Congressional hearings and that kind of thing. We were also trying to pick up the remnants of Westwide and see what we could use that would not have to be redone over, because Westwide

had done water studies in areas that the Planning Office was interested in, and so we were trying to use *that* work to keep us from having to start from ground zero in areas where a study was required.

It was primarily a coordination, review, and final preparation for Washington. The reports left from the Office of Planning and Coordination and went to Washington for Congressional hearings. And sometimes Washington had requests for a specific piece of study, and we would do it and get it back to them.

Storey: How many people on the staff?

Lopez: Oh, I can't remember exactly, but probably around twenty, something like that. We had economists and geologists, hydrologists, people who you normally find on a planning team.

Storey: Now, if I'm thinking correctly, there was and Office of Planning in Washington, also.

Lopez: That is correct.

Difference Between the Planning Functions in Denver and Washington, D.C.

Storey: What was the difference between the responsibilities of the Washington office and the Denver office at that time?

Lopez: Washington set policy and were the ones who had the final say on what went into Washington.

We were more of the implementation office. We prepared or got the reports put together. We supervised– supervised is not the proper word. We reviewed the reports that were done by the regions to make them more or less consistent, because when you have different people doing different reports, you tend to have different formats. And so we tried to get them all into a consistent format so that when it went to Congress, they could go through it and be familiar with the format and not get all confused by having it be different for them.

"Our job was primarily coordination and review. . . ."

Our job was primarily coordination and review.

Storey: Do you remember any particular projects that came in? Were there any that had problems, for instance?

Lopez: No, I don't. As I say, I was there just about a year, and I don't recall anything that was of a particular problem. They were fairly routine.

Storey: You'd been in the Denver office before.

Lopez: Right.

Storey: It must have been, what, until about '67, right?

Lopez: I went to Washington in '66 and stayed there for a year. I'd been *loaned* to the Office of Saline Water from the Bureau.

Storey: So you went when Floyd Dominy was still Commissioner.

Lopez: That is correct, he was.

Storey: When you came back, Ellis Armstrong was Commissioner.

Lopez: Right.

Storey: Did you notice any changes in the Denver office between the time when you left and the time when you came back?

Lopez: Not too much. In the first place, because I didn't come back to the same area. When I left, I was in design. When I came back, I was in planning. And so I really had no way of comparing how things were in planning before I left for Washington, so I really did not have any way of assessing what changes, if any, were happening.

Reclamation Was Becoming More Environmentally Conscious

One of the changes that I *think* was happening, because of my work on Westwide, was that I think the *Bureau* was very slowly becoming more environmentally conscious and also conscious of the fact that there were a lot [of] other people that had a very deep interest in the same area we were in. I think for a long time the Bureau felt they had an "exclusive" out West in water problems, and many, I think, of the old Bureau people were not as sensitive to the environmental issues as they should have been.

Westwide, I think, was the beginning of the awakening, because we had so many of the other agencies who had other axes to grind that you had to become aware of what their interest was. And if you *weren't* aware of it and didn't attempt to accommodate it, the studies wouldn't go anywhere. There was a lot more *clout* in the opposition than I think we'd ever encountered before.

I remember going to the first hearing on the–what the heck's the name of that project where they were going to build that dam up here on the South Platte, just above Waterton?

Storey: Is that Two Forks or one of the earlier versions of it?

Attended Hearing on Two Forks

Lopez: One of the early versions of Two Forks, yes. I went to a public hearing at one of the high schools. It was an *absolute unmitigated* disaster for the Bureau.

Storey: This was when Reclamation was the sponsoring agency.

Lopez: That's correct. Reclamation was the *sponsoring* agency. I went there just as an observer. I was kind of interested to see what happened at these public hearings, and it was a *pure* disaster. The opposition was vocal, well informed, and the Bureau was *not* well informed and was *not* very sensitive to it. All the Bureau people were sitting up on the stage, behind tables, with charts

and graphs and things like that, that could *not* be read from the audience because they were too far away. They didn't answer questions promptly and openly. There was a lot of evasion. And by the time the meeting was over, it just degenerated into a shouting match.

Concern about the Conduct of Public Meetings While Regional Director in Boulder City

It had an impact on me, because when I went down and became the regional director in Boulder City, one of the very first things I did was I took *all* of the people who were involved in public hearings and gave them a course in *how* to conduct public hearings and *how* to be sensitive to other people's views. Not to *pretend* to be sensitive to them. There's a difference. But to actually be sensitive, realize that we were not the only agency that had a *mission* in the West and that a lot of people had different views. That didn't mean that they were kooks or that they were stupid. It just simply meant they had different views.

It was, I think, to many of the people in the Lower Colorado Region the first time that they'd ever been exposed to that kind of thing. We had to do it, because we were starting the construction phase of the Arizona Project down there, the CAP, Central Arizona Project, and it was a very *large* project with a tremendous number of different views. The Indians wanted one thing. The old irrigators wanted another. The municipalities wanted another. Of course,

the environmentalists, they wanted other things, not necessarily in total opposition to the project, but they had different views on where it should be going. It was a project that required sensitivity and required the ability to see different viewpoints and to see if there were ways to accommodate it. Not an easy thing when you've been used to having it *your* way for fifty years, and I think that was part of the problem.

Storey: Now, you attended this public meeting when you were still with the Office of Saline Water?

Lopez: Yes. I had no interest in it other than I wanted to see how it was being conducted. I did that just strictly as an observer, and it was a *very* good learning experience.

Storey: Not a good experience for Reclamation, though.

Lopez: Not a good experience for Reclamation, but a good learning experience for me. It taught me a *lot*, and I think it taught Reclamation a lot.

Storey: Well, of course, this is the period, the National Environmental Policy Act was passed in 1969 and followed by a whole cluster of various acts. From your perspective in the Planning Division, what kinds of adjustments was Reclamation making to these new laws? How was that going?

How Reclamation Was Adjusting to Environmental Legislation

Lopez: It was going very slowly. It was just that we were having troubles trying to *understand* what the environmentalists were after. I think that there was a general view among engineers that the environmentalists were only interested in *stopping* projects, period, that everything else was an excuse to stop projects. And I *do* think that there were a number of people in the environmental movement whose only purpose *was* to stop projects, but they were not the only ones. There were a lot of people who, I think, were trying to accommodate the need for additional projects because of population growth and the need for water with a need to save the environment that we had and to not keep altering it.

"There is really no way that . . . you can continue to have an increasing population without altering your environment, and so either we stop it at the spigot, turn off the number of people we're producing, *or* we have to accept an altering environment. . . ."

There is really no way that I know of that you can continue to have an increasing population without altering your environment, and so either we stop it at the spigot, turn off the number of people we're producing, *or* we have to accept an altering environment. And so I think our job is to try to make that change as *painlessly* as we can for the environment. It's not an easy job. It's a very, very difficult job for anyone who's involved in construction or in any project work to do, because it is *impossible* to build a project without altering the environment,

period. You just can't do it. And so what you're going to try to do–you have to do–is to try to alter in such a way that you are as little harmful to the environment as possible.

"And the problem is that the environment isn't very well defined: what is it that you're trying to protect?"

And the problem is that the environment isn't very well defined: what is it that you're trying to protect? Now, are you trying to protect riparian habitat? Are you trying to protect wildlife? Wetlands? What are you trying to protect? Part of the problem is *defining* what it is you're trying to protect.

Storey: There's a whole complex of things of concern.

Lopez: A whole complex, some of which, incidentally, are very important and some of which are frivolous. But that's a matter of opinion. To some people, the frivolous is very important.

"It's probably the toughest job that engineers had during that period. *None* of us had been trained to consider environmental matters . . ."

Yeah, it's not an easy job. It's probably the toughest job that engineers had during that period. *None* of us had been trained to consider environmental matters–I mean, none of us. And so it was something we had to learn, and some of us didn't do a very good job of it. You learned it very slowly. And it has some very inherent difficulties for people who are used to dealing

with hard numbers, [in] ~~is~~ that the numbers in an environmental assessment are *not* very hard numbers. They're numbers that are difficult to assess. Another individual can go back through the whole set of environmental assessments and come up with a totally different set of numbers and be ~~just~~ as justified as the first person was. So it doesn't have the repeatability of an engineering design or the history of having done many engineering designs over the centuries and people have eventually gotten used to it and so we all accept a particular way of doing something. That wasn't true with the environmental assessments, so a methodology had to be evolved. Birth is always difficult, and that was the birth of that evolvement.

Storey: I take it from what you've said that when you were the deputy chief of the Planning Division, that that particular division, because of the nature of its responsibilities, *didn't* become involved in these controversies very much.

Lopez: It did, but not directly, because we were not holding public hearings. The public hearings were being held on-site, or as close to the site as you could possibly do it. The field offices, the field planning offices, actually did the environmental work.

Issues Related to Compliance with the National Environmental Policy Act and Development of Environmental Statements

We did set guidelines and attempted to review the environmental assessments and either

validate them, "Yes, that was reasonable," or go back and say, "Well now, look. It just doesn't look like it's reasonable." As a consequence, there was a tremendous amount of turmoil over how to accurately do these things, and there wasn't any clear-cut policy emanating from anybody. So we were all trying to do the job as best we could without really having any unanimity on how it ought to be done.

Storey: Now, are we talking about environmental statements here?

"It was just new, and like most new things, you had to work them out. . . ."

Lopez: We're talking about not only environmental statements, which ultimately everyone had to do, but also on how to *assess* the *impact* of a project on the environment and how to modify it so that you reduced it. It was the whole gamut of how the protection of the environment impacted on the planning of projects and vice versa, how the planning of projects impacted on the environment. It was just new, and like most new things, you had to work them out.

Working with the Planning Teams in the Field

Storey: Did the Division of Planning serve only in a reactive capacity or did you also have interactions, for instance, with the planning teams and that kind of thing? How did that work?

Lopez: Yeah, we did. We had interaction with the planning teams. Frequently, someone from the Denver office would sit down with the planning team in the field and review what the steps would be to get the plan under way. We were *not directors* of the plan, we were not the managers of the plan, but we could discuss with them the *policy* issues, procedural issues, and what should be done when and where; and then *after* the plan was completed, we would do the final review. And very frequently during the process of the planning, we would react to questions from the field as to how should we do this or what should we do here. It was a [hands-on,] ~~hands-off,~~ but we were not managers of the thing. That was not our function.

Storey: How was it you came to leave the Planning Division?

Asked to Apply for Assistant Regional Director Position by Ed Lundberg

Lopez: Well, for many years before 1974, which is when I left, I had known Ed Lundberg, who was the regional director down in Boulder City. And I think you'll remember I told you one of the things I did during my career was kind of troubleshoot for the Bureau, and Ed and I had met when we had dropped the gate down at Navajo Dam, and for three very intensive days and nights, we worked to get that gate up. Well, from that time on, we kept in touch, and every time he would come into Denver, we would get together and maybe just chat or maybe go out and have lunch or something.

So when his assistant regional director retired, he called me and asked me if I had ever considered going to the field, working in the field. I said, "Not really."

He said, "Well, if you'd be interested, why don't you put in an application for this job? I'd like to have you as one of the applicants." And so I did.

Trip to Valencia, Spain Helping Set Up a Technical Exchange Program

I was on a trip to Spain, as a matter of fact, when my appointment came through. I was in Valencia, and Will Reedy called me–it was probably twelve midnight or so in Valencia–and told me that I was the new assistant regional director down in Boulder City.

Storey: You were traveling on business?

Lopez: Yes.

Storey: What were you doing?

Lopez: I was trying to help the State Department set up a technical exchange program with Spain. It had been attempted for about a year, year and a half, and somehow or other it never could get put ~~back~~ together. And so Phil Roth, who was the Bureau's representative on this, asked me, ~~he said,~~ "Would you come to Spain with me? You know Spanish, you're bilingual, and *I* am having difficulty. I just don't seem to be able to get these folks to commit at the final moment. We

get right to the edge of it, and then something happens."

So I did. I went to Spain. I was there for about two weeks. And it was *primarily* a *cultural* problem, not a technical problem. The Spanish tend to make decisions based more on how they feel about an individual, the *personal* contact, than they do strictly based on numbers. I went over there, and I was lucky. Within a matter of just three or four days, I became one of their buddies, and so we were able to discuss very frankly what their concerns were and we were able to then get the thing put together. And out of that came a technical exchange program, which may still be in existence, but anyway lasted for something like fifteen years, between the Spaniards and ourselves, and it's been very successful. It's been one of the few long-term technical exchange programs that we've been able to carry out in this country.

END SIDE 1, TAPE 1. FEBRUARY 23, 1996
BEGIN SIDE 2, TAPE 1. FEBRUARY 23, 1996.

Storey: I had just asked you if you remembered any of the issues that were involved in this Spanish negotiations.

Lopez: I don't think it was anything that was overt. It was something underneath the surface. I think we went over there with the idea that we know all there is to know about irrigation, so here's what we're going to do for you. Well, the Spanish have been irrigating a lot longer than we have, and I think they *resented* that feeling that

"We're going to *give* you something." They wanted to exchange. They had some things that *they* had been doing for a long time that we needed to know about. And so once I think we were willing to accept the fact that *they* knew something about irrigation, then the program went along pretty well.

"In fact, they have a water court in Valencia that has met *continuously every* Thursday for over a thousand years and adjudicates water and settles water disputes. . . ."

And the Spaniards *do* know a lot about irrigation. There are *dams* down there that were built during the Roman period, a little before Christ and after, several dams built by the Moors in the period between 700 **A.D.** and about 1400 **A.D.** So they were carrying an extensive program of irrigation. They had probably one of the very *best* ways of *measuring* water to the fields that I have ever seen, better than ours. *But* they were not into the computer age yet in irrigation, and that's where the United States had the advantage, is that we were more mechanized than they were. The program that they became very interested in was IMS, Irrigation Management Services, where you irrigate *only* when the crop demands it rather than on a fixed weekly or daily schedule or whatever that had been done before, because then you can get optimum use of the water and you get better growth out of the crops, and that's what they were primarily interested in. That's what they finally have instituted. But they had areas of irrigation down there that had been irrigated for a thousand years. In fact, they have

a water court in Valencia that has met *continuously every* Thursday for over a thousand years and adjudicates water and settles water disputes. It *cannot* be overridden by *any* court in the country. It is absolute. It's democratic. The members are elected by the irrigators them-selves. It's probably one of the longest-running institutions in the world.

Storey: That's interesting.

Lopez: If you ever get to Valencia, look it up. It's always held on the steps of the cathedral, and the reason for that is apparently that it was sponsored by the church at one time, and I think because that gives it kind of a credence[, if] ~~of,~~ it's on the steps of the cathedral, ~~so~~ it has some permanency.

Storey: But why were you in southern Spain instead of in Madrid? Because of this?

Lopez: Well, because I had to *see* what they *had* in the way of irrigation. We actually had to visit the projects, see what the projects were like, what did they do, what did they need, because if you don't know what they need, the technical exchange program wasn't particularly useful. And so we went down there to see what it was that they were doing and to try to assess what they needed and what they might be interested in having us try to teach them. ~~That's~~ The area that has the largest amount of irrigation is the southern part of Spain. It's very much like our Southwest.

Storey: The Moorish part of Spain.

Lopez: Yeah. More like the Southwest. It's arid, similar soils, similar topography in some respects.

Storey: Except for all those olive trees.

Lopez: Oh, yes. Well, southern California used to have lots of olive trees, also.

Storey: Yeah. So you moved to Boulder City in '74.

Move to Boulder City as Assistant Regional Director

Lopez: Moved to Boulder City, 1974, yeah. And Ed Lundberg retired in 1975.

Storey: Did you know that you were being groomed for the regional director's position?

Ed Lundberg Recommends That He Become Regional Director

Lopez: Not when I went down there, no. After I'd been down there about, oh, six months, Ed took me aside and said, "I want you to know that I'm going to be retiring in about six months, and I would like to recommend you as the regional director. But before I do that, I want to know how *you* feel about it."

I said, "Well, I've never really thought about it, but I think I would be very pleased if you would do that," because by this time, I'd begun to understand what was going on.

When I went down there, it was totally an alien job. I'd never worked in the region, except on a temporary basis, and had *definitely* never worked in what was *really* a political job rather than an engineering job. But after I'd been down there for six months, I began to appreciate what was going on and understand it a little better.

". . . it is a unique job. As far as I'm concerned, it's the best job in the Bureau. . . ."

And it is a unique job. As far as I'm concerned, it's the best job in the Bureau.

Storey: The regional director of Lower Colorado or being a regional director?

Lopez: Being a regional director. And being the regional director of Lower Colorado is probably better than any of the others, because you're the furthest away from Washington. [Laughter]

Storey: What did they put you onto? What did Mr. Lundberg assign you to do when you arrived?

Coordinate Authorization of the Yuma Desalting Plant

Lopez: Well, the first thing he assigned me to do was to try to coordinate the work that was going on to get the Yuma Desalting Plant authorized. That's the sort of work I'd been doing before anyway, so it wasn't really a change. The only change was, *now* I got to work with the people in the field, where I hadn't done it before. And we prepared the final report that went to Congress

and resulted in the authorization of the Yuma Desalting Plant as a solution to meeting Mexico's objections to the high salinity in the Colorado River.

Dealing with Lower Basin States over Mexico's Water Issues

It involved a lot of hand-holding with the Lower Basin states. They did *not* want to give up their water to Mexico in order to help the United States meet Mexico's demands that the water supplies that we delivered to them be less saline. They just didn't feel it was their problem. They weren't the only contributors to the salinity of the Colorado River. The Upper Basin states contributed to it, but many of the contributions from the Upper Basin states were *natural* sources, like Glenwood Springs, for example. But there were also projects like the Grand Valley around Grand Junction that were large contributors of the salinity. So they felt that whatever was done, as a minimum ought to be done by the entire basin. But *really* it ought to be done by the United States, *not* by the basin people, because it was a consequence of a Federal treaty that actually caused the problem to arise. And so they were more, I think, amenable to a solution like a desalting plant that didn't use water rather than a solution where you just let them have more water in lieu of reducing the salinity.

The Wellton-Mohawk Presented a Particularly Tough Issue

The Wellton-Mohawk District, which was kind of the straw that broke the camel's back, was particularly insistent that *no* restrictions be placed on their irrigation, because what had happened was that over the years a large amount of salt had collected underground in the Wellton-Mohawk District. When they started irrigating from the Colorado River, they used a lot more water than they had historically done in the past, and they irrigated many, many more acres than they had historically been able to do in the past from the Gila River.

There's a peculiar geologic feature in that project. There's a rock dike that makes the valley almost like a bowl. It *blocks* the *subflow* underneath these lands to go on out into the Gulf of Mexico. It *blocks* it within the District. And so when they started putting on a lot more water, they *raised* the level of the groundwater, and it was very saline. And so they put in a whole bunch of pumps and started pumping the salt water back into the river, and that raised the salinity of the Colorado River beyond acceptable limits for Mexico. So what the solution that we finally came up with–[Tape interruption.]

Anyway, when they started pumping this drainage water, it was very saline. It got up, at times, up to about 5,000 parts per million. And so by putting the desalting plant *on* the drain, the Wellton-Mohawk drain, we were able to *save* some of this water, which we did *not* count as part of our delivery to Mexico, and that was something that the State Department had agreed to do to get Mexico to accept the water. And we

could then put the desalted water back in the river and further reduce the salinity. So that, in essence, is what the Yuma [Desalting Plant] Project is designed to do.

Storey: So you were intercepting the drain water from Wellton-Mohawk before it got back in the river?

Lopez: That is right.

Storey: Desalting it.

Lopez: Yes. And then putting the desalted water back into the Colorado River.

Storey: I gather that project's now been mothballed because there's been such a good supply of water.

Lopez: Well, and that was the intent all along, that we would only use it, and to the extent that we would use it, depending upon the salinity in the Colorado River. If the salinity went down, then we didn't have to use it. So my guess is that it'll be used intermittently, depending upon the vagaries of the weather.

Storey: Tell me about Mr. Lundberg.

Ed Lundberg

Lopez: Well, Ed Lundberg was an old-time construction man for the Bureau of Reclamation. He had been in construction his entire career. In fact, he did some of the initial surveys at Hungry Horse. He had worked as the assistant project manager

at Navajo Dam. And then they moved him into Montana and North Dakota, and he was the Construction engineer on several projects up there. When the regional director in the Lower Colorado Region retired, he was brought down there, and had been there *about* four years when I went down there.

He was a very kind man, and by that I mean that he never harbored any grudges and he wasn't one of these mean people we see occasionally who like to get their way by undermining everyone. He just simply was very mellow, believed in developing people, letting them do their work, gave them very general guidelines and then just sat back and let them do their job. So he was a very pleasant man to work with. You had the feeling that he trusted you and that you could go ahead and do your job.

Storey: This was the beginning of the environmental movement, of course. How did he come out on those kinds of issues?

Lopez: Well, he had difficulty with them, as most old construction people did, because they interfered with what he saw was his main mission, which was to get the project completed as quickly and as economically as you possibly could, and on *both* those counts, the environmental issues interfered with it.

"*Every* project since the beginning of the environmental movement has taken *much*, *much* longer to get done, and the costs have risen tremendously. . . ."

Every project since the beginning of the environmental movement has taken *much*, *much* longer to get done, and the costs have risen tremendously. I think that we have to be *concerned* with that regardless of how we feel about the environment, because things are costing *much* more than they should, for two reasons. One is that you have to mitigate for environmental losses, and many of those mitigations are very, very expensive and I think of doubtful value.

But the other is that the *process* from inception to completion of a project has been increased so much. There are tremendous costs associated with delaying projects, *inflation* and all sorts of things. And so I feel that we need to find some way to shorten the amount of time between the initiation of a project and its completion, because *no* project that lasts ten to twenty years from inception to completion is going to get completed for whatever your original estimate was, just because of inflation. I think something needs to be done to shorten that up. We're paying a tremendous fee, I think, for the protection of the environment. I have no objection at all to money being spent that does indeed protect the environment, but I think there's an *awful* lot of money being spent and just churning that is *not* well spent. A tremendous number of lawyers have become very rich in the process, and I don't think that lawyers necessarily improve the environment.

Storey: Now, when you went there, I believe, Mr. Lundberg had [Phil] ~~Ken~~ Sharp there.

Lopez: That's right.

Storey: Could you tell me about Mr. Sharp?

Phil Sharp and Environmental Issues in the Lower Colorado Region

Lopez: Yeah. [Phil] ~~Ken~~ is an extremely capable negotiator. He had a difficult job, because he was the environmental officer in an organization which is primarily composed of engineers. But [Phil] ~~Ken~~ was able to convince engineers of the importance of preserving the environment, of planning for it, of being sensitive to it.

He was also, I think, very instrumental in getting *some* of the environmentalists to back off of the idea that *all* projects are destructive to the environment. For example, over the years salt cedar[9] has taken over many of the water courses in the Lower Colorado River. Well, *before* [Phil] ~~Ken~~ got into his job, any time you even *talked* about clearing the salt cedar to improve the water courses so that in, say, flood times you wouldn't have the extent of flooding, you just simply couldn't even talk to an environmentalist about it because he was adamantly opposed to it. He got the University of Arizona to study the salt cedar as it relates to habitat and found out

9. Also known as Tamarisk (Tamaricaceae: *Tamarix ramosissima Deneb*), salt cedar is a non-native intruder.

that it provides virtually no habitat. It's an exotic species. Our wildlife doesn't use it.

Storey: Salt cedar is what I call tamarisk, I think.

Lopez: That's correct. That is correct, yeah. It was imported as an ornamental. It's now everywhere. They also found that it had no food value. So truthfully, the thing really had no environmental value. But up until that time, you could not talk to an environmentalist about clearing salt cedar.

Finally, when I was down there, towards the end we were able to convince them that this would *not* harm the environment in any way. In fact, it might benefit it, because when the floods came, it wouldn't get out so extensively and flood some areas that you wanted to protect.

This is just one of the things that he was able to do. He's a very good negotiator, could see both sides of an issue and find ways to accommodate them. I enjoyed working with him.

Storey: Once you were told by Mr. Lundberg that he wanted to recommend you for the regional director's job, did your responsibilities change?

Lopez: Not immediately, no. I still carried on as the assistant, which carries with it almost anything that your boss wants you to do. My primary responsibility was still trying to get that desalting plant authorized, which I did, and I would, on occasion, go to meetings for Ed, get to know the people in the region. That was really one of the

main things I did while I was down there in that one year is get to know the people who were the main actors in that region.

Every region, I think, is *populated* by a different set of characters, and *how* they get along dictates, to a large extent, how easy or difficult it is for you to get anything accomplished. And down there we were fortunate in that the men who were the state engineers or the water engineers for each of the Lower Basin states got along very well. They understood each other, they knew each other. They disagreed very frequently, but they were never *vicious* about their disagreements. They just simply disagreed. But they were able to work together very effectively, and that made the job of the Bureau a lot easier. Wes Steiner, Holbert, Paff, all the people that were responsible for, I guess, getting agreement first on the management of the Colorado River, the man-aging of the salinity, whether or not we were ever going to get a desalting plant built or what the solutions were, were all in that group, and they were fortunately, as I say, very good to work with. We disagreed from time to time, but they were always honest disagreements and we were able to ultimately proceed and get things done.

Storey: I would suspect, or expect maybe, that one of the themes down there is always who's going to get what water.

Lopez: Oh, yes, and there will always be.

Storey: California always wants a big–

Lower Colorado River Basin Water Issues

Lopez: *Big* chunk, and they need it. From the standpoint of need, they need it as much as anybody. Arizona has been kind of the Johnny-come-lately. It wasn't until the CAP went in that they were in *any* position to accept their allocation from the river. So as a consequence, *all* the years that they were not able to get the CAP on line, California took their share of the water. *Nevada*, on the other hand, when they were allocated the water, couldn't see any way in the world in which they could possibly use 300,000 acre-feet, and now that the Las Vegas area has *exploded*, they're *woefully* lacking in water. You know, the dynamics have changed, but the thing that hasn't changed is, there's no more water in the river. And so there will always be a struggle between them.

Storey: And you're in the middle of that.

Lopez: Yes, the Bureau *is* in the middle of it, because we're the water managers.

Storey: How did that play out in terms of the regional office down there?

The Regional Office's Job Is to Deliver Water in Accordance with the Allocations in the Colorado River Compact

Lopez: Well, the regional office can't reallocate water. All we can do is to attempt to allocate it in the way that the compact is written, because that's law. We can't reallocate water. We can listen, we can be sympathetic, but there is absolutely *no way* which we, the Bureau, can change the allocation of the water.

We can *improve* its delivery so that each of the states *gets* it when they need it. That we can do. But there are also some other things we can do that are a little bit more subtle, but they're not as easy to do, and that is, we can slightly alter the flood release criteria to attempt to keep more water in the reservoirs. But when you do that, you run afoul of the Corps of Engineers, who ultimately has the final say-so on flood control. Every reservoir has a rule, a reservoir rule, that you release when the water gets to a particular point in a particular time of the year.

We Need Better Tools to Predict the Colorado River's Flow

I don't know what we are doing *now* to attempt to predict precis and flood flows, but we need a much better way of being able to tell, say, in January whether this is going to be a wet year or a dry year. If we think it's going to be a wet year, we can change the reservoir regulations, the reservoir rules, to accommodate that. But if we think it's going to be a *dry* year, we can hold more water back, instead of releasing it, on the expectation that we're not going to get the high March and April flows that you would get in, say, a *normal* year, and I think that needs to be

done. I think it's one of the most critical ways in which we can *improve* the water supply in the river, because sometimes you release water in anticipation of *normal* precis and it doesn't happen, and you've released water which you could have held.

So I think that's one area that, if it isn't being done, it really needs to be done, and I think our tools for doing it have improved quite a bit in the last twenty years. We now have satellites that give us weather data way in advance. I think we understand the influence of ocean currents on the atmosphere better than we did. We need to be able to tell in January whether we're headed for a wet year or a dry year.

Storey: And then you can manage the river better.

"I also think we need to integrate the management of the Upper and the Lower [Basins]. Tough job, but I think it ought to be one region, . . ."

Lopez: Then you can manage the river better. I also think we need to integrate the management of the Upper and the Lower [Basins]. Tough job, but I think it ought to be one region, and I don't care where you put the regional office. Put it in the middle of the river on a raft if that's necessary, but get the two offices into one so that the whole river can be managed as one river basin, which it is. It is now managed as two river basins, and that's bad.

Storey: Do you remember anything, other than the salinity issue, that came up while you were assistant regional director?

Central Arizona Project and Orme Dam

Lopez: No, while I was assistant regional director– well, that was the *main* issue that came up. We were just getting started on the Central Arizona Project, and it was right *after* I became regional director that we started having our public hearings on the project, and the most contentious of all was Orme Dam, which was to be the reregulating dam for the Central Arizona Project. It was going to be in the Indian reservation just above Phoenix. The Bureau felt, and I think they were correct, that Orme Dam would have been a tremendous *boon* to the Indians, because it would have given them a business that they could have managed, and they could have, I think, gotten a lot of tribal revenue. But unfortunately, they became convinced otherwise, primarily by, I think, a group of perhaps well-meaning, but ill-informed people in the area who kept advising them that they didn't want to have a dam on their reservation. And so Orme Dam eventually was discarded.

"The Bureau people . . . in Phoenix . . . had become so *convinced* that Orme Dam was the *only way* to regulate the CAP that they simply could *not* see any alternatives. . . ."

The Bureau people at that time, the ones that were there in Phoenix, had been so involved with project planning and had become so

convinced that Orme Dam was the *only way* to regulate the CAP that they simply could *not* see any alternatives. Whenever we in the regional office would ask them to look at other alternatives, they would always come back and tell us there *weren't* any other alternatives.

New Waddell Dam

Well, after Orme Dam got shot down, another alternative did develop, which was about as good as Orme Dam, and that's New Melones, just a little [upstream of] ~~before you got to~~ where Orme Dam was supposed to be.

Storey: New Melones? Isn't New Melones in California?

Lopez: No, I'm sorry. That came up because I remember New Melones. No, it's the–I can't remember the name of it now. There was a small dam there.[10] It was used by one of the irrigation districts, and they increased the size of it and made it a regulating reservoir. I can't remember the name of it now. It slipped my mind.

Storey: I don't happen to know that one, either.

10. New Waddell Dam on the Agua Fria River is north and west of downtown Phoenix. The site for Orme Dam was east of Phoenix. New Waddell replaced Waddell Dam, and it uses a pumping plant which raises water from the main aqueduct of the Central Arizona Project up into New Lake Pleasant behind the dam.

During his oral history interviews with Reclamation Larry Morton talked about this project and the Maricopa Water District which owned the original dam.

Lopez: But that one came up. It was New [Waddell,] ~~something,~~ and it became the reregulating dam for the CAP.

Storey: What's a reregulating dam? Or maybe I should ask you a different question. Maybe I should ask you how water flows *through* the Central Arizona Project.

Function of New Waddell Dam and Lake Pleasant as a Reregulating Reservoir

Lopez: Okay, and I'll answer the question. The water's taken out at Parker Dam through the Buckskin Pumping Plant and is raised out of the reservoir, put into a canal, and regularly as the head drops there's a relift station. It's pumped back up again and put into a canal. It makes a loop around Phoenix and then goes on down to Tucson. The amount of water you can take is limited by the size of the pumps and by the size of the canal.

END OF SIDE 2, TAPE 1. FEBRUARY 23, 1996.
BEGIN SIDE 1, TAPE 2. FEBRUARY 23, 1996.

Storey: This is tape two of an interview by Brit Storey with Manuel Lopez on February 23, 1996.

The size of the pumps and the size of the canal limits the amount of water.

Lopez: That you can take daily.

Storey: But at the other end–

Lopez: It's being used in a non-regular way–that is, that sometimes you use more water than others and some seasons you use more water than others. So in order to be able to *use* the water most efficiently where it's needed, you need to run the pumps on [a] more or less a continuous basis and then store the water that you're not going to use that particular day in this reregulating reservoir. Then when you need it, you bring it back down and you use it.

Reregulating Reservoir Permits a More Flexible Project

Also, there may be periods when the river has more water in it than others, like in a flood time, and you can then fill up your reregulating reservoir and in a period of drought be able to have some water to use that you would not otherwise have if you didn't have the reregulating reservoir. So it makes the project a lot more feasible, it improves its operational flexibility tremendously, and it provides more water ultimately.

Storey: You don't end up with a lot of water one day that you can't use.

Lopez: That's right.

Storey: That you have to waste somehow.

Recharging Groundwater Aquifers

Lopez: Yeah, which you don't want to ever do out there in central Arizona, because they are very, very

short of water. You wouldn't waste it anyway. What you would probably do now is put it into recharge basins and recharge the groundwater aquifer. See, that's another way of taking care of the excess water. But the water need is so great on the surface that you only want to do that whenever you have surplus water.

Storey: Anyway, you went through about a year.

Lopez: A year.

Storey: As assistant regional director.

Lopez: Actually, it was a little over a year, because I went down there in July and I wasn't appointed as the regional director until a year past that, until October. When Ed Lundberg retired, which he did about June, I was made the acting regional director, and then my final appointment came through in October.

Storey: Who was this that made you the acting regional director then?

Gil Stamm Selected Lopez as Regional Director

Lopez: Gil Stamm was the Commissioner, and he was the one that made me the acting regional director and also eventually appointed me as the regional director.

"I had *no* experience as a field man. I'd always been an office man. . . ."

I think the reason it took that long a period was that no one really *knew* me in the field. I'd been there a year, but they didn't really know me. I had *no* experience as a field man. I'd always been an office man. And so I think it took a long while for people to kind of become comfortable with the idea of someone like me out there. And I got a constant barrage of calls, as you might imagine, from Wes Steiner and Myron Holbert and Don Paff and all the others, wanting to know, in a subtle way, whether I would favor them in any disputes on the river, and that is a *loaded* question, because the only way you can answer that is, "No. I'm going to do the very best job I can in following Federal law. I am a Federal man. I'm not a state man."

Storey: These were the state engineers?

Lopez: These were the state engineers. I got the same call from each of them at different times. I'm sure they didn't all plan it that way. It just happened to be that they were curious, "What are you going to do about *my* problem?" And like I say, that's a loaded question. The only way you can possibly answer that, in the position that I was in, was to say, "I'm not going to favor you. I'm going to administer Federal law as carefully as I possibly can. I will be as fair as I can be, but I will not favor you."

Storey: Was there anything else going on in that period?

Lopez: We were also working on the second stage of the Southern Nevada Water Project.[11] There had been one stage built, and we were in the process of just getting started for the other one. We got started and just about finished it while I was down there.

Storey: This is the water supply for Las Vegas, I believe.

Lopez: Correct, yes. There was a single aqueduct–actually, a pipeline–that went in from Lake Mead to Las Vegas. That was supposed to last thirty years, and it lasted something like ten. And so we were then in the process of planning and getting bids for and getting construction started on the second stage of the Southern Nevada Water Project, which, incidentally, is now also totally used up and they're trying to find more water.

Storey: It can't produce as much water as they need.

Las Vegas Has to Find More Water

Lopez: No. That's right.

Storey: You don't mean that they're having to abandon it.

Lopez: Oh, no, not at all. What they are going to have to do is to find a way of reusing their sewage. They use it, to a large extent, now for golf courses and things of that sort, but they're going

11. This project has been renamed the Robert B. Griffith Water Project.

to have to use it, I think, as part of their domestic water supply.

See, one of the problems with Las Vegas and many of these really hot desert areas is that we keep trying to make them look like Iowa, and they're not like Iowa. If you go down to Las Vegas, that's one of the first things that impresses you is, *"My God, they're using a lot of water."* They're irrigating a lot of stuff to make it green. Down in that environment, that's, I don't think, the right use of water. It's too precious.

Storey: Let me ask a question I tried to ask a few moments ago differently. You mentioned earlier that the regional director's position is a very political one.

Lopez: Yes.

Storey: Were there any political things you were having, that you were *noticing* were changing for you as you were in your acting period?

Political Aspects of the Job

Lopez: I guess I don't understand the question, because I knew, of course, that the position of the regional director is, like I say, a political one. A friend of mine gave me a compliment one day. He said, "You are a political engineer." At first I didn't quite understand what he meant, but he explained that a political engineer is one who can somehow or other meld politics and

engineering together, and they don't always go together.

That is the job of the regional director. He's a political engineer. He has to carry out the engineering demands of his job, but in a political way. There are various ways in which you can do that. Being a very good listener is probably *the* best way, trying to *hear* what people are telling you, understand what their concerns are, and sometimes you can accommodate their concerns without *altering* the engineering aspects or without altering your responsibility, still being able to carry out your Federal responsibility. Being able to deliver when they need it, trying to keep them from getting too nervous about other users taking their water, that kind of thing.

"There's a tremendous paranoia about water in the southern Colorado [River] region, and it's well founded. More water has been allocated than there is available . . ."

There's a tremendous paranoia about water in the southern Colorado [River] region, and it's well founded. More water has been allocated than there is available, and so as a consequence, anyone who is in the water business is *constantly* concerned about there not being enough, and one of the ways in which you may not get enough is if somebody gets too much that they shouldn't get. And so you *constantly* have to be assuring people that, yes, you are *indeed* measuring water carefully to everybody to be sure that no one is getting more than they should,

that you *never* over deliver, but that you do deliver when they need it, and that requires, frequently, lead time. You have to understand what their needs are going to be. They have to feel free to be able to call you and say, "Look, I screwed up. I need 20,000 more acre feet than I thought I was going to need this coming month. Can I *borrow* it, and the next month or the next two or three months I'll use less." And so there has to be some trust involved that indeed you're going to be able to do these sorts of things.

"You have to establish credibility. That's *very*, *very* important in that job. . . ."

It's not highly technical, but you do have to be able to understand the needs of the people and also somehow or other get the point across that you are going to do what you say you're going to do when you're going to do it. You have to establish credibility. That's *very*, *very* important in that job. They have to believe that what you tell them is true, and so you have to tell them what is true. That sometimes is an unpleasant task, but you *have* to tell them what is true.

Storey: Let me try again. That was good, but that isn't quite what I was talking about.

Lopez: Tell me what you're asking specifically.

Political Contacts

Storey: Did you have to, for instance, field calls from congressmen and senators and governors and

things who might be approached by Reclamation to say, "Is this guy okay?"

Lopez: I never had a call from the governors or the senators or the representatives themselves. I *did* have calls from their staff, yes, I did. In essence, the water engineers were calling for the governors, the Wes Steiners and Myron Holberts and Don Paffs. But I did have calls from [Congressman John] Rhodes' staff. Rhodes was probably one of the fathers of the Central Arizona Project, and he was a long-standing congressman down there.

Storey: This is R-H-O-D-E-S?

Congressman John Rhodes

Lopez: R-H-O-D-E-S, yes, John Rhodes.

Storey: From?

Lopez: From Arizona. He was, I think, the only one that I remember who directly approached me, trying to find out what my views were and how did I feel about the Central Arizona Project, did I think we ought to take the fast route or the short route, and those kinds of questions.

I eventually got to know John Rhodes myself and found him to be a very, very knowledgeable *and* pretty fair congressman. Many congressmen think that when they say jump, all you have to do is to answer, "How high?" But John Rhodes could, I think, *handle* differences. He wanted the Central Arizona

Project built in four years, for example, and that was totally impossible. So I had to try to let him understand that we were limited not only by money, which is hard to get out of Congress, but also by the magnitude of the job. If we rushed into it too much, we might screw it up and it would cost a lot more, and I think John understood that.

Exploring Geothermal Power in California

Probably the most difficult thing I ever had to do, though, in that area was, we had a program exploring and testing to see if we couldn't desalt–well, not desalt, but see if we couldn't make *power* out of the hot waters that underlie the Mohave Valley in California, the Coachella Valley and that whole area, the Imperial Valley, really, that covers that whole area.

Storey: This is geothermal?

Lopez: Geothermal power. We carried out a test for about three years, taking hot waters and testing them to see what the volume was and what the temperature was, and at the end of that time, I concluded–and we weren't unanimous about that. Some of my people didn't agree with me. But I concluded that there was no power potential in it and that we should stop the test. The test was scheduled to go for about seven or eight years. I could see no reason spending more money doing this.

So I had to tell the congressman that we were stopping it. In fact, there were two

congressmen in this area. I went to Washington specifically for that, and I really have to admit I really wasn't looking forward to it, because when a congressman works to get you a project and then you have to come back and tell him that it isn't working, you're wasting some of his brownie points that he used up to get it. And so I did. I went to Washington, and I told them each individually why I felt that we ought to stop and what the technical reasons were and showed them the results of our studies and so forth. And it was very interesting. In both cases, they both said, "You know, that's the *first* time that a bureaucrat has come to me and said, 'Don't spend any more money on me.' I appreciate you're telling me that. I'm going to have to go back and tell my people. They're not going to like it. But I appreciate your telling me." And so we stopped it.

Storey: Do you remember their names?

Lopez: Oh, golly. I knew you were going to ask me that question, and I can't remember their names right now. I'm lousy with names.

Storey: But they were the Representatives from that area.

"I think that as an administrator, you have a responsibility to abort projects that don't work just as much as you have a responsibility to complete projects that do. . . ."

Lopez: They were the two Representatives of the people in the Imperial Valley, one that represented the

southern part and a woman represented the northern part, and I was able to convince them both that it wasn't in *our* best interest and it wasn't in their best interest. A project that goes *nowhere* doesn't serve anybody's interest. I think that as an administrator, you have a responsibility to abort projects that don't work just as much as you have a responsibility to complete projects that do.

Storey: I presume you got to know Gill Stamm fairly well.

Lopez: I did.

Storey: Tell me about Gil Stamm.

Floyd Dominy and Gil Stamm as Commissioner

Lopez: Gil was a contrast to some of the commissioners before him. Dominy, of course, was *flamboyant* as hell and just was–you couldn't be in the room with Dominy and not know he was there. He just *dominated*. Gil was a much quieter man. He had been in the Bureau all his life, he knew everybody in the Bureau, and he did things in a much different sort of way. I never heard him *threaten* anybody or get angry or anything. He was just very persistent, and there were certain things he liked to do and liked to do them in a particular order. And so it was quite a contrast to the way Dominy operated.

Gil actually wasn't Commissioner for very long, because when Jimmy Carter came in, he

was one of the casualties of that change. But when he was in there, he was, I thought, a very quietly efficient Commissioner.

It was interesting that when he appointed me, we'd been talking over the phone from time to time, and he *never* gave me any hints whether he was going to appoint me or not. I know that he must have been having some difficulties, because otherwise he would have appointed me or somebody else sooner. The day that he called, I thanked him for it. I said that was great. He said, "Now, I want you to come into Washington next week, and we'll talk about it."

I said, "Well, gee, I can't."

He said, "Why not?"

Trip down the Colorado River Interferes with Commissioner Stamm's Desire to Have Lopez in Washington, D.C.

I said, "I'm going on this trip down the Colorado River." That was the one time when I could detect in his voice that he was not too happy that I had scheduled this trip just at the time he wanted me to come in, but we had scheduled this trip for a long time ahead of time. No one had ever been down the river since Glen Canyon got closed, and we didn't really know what was happening down the river.

Storey: You mean administrators hadn't been?

Looking at Administrative Issues in the Grand Canyon on a River Trip

Lopez: Administrators, yeah, to understand what was happening along the river, and some things were happening that [were] ~~was~~ not good. The water, now being so clean, was beginning to erode many of the beaches that had been built up along the river, and so there was some concern, particularly by the river runners, that they would have no places to camp overnight because it was eroding the river.

Feral Burros in the Grand Canyon

We also discovered that there was a tremendous environmental damage being done by the feral burros that had invaded the Grand Canyon. They were crowding out the desert big horn *and* the deer. So there [was] ~~were~~ some, I think, useful information that came out of it that eventually led to programs like the Burro Eradication Program that took such a long time because of Wild Horse Annie or whatever her name was that kept opposing it. And there's been a lot of concern about the beaches. They continue to erode, and there's not much you can do about that.

Storey: Why don't you tell me more about where this trip came from and how it was set up and who was there and all that kind of thing.

Why a Study Trip Through the Grand Canyon Occurred

Lopez: Well, we set the trip up–[that is] ~~and this was~~ Phil Sharp decided to set it up, or actually proposed it to me. He said, "Look, we don't know what's happening between Glen Canyon and Hoover Dam on an official basis. We've heard reports, but we *really* need to know. We need to get the people from the Bureau of Land Management, the National Park Service, the Fish and Wildlife, representatives from each of the states, Arizona and Utah and Nevada, and the ~~upper/lower region commissioners or~~ upper/lower regional directors to assess what the problems are and then see if there's some way we can improve it by the way we operate the reservoirs."

And so that's who we got together. We had the regional directors of the Fish and Wildlife Service, the National Park Service, the Bureau of Land Management, and the three representatives of the states all on this one raft. And so nights, after we'd get through our supper or something, we would have bull sessions that sometimes extended way into the hours of the night as to what could be done about it.

It was one of those subtle things you do sometimes that pays off in unexpected ways. It allowed *us*, me particularly, to be on a first-name basis with some of the people who were the primary *opponents* of what we were doing in the Lower Colorado River Basin, and that meant that we could, I think, discuss things a little more openly. I doubt if it changed the attitudes of any of us, but at least it allowed us to communicate a little better.

Storey: And how long were you on the trip?

Lopez: I think six days. We put in at Lee Ferry and came out below Lava Falls at about Separation Canyon, which is where two of the men from [John Wesley] Powell's expedition took off [on] the first expedition he went down there. I took Powell's book with me on this trip, and I was amazed at his powers of observation and how closely he could describe the things. You could just read them as you were floating past them. It was a very good trip.

Storey: I'm told you went past the Marble Canyon dam site.

Marble Canyon Dam Site

Lopez: Yes, we did.

Storey: Do you remember your reactions?

Lopez: Oh, yeah. My reaction was, it probably was a good thing we didn't put it in. It is a beautiful, beautiful place, and it is so unique that I think we can afford to give up some water for the uniqueness of the place. I was really impressed. That was the first time I had floated down the canyon. I had hiked into the canyon before and had camped down there, but I had never floated down the canyon. I was impressed with how absolutely uniquely beautiful it is, and I think it's one of those things that we have to preserve. I didn't regret that we didn't put in Marble Canyon at all.

Storey: Marble Canyon is the one above the Grand Canyon National Park, is that right?

Lopez: No, it's below.

Storey: It's the one below.

Lopez: And it would backwater *into* the Grand Canyon.

Storey: Into the monument, I think, at that time.

Lopez: Right. Now it's part of the canyon.

Storey: Now it's part of the park, yeah.

Lopez: Right. There was really no reason why not to make the monument part of the park. It's just as beautiful.

Storey: We were talking about Gil Stamm when we started this. Anything else about him?

Lopez: No. Like I say, my dealings with him were always very cordial. Gil, again, was one of those sorts of people that didn't micromanage. He told you in general what his philosophies were, or you knew what they were, and you very rarely got any criticism from him or direction on what you should do this or you should do that.

Storey: I've been struck by the photographs of him. He seems to be holding his head way back. Did you ever notice anything about that?

Lopez: No, I didn't. That's interesting. I knew him for a long while, and I never did notice that.

Storey: Did you know Ellis Armstrong, also?

Ellis Armstrong as Commissioner

Lopez: I knew Ellis, not as well as Gil.

Storey: What was he like?

Lopez: Oh, Ellis was a different type of a character. Ellis was very blustery and *delighted* in micromanaging. I don't know if you've ever been to his place or not, but he has two desks, one on opposite sides of the room, and that was characteristic of him. He wanted every piece of paper that went out to go over his desk, and as a consequence, he might have even let slip some of the policy issues by that he should have been paying attention to.

". . . Ellis is one of those types of people who *has* to be involved in everything. . . ."

I think Ellis is one of those types of people who *has* to be involved in everything. He *cannot* let someone else make a decision. *He* has to make it. And Gil was not that way. Gil was more of an easygoing person, who was *firm* in what he believed in, but then he didn't micromanage. And I suspect that if you didn't do what he wanted you to do, he'd get rid of you, because he was pretty forceful. But he just let you kind of–you do your job, I'll do mine.

Storey: And you were there, I believe, about four years, is that right?

Lopez: I was there four years. I was in Boulder City five years, but four years as regional director, a little less than four years as regional director.

Storey: So about '74 to '79.

Lopez: Correct.

Storey: In Boulder City.

Lopez: In Boulder City.

Storey: Well, I would like to explore that, but we've run out of time again. So I'd like to ask you once again if you're willing for the information on these tapes and the resulting transcripts to be used by researchers.

Lopez: Certainly.

Storey: Great. Thank you very much.

END SIDE 1, TAPE 2. FEBRUARY 23, 1996
BEGIN SIDE 1, TAPE 1. MARCH 7, 1996.

Storey: This is tape one of an interview by Brit Allan Storey with Manuel Lopez on March the 7th, 1996, at his home in Littleton, Colorado, at about nine o'clock in the morning.

You mentioned New Melones last time, and now you've just told me that you meant New Waddell down on the CAP, so let's just put that in the record.

Lopez: That's the reregulating reservoir that took the place of Orme Dam.

Planning for the Central Arizona Project (CAP)

Storey: I think it would be a good place for us to start and talk about planning for CAP and where it was done and how it was done and how you were involved and that kind of thing.

Cliff Pugh in the Arizona Projects Office

Lopez: Okay. The major part of the planning for CAP was done by the Arizona Projects Office, which was in Phoenix, Arizona, and it was run by a fellow called Cliff Pugh, who really spent virtually *all* of his forty-plus years in the Bureau down in the Arizona Projects Office trying to get the CAP off the ground. Cliff knew *every* mover and shaker in Arizona, was on intimate terms with the delegation, and really was, I suppose you could say, the *father* of the CAP as far as the Bureau of Reclamation was concerned. Everyone deferred to him because he'd been down there so long and knew everybody.

"There was *never* a complete project report on the CAP before it was authorized, so no one *really* knew the final alignment . . . It was a very, very incompletely planned project . . ."

Unfortunately, that was not 100 percent good, because Cliff did an awful lot of his planning on backs of envelopes. There was *never* a complete project report on the CAP before it was authorized, so no one *really* knew

the final alignment, no one knew the total cost of it, no one knew who the customers were going to be or how much we were going to charge them.

". . . it caused a great deal of friction between the regional directors that preceded me and Cliff Pugh . . ."

It was a very, very incompletely planned project, *very* incompletely planned, and it caused a great deal of friction between the regional directors that preceded me and Cliff Pugh, because they kept pushing him, wanting him to provide them with a complete planning report.

The regional director is responsible, after all, for the expenditure of the funds that would ultimately be appropriated for, and it's very dangerous to start a project when you have no idea of its final alignment, who its *customers* are going to be, how much you're going to charge for it, its final cost. But none of that was [done] ~~known~~ when the CAP was authorized, because there was no final project report, and no final project report, to my knowledge, has been written. It may have been written after I left, but it certainly wasn't written while I was there.

One of the regional directors that preceded me, West, Arleigh West.

Storey: Arleigh West. And that's A-R-L-E-I-G-H, is it?

Arleigh West

Lopez: Yes. I think actually lost his job because he kept pushing Cliff Pugh to get some information to him that he needed. It finally got to the point where Arleigh just said, "Either you get rid of Cliff Pugh or I go," and the consequence was that Arleigh went. They relieved him of his job as regional director, transferred him to Washington, gave him a desk and *nothing* to do, and after a couple-, three weeks he just said the hell with it and left, which was, of course, the objective. So Cliff politically was extremely powerful, extremely powerful.

Storey: Is he alive?

Lopez: I don't know. In about 1976, he retired, and at that time he was about, oh, I think, sixty-seven, sixty-eight. So if he is, he's a fairly old man now. But it's just that he knew so many people that whenever anyone *threatened* him, he could call in all of his chits and get something done.

Cliff Pugh Was Well Connected to the Congressional Delegation

Storey: And, of course, that state would be Carl Hayden's state.

Lopez: Carl Hayden, John Rhodes.

Storey: Barry Goldwater.

Lopez: Right, old-timers who had a lot of muscle in the Senate and in the House, and Cliff was an intimate of all of them. Ed Lundberg handled it

by just kind of leaving him alone, because you couldn't challenge him.

When I took over, I *couldn't* leave him alone because we were beginning to spend *big* bucks and we needed more information than what was already available.

Lopez: So you were *past* the authorization stage at this point?

Lopez: Oh, yes.

Storey: You were in the construction stage?

First CAP Contracts Awarded

Lopez: Yes. We were starting the construction stage. The first contracts were awarded while I was regional director. And so what I had to do was to try to get to the point where the Arizona Projects Office, [which] ~~who~~ by this time had become the Central Arizona Projects Office, was more responsive to the needs we had, and so I started cultivating the very same sources that Cliff had cultivated.

Began Cultivating the Same People Cliff Pugh Had Cultivated

I got to the point where it was necessary, if anybody wanted any information on CAP, to come through the regional office, and by eventually *weaning* them away from this dependency they had on Cliff Pugh–because it was kind of a mutual dependency. Anytime that

any politician in [Arizona] ~~California~~ wanted to know anything about the CAP, they asked Cliff, and, of course, Cliff always provided it. We *slowly* were able to change it so that whenever they wanted anything, they had to come to the regional office, and ultimately, then, we were *able* to get work done that needed to be done before we could start getting construction underway.

Cliff Pugh Replaced by Dick Shunick

Cliff eventually retired while I was down there, and Dick Shunick took over. Dick was ~~a~~ much more [of a] team player than Cliff had been, and from then on we had no problems in getting the work done in a way that it should have been done in the beginning.

Storey: Why did he retire?

The Nature of the Office Changed from Planning to Construction

Lopez: Well, he had about forty-four years of service, and I think he felt that he had done his job, and he had. Cliff was extremely competent in putting together the project. It's just that when we got into the construction phase of it, he had spent his entire career in one office, had done *no* construction, and simply didn't understand what the *requirements* for construction were. They're quite different than planning. You're now talking about large money. We were having money appropriated to us for construction at around $200 million a year, and that's a *lot* of

money if you don't have good control over it. So I think, in essence, he had done his job, and finally recognized it, and moved on.

Storey: And he'd been there a long time.

Lopez: And he'd been there over forty years.

Storey: Did he have an assistant?

Lopez: The assistant was Dick Shunick.

Storey: So Mr. Shunick moved up.

Lopez: Mr. Shunick moved up.

Storey: I've been asked to go down and interview another man who's been there quite a long time. I believe his name is Moore.[12]

Lopez: Moore?

Storey: Lewis Moore, maybe.

Lopez: I don't remember him.

Storey: He's now the assistant area manager.

Lopez: Dick had spent a lot of time in Washington, D.C., and was a very capable administrator, which is what was needed.

12. Larry D. Morton, whose extensive oral history interviews on the Phoenix office are part of Reclamation's collections.

Storey: And when you have that kind of *broad* experience, you also understand why other people need things from you, I think.

Lopez: Sure. And that was part of the problem with Cliff, is that he spent his whole career in that one small office and pretty much independently doing whatever he wanted to do.

Storey: Tell me more about the political contacts you had over CAP. Of course, you know, this was, what, Arizona's chance to get its entitlement to the Colorado River.

CAP and *Arizona v. California*

Lopez: The last chance, yeah. They had been involved, as you know, in a very, very long and acrimonious suit, which was finally settled by the Supreme Court of the United States, *Arizona v. California*[. It was] ~~, by~~ one of the most famous of *all* the water litigations in the United States.

The gist of it was that California had been *using up*, in essence, Arizona's share of the water, because Arizona didn't have the facilities for taking the water and using it. Arizona sued California to get their share, according to the Colorado River Compact. According to the Colorado River Compact, they were allocated 2.8 million acre-feet of water a year. California was allocated 4.4, and Nevada point-3–300,000 acre feet. Arizona had been able to use very little of it, because they simply did not have the facilities.

When the Supreme Court finally agreed with Arizona, ~~California,~~ it opened the way then for the project to be authorized, for the Central Arizona Project to be authorized. But Arizona had to pay their pound of flesh to California, because in the act that authorizes CAP, there is a provision subordinating Arizona's *right* to the water to California. What that means is that if there's a shortage in the river, the shortage comes out of Arizona's share *first before* California has to give any of it up.

There's a feeling–this is opinion on my part–among the Arizonians that that part *still* is going to be litigated *again*, and their basis for this feeling is that *most* of the water that California takes is used for agriculture. *Most* of the water that Arizona takes is used for municipal and industrial, for people. And that if it comes to a showdown between people and farms, that the needs of people will prevail. Now, that's not an articulated premise. No one admits to it. But that, I think, is their reason for finally saying, "Okay, we accept, and we're going to go ahead and build an aqueduct that will take our full entitlement." And I think what they internally were saying, "And we'll worry about that part, that subordination part, later on." I think it's inevitable that sooner or later *that will* come to a head.

Storey: Now, am I correct in thinking that Arizona had never really signed the Colorado River Compact?[13]

Lopez: They didn't sign it until after the Supreme Court decision. Part of the problem was that Arizona *did not* believe that the water in the Gila River should be *counted* as part of their allocation, because the Gila River rises and falls almost entirely in Arizona.

Storey: It barely touches California for, what, maybe ten miles?

Lopez: It doesn't touch it at all, actually.

Storey: It doesn't?

Lopez: No. It empties right into the Arizona side of the Colorado. And so they felt that that water should be *excluded* from their allocation of Colorado River water, and the Supreme Court held otherwise, that the *total* flow in the river was from all tributaries.

Storey: Including the Gila?

Lopez: Including the Gila.

Storey: What kind of a problems did this cause you as regional director?

13. Arizona ratified the Colorado River Compact on February 24, 1944 and then it contracted with the Secretary of the Interior for its 2.8 million acre feet, and soon thereafter it entered into the lawsuit, *Arizona v. California*, over interpretation of the compact.

Lopez: Well, the fight was really over by the time I got down there. The decision had been made, the project had been authorized, and all of the political in-fighting was pretty well over. And because of the individuals involved, they had pretty well decided to go ahead and get on with building the project. Even the Californians recognized that the longer that was delayed, the more it would cost, and they didn't think that was too fair. So they went ahead and, I think, actively promoted appropriations to the project. There really was very little in-fighting over the project itself, but I think both California and Nevada were very adamant that, if there was any shortage in the river, it was to come out of Arizona's share, and I heard that reiterated many times.

Storey: I think I've heard from folks who worked down there, you know, you get more water in Hoover, behind Hoover in Lake Mead, than is really necessary for a full year's allocation, so California is constantly trying to get that water released to them. Did you run into anything like that?

Lopez: Oh, we had some discussions over how much water was released, but there is no *right* that California has to take water that's in storage. That's for future use. The only right they have is on how much water is flowing in the river in any given year, and if there is a surplus, then it can be used by those who have the facilities to use it. If the surplus exceeds what their facilities can use, then, of course, it goes on down to Mexico. If the surplus is less than what their total

facilities can use, then it needs to be allocated in proportion to their rights in the compact.

Nevada Needs to Find More Water

One of the problems that's coming up is that Nevada needs more than the 300,000 acre-feet that they're now currently entitled to, because when that was done, Las Vegas was kind of a desert outpost, and it's now a very, very large metropolitan area with a tremendous demand for water, partly because of their lifestyle, which is totally insane in a desert, but that's the way it is. There's an awful lot of adjustments that have to be made in the future in how people treat water in these desert states, tremendous.

Storey: You were mentioning that you began to work on the politicians as sort of a countermeasure to Mr. Pugh. Who were the politicians and what were they like?

Lopez: Well, John Rhodes was the primary one, and Barry Goldwater was the second. By the time I got there, Hayden had already left the Senate.

Developing a Working Relationship with Rhodes and Goldwater

Storey: Rhodes is R-H-O-D-E-S?

Lopez: R-H-O-D-E-S, John Rhodes. John was a very, very capable man, who had been representing that district of Arizona, I don't remember, but many years, maybe twenty years, so he had good seniority in the House. And, of course, Barry

Goldwater was not quite as active as John Rhodes in promoting the CAP, but he also carried a tremendous amount of weight. They were the two main characters in getting the CAP authorized, and in getting the appropriations, which is just as important, because with authorization, that's the kiss. You don't get any action until you get money.

Storey: What about California politicians? They would probably not look very favorably on this.

Lopez: Well, I think they had been convinced that that was the only honorable thing to do, that they had lost the fight, that the project was going to get built anyway, and so they did, they actually did support it.

Storey: Oh, okay. Who were they?

Lopez: Well, you asked me that question the other day, and I'm having–there were no–well, there was Brown from the Coachella area. I remember him. But I can't remember the other two that were involved in that area. We were still working with them, because we were doing some geothermal development work in the desert, and we also lined the Coachella Canal, which was a project that they had wanted for years. We were able to get *that* project started while I was down there and completed. So there were still some things being done by Reclamation in their districts. They hadn't just totally been excluded.

Storey: Well, you mentioned just in passing a few minutes ago Mexico, and, of course, we had a long-standing treaty obligation to deliver water to them. How did you relate to Mexican authorities.

Dealing with Mexico

Lopez: Well, I was lucky because I was bilingual, I am bilingual, and so I was able to get along very well with the Mexican authorities, and with Mr. Friedman, who was the Commissioner in the International Boundary Water Commission. We visited each other quite frequently, probably twice a year.

And I visited all of the area in Mexico that was affected by the Colorado River water. I got to know the people, and I wanted to understand what their concerns were, whether it was a frivolous concern over salinity or whether they really had a legitimate reason to complain. And it was both. Part of the problem down there, of course, was that they had brought in a large number of farmers, gave them very small plots of land, and not enough water to irrigate those plots of land, and the farmers were not able to exist on these very small plots. I think they were ten hectares, which is about twenty-five acres. And they didn't give them enough water that they could use water to flush out the salts. Their allocations were so small that they were having trouble raising crops with saline water. You can use saline water of that salinity, around 1,000 to 1,500 milligrams per liter, if you increase what they call the leaching fraction. You put enough

water on that you satisfy the demands of the crop, and then a little more to flush [salts] ~~soils~~ through the soil profile and out into the drain.

Storey: Flush salts out.

Lopez: Right, you flush the salts out. But because they had so many farmers and a limited amount of water, they allocated them an insufficient quantity to permit them to do this. So that was one of the problems. The water was more saline for them than it was for anyone in the United States.

Storey: Why?

Lopez: Simply because they were at the end of the line. That was the main reason. The people over in the Imperial Valley were using water that was approximately the same salinity, but they had put in a very extensive system of drains to *permit* them to use the water. And so they were able to use the water and get better yields than the people down below the border, where they did not have the drains.

How American Storage/Regulation Permits Mexico to Use Its Colorado River Allotment

But on the other side of the coin, Mexico historically had not been able to use even a portion of the total allocation they finally got with the '44 Mexican Water Treaty, because they have no way to store flood flows. It's too flat. They have no reservoir sites or anything. So if were it not for the fact that the United States is

able to impound water from high flows to low flows and regulate the flow to them in such a way that they can *use* it, they would not be able to use the million and a half acre-feet that they have. And they didn't pay anything for any of this extensive system of regulation that we have built on our side of the border. So they are benefitting from a tremendously large expenditure of funds that have been made on this side of the border that *allows* them to use the million and a half acre-feet a year. So I think they get something that they're not paying for anyway. That's always discarded by the Mexican authorities.

Storey: Discounted, not they don't think that matters.

Lopez: They just don't even consider it. It's not a subject for discussion.

Storey: What about the State Department? Has anyone ever gone to the State Department and said, "We need X in order to meet your treaty obligations?"

Lopez: Well, no, they haven't, because the reservoirs were, in large part, built *before* the treaty was signed; *or* if they were built afterwards, there was no provisions in them for extra storage for the treaty. So that although they get the benefit from it, they were *never* built with any treaty purposes in mind.

Now, that's something that's ultimately going to turn around and create some real problems for the United States, because the treaty allocation of one and a half million acre-

feet of water a year has an indeterminate source. No one knows where that water's coming from. Does it come from the Lower Basin allocation? Does it come from the Upper Basin allocation? Does it come from both basins, and if so, how do you divide it? Do you do it on the basis of historic flows? Do you do it on the basis of the compact? No one really knows. And up until now, that has not been an issue, because there's always been enough water in the river to meet all the needs, including those of the Mexican Water Treaty.[14]

That is not going to be the case when the CAP gets up and starts cranking full bore and we have a dry cycle, and the Colorado River has a history of dry cycles. So it's strictly a question of time. Sooner or later, that's going to be a problem, and no one is doing anything, to my knowledge, to try to get it resolved ahead of time and say, "Okay, now, if we have a shortage, this is how we're going to divide it." That just isn't being done, and so it's going to be another crisis situation. And one of the unfortunate things is, you can't manufacture water. I don't care how much money you throw at it, you *cannot* manufacture water. I think we're just postponing a *tremendously* large diplomatic problem.

Storey: What were you trying to do about the salinity issue?

14. The Mexican Water Treaty and Protocol was signed in Washington, D.C., in 1944 and proclaimed by the President in November of 1945.

Herbert Brownell's Task Force

Lopez: Well, I had been on Brownell's task force that was appointed by President [Richard] Nixon to attempt to find a solution to it.

Storey: Brownell?

Lopez: Yes, Herbert Brownell. He had been an ex-Secretary of State.

Storey: Was this when you were in the Office of Salinity?

Lopez: Yes, I was in the Office of Saline Water.

Storey: Saline Water.

Lopez: Right, stationed in Denver, and commuting between Denver and Washington virtually every week.

Storey: So you had been in on this issue even earlier?

Lopez: Oh, yeah. I had been in on it from the very beginning.

Storey: Tell me about it.

Lopez: Well, the task force was, as I say, set up by President Nixon to try to find a solution to it, and he appointed Herbert Brownell as the head of the task force. Brownell at that time was probably seventy years old, had had a tremendously prominent career as a lawyer and as a Secretary of State, so he was very knowledgeable.

He recruited people from each of the states, the seven basin states, each of the agencies that had an interest or could offer a solution, and for about, oh, I'd say six months, we kept struggling with this problem, and the problem was that you can't manufacture water. The people in the basin were absolutely adamant that the Mexican Water Treaty was a federal obligation. They had had no part in [setting up the treaty,] ~~reaching it,~~ and therefore they should not be expected to pay for it–pay for it in water. ~~, that~~ If the United States wanted to do something about it, the cost of it should be spread out so that the *entire* United States paid for it, not just the seven basin states. Now, if you can accept that, that says that you have to conserve the water supply of the seven basin states, that you can't use *their* water to pay Mexico. In other words, you can't just automatically deprive anybody of water so that Mexico can get their full share.

Salvaging Drainage from the Wellton-Mohawk Irrigation and Drainage District

That led, then, to trying to salvage the drainage from the Wellton-Mohawk District that was now being discarded, it wasn't being counted, and the only way you could salvage that was to build a desalting plant.

Yuma Desalting Plant

And that was the genesis of the Yuma Desalting Plant, which has been used intermittently since then, depending on river flows. And from the very beginning, that was understood, that you

would use that plant only in those times when the salinity was higher than what we had agreed to deliver to Mexico. Now, the plant had tremendous opposition from a lot of sources.

Storey: Was this when you were regional director? Before you were regional director?

Lopez: No, before I was regional director, while I was still on the task force. But ultimately they had to give up, because there was no other way to meet the needs of the treaty *without* taking water from the basin states. Those are the only two ways of doing it. You either desalt water and salvage [a] ~~that~~ portion [of what] ~~that~~ you were throwing away, and at the same time temper the salinity down to what it should be, or you use water from the basin states. Brownell, I think, hit probably the–

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Storey: You were saying that Brownell had figured out the only real solution that would work.

". . . if we get to the point where there's a shortage of water in the river, we've already established a precedent and we're not going to take water from the basin states to meet a federal treaty obligation. . . ."

Lopez: And what that tells me is that in the future, if we get to the point where there's a shortage of water in the river, we've already established a precedent and we're not going to take water from

the basin states to meet a federal treaty obligation. That's what we did in the salinity issue. So if that is then expanded to just meeting the quantity of water that we have agreed to deliver to Mexico, they're going to have to try to get a new supply of water for Mexico, and the only solution I can see is to desalt seawater. That part of Mexico is surrounded by ocean. And so it may be that the Yuma Desalting Plant is merely a precursor to a much larger seawater desalting plant some day in the future to meet our requirements to Mexico *when* the shortages occur, and I think they will occur.

Storey: The desalting process, what stage was it in when you became regional director?

Lopez: It had probably progressed from the development phase to the early stages of commercial production and commercial adaptability.

Several Plants in Florida Use Reverse Osmosis to Desalt Brackish Water

There were several plants in Florida that were using reverse osmosis, which is the process that was finally decided to use down at Yuma. Florida has had a tremendous amount of seawater encroachment into their so-called Florida aquifer. It made the water very brackish along the coastal area, particularly in the Gulf side. Their solution has been to attempt to desalt this brackish groundwater, and it's been fairly successful. It's not *cheap*, but they have been able to meet their needs.

Pretreating Water at the Yuma Desalting Plant

I think that Yuma has had some problems, the desalting plant at Yuma has had some problems, and the major problems that they've had is in the pretreatment. By the time the water is dumped into the canal, the drainage canal, and gets to the desalting plant, it's picked up a tremendous amount of *gunk*. It's picked up algae, it's picked up dirt, it's picked up all kinds of things that the membranes cannot handle, and so it has to be cleaned to the point where it is *almost* drinking-water quality before you put it into the desalting plant. That's very expensive and very difficult.

It may be that some day they may have to just tap the wells, take the groundwater, which is a *lot* cleaner, and transport it to the desalting plant without dumping it into a canal. The canal was already there, and it seemed the logical place to take the water. Now in retrospect, when you think of all the problems they've had which has been primarily due to the pretreatment, you started wondering whether maybe we ought to go back to ground zero and pick the water up before it gets a chance to get contaminated, which would involve a pipeline, closed pipeline, from the wells into the plant.

Storey: What was going on while you were regional director in terms of the development of the planning?

Lopez: Well, it was authorized while I was regional director, or actually while I was the assistant

regional director, and trying to get that put together was my initial responsibility when I first went down was to try to get that job done. It was. We finally got it authorized. And then we started doing the design on it.

Difference of Opinion with the Denver Office over Where Design Work Should Be Done for the Yuma Desalting Plant

We had a difference of opinion between the Denver office and myself on it. The Denver office won. I felt that the Denver office had *never* designed a desalting plant, and I did *not* feel that we could just pick up and design a desalting plant kind of on a cookbook basis, reading as we go along. I felt that what we needed to do was to get an outside contractor who had designed desalting plants, let the Bureau supervise the contract, *learn* the process, and then be ready in the future if anymore [desalting plants were needed.] ~~came up to do it.~~ If no more came up, you hadn't lost anything. But if you set up a whole division to design desalting plants and all you ever designed is one desalting plant, then what do you do with these people after you get through? But I lost, and so the desalting plant was designed in Denver by people who in the main had never even seen a desalting plant.

Storey: So you were in the design phases?

Lopez: Yes.

Storey: A lot of money involved?

"It was the biggest desalting plant that had ever been planned, if it had been built to its original size. . . ."

Lopez: Well, not in comparison, say, to the Central Arizona Project, but, yes. It was the biggest desalting plant that had ever been planned, if it had been built to its original size. There are much bigger ones than that now in Saudi Arabia, but at that time we were kind of pioneering a big desalting plant, and so there were a lot of problems. One of the problems is, [that] ~~how do you=~~ we had a technology that was constantly evolving, and so we needed to be able to somehow keep up with the evolution. And so we were able to, in the design phase, put in a side stream that was to serve as a laboratory, where we would try new techniques for pretreatment, we would try different membranes, different configurations, and keep very close tabs [on] ~~of~~ them so that in the future when we needed to replace membranes, we would be able to replace them with the right type, the most economical and better working type, and that's worked out very well for them.

Maintaining Accurate Records at the Yuma Desalting Plant

We had also the problem of [having] ~~these tremendous, I can't remember how many~~ *thousands* of different cartridges[,] ~~we would have,~~ and we had to have some way of keeping a control of them so that we knew when they went on line, what their problems were, when they needed to be cleaned or replaced and all that.

A desalting plant, particularly a reverse osmosis desalting plant, is a fairly complex processing plant. It requires someone with process mentality to operate it and maintain it, because these membranes were supposedly guaranteed for I can't remember, something like three to five years, but you were constantly changing [them.] ~~those.~~ You have to keep track of them to know what their life history was. It's a complex process, and expensive.

Storey: Who was your assistant regional director?

Lopez: I had two. The first one was Roy Gear, who had worked in the region for about thirty years. I specifically picked Roy because he had been in the region that long and I felt probably knew where the mines were.

". . . we actually had the biggest budget of any of the regions in the Bureau and the largest number of people. . . ."

As the CAP came on line and we began to have these tremendous appropriations and we were at the same time lining the Coachella Canal and we were bringing in the second barrel of the Southern Nevada Water Project and we were also designing the desalting plant, we actually had the biggest budget of any of the regions in the Bureau and the largest number of people. So I felt that we needed another assistant regional director, one to handle the administrative work by itself. And so Dib Campbell was appointed to that. Dib had been the office engineer down at the Yuma Projects Office, and so I brought

Dib up and he became the assistant regional director for administration.

"It created *huge* waves in Washington, because no other region had ever had two assistant regional directors . . ."

It created *huge* waves in Washington, because no other region had ever had two assistant regional directors, but then no other region had had the workload that we were having and the diversity that we had. I really intended–and did–let them run their own divisions. Dib ran the administrative part of it, and Roy ran the technical part of it, because I was spending such a tremendous amount of time in traveling and flying around that I really couldn't do the sort of job that needed to be done if I had insisted on keeping complete control of things.

Storey: Tell me about flying around. What is the regional director's job? What are the components when you're regional director?

Lopez: I told you before that I think it's the best job in the Bureau. I really mean that. You're far enough away from Washington that you very frequently have to exercise judgment instantly. You can't ask someone what to do. So a great deal of it is making sure that everyone understands the mission, and that requires frequent contact. You have to keep touching base with people.

Then we had the states that were involved [requiring] ~~required~~ to be informed *constantly* on what we were doing, what we were planning to do. They had to tell me what *they* wanted done far enough in advance so that if it was possible for us to do it, we could crank it into our operations. And so I spent a lot of time just talking with and visiting with the state people to understand what their needs were.

You're kind of the point man for the Bureau in that area. Everyone expects the regional director to know *everything* that's going on in his region and to be able to instantly give them decisions on problems. The latter part is not possible all the time. You can't always give them a decision instantly, but you can at least start the process as quickly as you can and get answers back to people. It's primarily one of keeping people informed on what *you* want done and what needs to be done, reinforcing that on a very, very frequent basis, and then having some system to assess whether or not you're doing your job.

How Reclamation Measured Whether You Were Doing Your Job

Unfortunately, the Bureau uses expenditure of funds as a way of knowing whether you're doing your job or not, and that, I don't think, is a very valid yardstick, but that's the yardstick that is used, or was used when I was there. The objective was that at the end of a fiscal year you were supposed to use 100 percent of the money that was appropriated to you.

Storey: But not 101 percent.

Lopez: But not 101 percent. That's bad. But that, as I say, is not really a *valid* yardstick, because there are times when you should delay expenditures until either a situation gets clarified or you get a better price or any number of [reasons]–or maybe until you've *really* completed your planning and some of the delays are beyond the control of the regional director.

"In essence, we were working in about a six-months' schedule trying to spend the money for a whole year, and that just isn't, I don't think, the best way to do the job. . . ."

That was probably my greatest source of disagreement with Washington was this issue of having to spend *all* the money in that same fiscal year. It's very difficult in a construction job, for example, to wisely spend your money if you have to do it in chunks, because you don't know what your chunk is sometimes until December, and until you get that money, you can't really spend any of it in getting ready to spend it. You don't have authorization to do that.

In essence, we were working in about a six-months' schedule trying to spend the money for a whole year, and that just isn't, I don't think, the best way to do the job. There either has to be some money provided early on so you can do all your spec work, get all your specifications written, and do all your engineering, so that the minute you *do* get the money, you can put out your bids and get it awarded, and that way you

can probably shorten it by three months. You're still going to be working on about a nine-month schedule for one year's activity, but that's better than six months. But there's just apparently no way of doing that. It's *illegal* to spend money on something that hasn't been appropriated, and so you can't spend it. You can do a lot of thinking about it on your own time, but you can't charge anything to it.

Storey: These people you were going around to talk to, were they mostly the state engineers or the Governors or politicians or what?

Lopez: All of those, especially in Arizona. There was a very large organization called the Central Arizona Project something or other. It was a CAP organization, and it involved a tremendous number of people, all the water leaders, many of the business leaders. They were in constant need of reinforcement, and they had a good reason to need that, because they had waited so many, many years for this project to get authorized and then for construction to start that they were ever-doubtful that things were going to go smoothly, and so they needed to be kept informed all the time.

Public Hearing on Orme Dam

And there were some differences of opinion. For example, I told you that we had this public hearing on Orme Dam and the Indians just en masse came down to testify that they didn't want the dam, and there were a lot of people goading them and urging them to do this,

whites who were using the Indians for their own agenda, which was to kind of stop the project. And so there was a large group of people in the CAP that thought what we ought to do was, "The hell with the Indians. We're going to build Orme Dam," and another group that said, "Oh, no, no, you just can't do this."

". . . we were getting all hung up on Orme Dam. . . ."

So what we finally agreed to do was to continue working on Orme Dam [planning], but not appropriate any money for it, just appropriate money for planning and continue working on it and start building the aqueduct, because we were getting all hung up on Orme Dam.

The people in the Arizona Projects Office were *adamantly* opposed to any alternative for Orme Dam. They had spent their entire lives on this project. Orme Dam was an integral part of it, and, by golly, *nobody* was going to tell them they couldn't build Orme Dam. It took up a tremendous amount of time and energy and was not very productive. After the first public meeting, I had asked Cliff to tell me what alternatives there were to Orme Dam. He said, "There are none."

Storey: Cliff?

Lopez: Cliff Pugh. He said, "There are none."

I said, "What do you mean, there are none?"

He said, "There are none. This is it. This is the only reservoir that we can use."

Well, I knew that wasn't correct, because there's always alternatives. And so we proceeded in going ahead and starting with the Buckskin Pumping Plant, which is the pumping plant that takes it out of Parker, and portions of the aqueduct, while we struggled with Orme.

"Ultimately it became obvious that Orme was *not* going to get built. There was simply too much opposition to it . . ."

Ultimately it became obvious that Orme was *not* going to get built. There was simply too much opposition to it, and so then we said, "Okay, we're not going to build Orme Dam. That's it." I had meetings with John Rhodes and with Goldwater's staff–I never met with Goldwater himself–and told them why and that we were going to look for alternatives. They were very amenable. I said, "The important thing is to get the project. Orme Dam isn't the project. That's the way I feel about it."

It was interesting that I then went back to the Arizona Projects Office and I said, "Okay, you're not going to build Orme Dam, and you're not going to have a reregulating reservoir unless you find another one. So I think you ought to find another one."

". . . within a month they found another one that was about as good as Orme Dam. So whether [you] ~~or~~ find alternatives or not

depends a great deal on whether you're looking for them or not. . . ."

And within a month they found another one that was about as good as Orme Dam. So whether [you] ~~or~~ find alternatives or not depends a great deal on whether you're looking for them or not. [Laughter]

Storey: How true. Were there other issues like that? That was at least partially an environmental issue, wasn't it?

Lopez: It was at least partially an environmental issue, but it was also, it got all tangled up into what the white man's treatment of the Indian had been. There were a lot of *side* issues, but the primary one that many were focusing on was that it would drown out a portion of the river that was used both for recreation and as a wildlife sanctuary, and so that was part of it. Waddell, on the other side, was an old desert reservoir, where occasionally you had flows, but there wasn't any large environmental issue associated with it. And so that's where we ultimately put the reregulating reservoir.

Storey: At New Waddell.

Lopez: At Waddell, right, New Waddell. There was a old dam there, and the new one was built just sightly downstream and drowned out the old one.

Storey: Just like New Melones.

Lopez: Exactly.

Storey: What about environmental issues while you were there?

Environmental Issues in the Lower Colorado Region

Lopez: The environmental issues were *always* there. They were constantly a problem. Anytime you do any construction, you *have* to alter the environment. You can't do it without that. And so there was always opposition to altering the environment. We had it on the second stage of the Southern Nevada Water Project. Fortunately, it was minimal, because the need for water was so great that the great majority of people were in favor of it.

We had it along the whole alignment of the CAP. Although it's a desert environment and there isn't a lot of critters, as Phil Sharp used to call them ~~, there,~~ the critters that are there are affected by anything that cuts through their habitat and isolates one part from the other. One of the concerns we had, for example, were drowning deer who tried to migrate across it, so we attempted to make crossings for them where they could cross, bring fences into a funnel and then having them cross under the canal, *or* if they fell into the canal, we provided steps for them to get *out* of the canal. I don't know how successful it has been because we hadn't started delivering water when I left.

Phreatophytes

Along the Colorado River itself, we had a tremendous growth of salt cedar, phreatophytes, tamarisks, that were affecting the flow characteristics of the river, particularly when and if it flooded. So we were trying to improve the ability of the river to carry water by taking out some of these exotics that had become established in the last hundred years. We had studies with the University of Arizona– Phil Sharp was the one that initiated this–that ultimately showed that there was really *no* habitat value in tamarisk. It's an exotic. Our species are not used to it, and so it doesn't do our species any good. So ultimately we were able to convince the environmental community that it was not only not *harmful* to the environment, but if we took out the tamarisk and, say, sowed grass or something else in there, that it would be of benefit and still not hold up the flow of water.

We had both good and bad, I think, successes. We lost some, won some. We found that there was a pupfish community in Mexico that no one had known about, and when we started investigating places to get rid of the effluent from the desalting plant, we discovered that there were quite a few pupfish down there. And when I left, one of the plans was to try to capture some of those and reintroduce them into some of the salt springs where they had become extinct in the United States.

". . . even when you did something that was environmentally sensitive, the environmental community didn't give us much credit . . ."

I think that our region honestly did attempt to be *sensitive* to the environment. It's just that we had such a long history of not being sensitive to it that even when you did some-thing that was environmentally sensitive, the environmental community didn't give us much credit or I don't think believed us. They thought we probably had some hidden agenda they weren't aware of. So there was a great deal of distrust. Whether that exists still today or not, I can't tell you. But it's one of the problems you have in dealing with environmentalists is that they have the history of our organization in mind all the time and they view us, viewed the Bureau, as, you know, "Damn the bulldozers, full speed ahead," that kind of mentality, and there were still a few people in the organization that had that feeling. It probably will take a generation to overcome it. I don't know if it's overcome now. Is it?

Storey: Well, you knew Wayne Deason.

Lopez: Yes.

Storey: I think he told me that it always surprises him when he hears young engineers who are talking like the ones he first knew at Reclamation.

Lopez: That's interesting.

Storey: But on the whole it's changing, and I think the attitude that I'm hearing is that a lot of the managers who wouldn't hear of it in ye olden days, as it were, now they just simply aren't appointed any longer because they can't make it

to those levels any longer. Who was it, the regional director in the Southwest Region had his environmental officer sitting in the hall outside his office because he couldn't *stand* having an environmental officer.

"On the other side of the coin, I think that environmentalists have in the past . . . been very unrealistic about what could be done to preserve the environment. . . ."

Lopez: Yeah, I think there was a lot of that. On the other side of the coin, I think that environmentalists have in the past, and I don't know what they're doing now, been very unrealistic about what could be done to preserve the environment. As long as you have an increasingly larger population, as long as you have population growth, you're going to have more demands on roads, on all of the infrastructure of the country, you're going to need more power, you're going to need more water.

"So there isn't anything you can do to meet these needs without altering the environment, and the environmentalists don't seem to be able to understand that we're not talking about whether we do it or not. What we're talking about is *how* should we do it. . . ."

Unfortunately, all of these things, so far, require altering the environment. Even the hallowed solar energy that everybody has been

touting for forty years requires tremendously large areas dedicated to the production of solar power, and *they* alter the environment. So there isn't anything you can do to meet these needs without altering the environment, and the environmentalists don't seem to be able to understand that we're not talking about whether we do it or not. What we're talking about is *how* should we do it. And their's is, don't do it. [Telephone interruption.]

Storey: Environmentalists' attitude is, just don't do it.

Lopez: Yes. I don't think that is a feasible alternative. Would you deny, then, water to people? Would you deny food? Would you deny access to markets or to jobs. ~~That's what Rhodes was talking about.~~ What are you going to do about heating a house? We don't seem to be willing to address the problem, and the problem is that as long as you have increasing populations, you're going to have increasing needs. Either you slow down one or you increase the other.

Storey: What else stands out in your mind from your years as being regional director?

". . . how people feel about water is totally different than how we feel about any other resource. . . ."

Lopez: Well, I guess several things. One, that how people feel about water is totally different than how we feel about any other resource. There's almost a messianic feeling about water. You can't talk dispassionately with anyone about

water. They seem to have very, very strong feelings about water. Water occupies a unique place in how people feel about resources. For example–

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BEGINNING OF SIDE 1, TAPE 2. MARCH 7, 1996.

Storey: This is tape two of an interview by Brit Story with Manuel Lopez on March the 7th, 1996.

You were talking about this Messianic feeling and the fact that we can't even ship water across state lines.

Lopez: Right. We can ship oil across state lines. Nobody really thinks much about that. But you start talking to any water man about, say, selling Colorado water to California–

Storey: Or Nevada.

Lopez: Or Nevada, and they just become unglued. It just can't be done. Well, it's just a different feeling, and it's probably due to the history of the West, where life was not *possible* without water. Everyone who's been associated with water develops a very protective attitude towards water. We even have trouble transferring within state. It doesn't really make an awful lot of sense to grow timothy hay in the high country with water that could be used, say, to grow corn or potatoes or sugar beets or something like that at lower altitudes. But even within a state, it's very difficult to transfer water from one use to another. We deal with water much differently

than we do with any other [natural resource]. That's one of the things that I became aware [of] down there.

And I think, also, there is among people who live next to watercourses a feeling that rivers are constant, they don't change. And so you build your house right next to the river, and then you're *really* surprised when a flood comes. My goodness, just really, really surprised. That happened down around the Davis Dam area, below Davis Dam. That whole area had been encroached by development.

Storey: That's the Laughlin area now?

Lopez: Yes, and downstream from there. They really, I suppose, the developers either never thought about it or ignored it, the fact that on occasion the river is going to flood and that we do *not* have enough storage capacity in the system that we can *prevent* floods. Now, we can ameliorate them and there'd be a lot less, but there's still the possibility, and the probability, of high water. And so whenever high water comes, there's immediate reaction that the Bureau isn't doing their job because they've allowed water to rise. You can tell them about it, but they simply don't listen, don't understand it. They keep right on building and encroaching on the river.

". . . if I had a young child today, I would try to get him to be a water lawyer. . . ."

My other impression I've had from my experience down there is that if I had a young

child today, I would try to get him to be a water lawyer.

Storey: Why is that? [Laughter]

"I think that the time will come in the not too distant future when we're not going to be fighting over water rights. We're going to be fighting over water. That's a much different fight . . ."

Lopez: Because I really do believe that the litigation that we're going to have over water on the Colorado River will make anything that we've had before just almost insignificant. We've been talking in the past about water rights and we've been litigating water rights, but anybody who needed water got water. I think that the time will come in the not too distant future when we're not going to be fighting over water rights. We're going to be fighting over water. That's a much different fight, because people have this really strong feeling about water. And whenever that starts to happen, it's going to create some tremendous problems along the river.

Storey: Could you talk about that some more? Tell me why it's different.

The Colorado River Is Over-Allocated

Lopez: It's different on the Colorado than, I think, on other rivers, first because we've over-allocated the water based on the more recent hydrographs on the river, the hydrology of the river. When it was allocated, they thought we had some-where

in the neighborhood of 22 million acre-feet of water, and so everybody got a share based on that. Now it's evident that, unless something changes drastically, we have closer to about 14 and a half million acre-feet of water a year in the river. That's a pretty sizable shortfall.

People have built on the expectation that their allocations would be met all the time, and I don't think that's a realistic expectation in the future. The use of the water has been planned on a much larger flow than exists in the river now. Then you add to that the international aspects of the river, the fact that we have the Mexican Water Treaty requirements, which were tacked on after the Colorado River Compact. No one has *yet* decided on how we're going to meet that when we start using the full allocation of the river. So I think that the conflict over water on the Colorado is something that's going to occupy a tremendous amount of time and energy in future–probably one generation from now.

We're a fast-growing area along the Colorado River. People who use Colorado River water, in general, are in a fast-growing area. Arizona is one of the fastest-growing states in the Union. Nevada, southern Nevada, is fast growing. There's a lot of development up and down the river that is dependent upon water, and there really isn't any other source. We don't have those *large* groundwater aquifers like they have in the Great Plains. Most of the groundwater aquifers are brackish, saline. So there just isn't any other place to get it. It's going to be *very* interesting in the next fifty years.

Storey: How long were you regional director down there?

Lopez: About four years, a little under, from August of 1975 until April of '79.

Storey: What caused you to leave?

Keith Higginson Wanted Lopez to Become Deputy Commissioner

Lopez: Oh, a whole series of things. One, they wanted to transfer me back to Washington. Keith Higginson was the commissioner, and he wanted me to come back to Washington and be his deputy commissioner. I'd already been in Washington twice. I detest Washington. My wife was sick. She wasn't doing well, either physically or mentally. She had what I now *think* was the beginnings of Alzheimer's and she had Parkinson's. Since I was traveling all the time, I just really was home probably less than an average of two days a week. I didn't feel that I wanted to continue to not take care of her. I thought that was an obligation I had, and then I just felt that I needed to be able to do that. And I was tired. I'd been working very, very hard, many, many long hours for many years, and I just felt that I wanted to take a break and do something different. It wasn't that I was dissatisfied with the Bureau or anything.

"Like I say, I think I had the best job in the Bureau. . . ."

Like I say, I think I had the best job in the Bureau. But it just got to the point where I think other things were more important, and my own personal life and that of my family definitely took priority, and so I left in April of '79.

Storey: You decided to do what?

Retired from Reclamation in April of 1979

Lopez: I said I left in April of '79. Keith had offered me the job six months before, and I mulled over it for about a month and finally I told him, about five months before I was to leave, that he better get himself a new regional director because I was going to be leaving that spring.

Storey: Were you going to retire or what?

Moved to Boise, Idaho

Lopez: I intended to retire. I left Boulder City, moved to Idaho, because frankly, the desert didn't really enthrall me. I'm not a desert rat. I like trees and I like water, and there's precious little of that down there. So I moved up to Idaho, and for about a year, a little over a year, about a year and a half, I bought a piece of land, designed a house, and built it myself.

Storey: Where was this?

Lopez: In Boise. Then when I got all through with that, I got to thinking, "Well, okay, now what?"

Consulting Engineer with CH_2M Hill 1980-1989

I happened to know the people at CH_2M Hill. One of them was my neighbor. So I went over one day to have lunch with him, and the first thing I knew, I was a consulting engineer. I associated with them for probably, let's see, from about '80 through '89, for about nine years, and we worked primarily on irrigation projects and salinity projects. We did a salinity project for the Bureau.

Storey: Where were these projects?

Lopez: Well, the irrigation projects were in Idaho, old irrigation districts reviewing structures and advising them on what they needed to do to make the structure more useful and safer. And the salinity project was in the Price River, Price and San Rafael Rivers in Utah. It was part of a general salinity study there, large contributors of salt to the Colorado River because they are on Mancos soils and they're irrigated, and so we did a study on what we could do to try to reduce the salinity.

Storey: Were you doing this full time? Part time?

Retired Again after a Heart Attack

Lopez: Well, my intention was to work about a day or two a week, but when you take on some of these projects, it's pretty hard to do that. So before long, I found myself working six days a week, ten hours a day again. And then I had a heart attack and a quadruple bypass. It took me about

two years to disengage myself from all the assignments that I had and really retire. So I'm a two-time retiree. I think I finally got the hang of it the second time.

Storey: That was about '87 you had a heart attack?

Lopez: Yeah.

Storey: But you retired from Reclamation, then, in '79?

Lopez: Right.

Storey: With how many years of service?

Lopez: I had thirty-six.

Storey: Thirty-six years of service. Then you were in Boise until '79?

Lopez: No. I was in Boise until '90.

Storey: I meant '89.

Moved to Grand Junction, Colorado, in 1990

Lopez: No, I stayed till '90. My wife was getting progressively worse, and I thought that we needed to get closer to our children, all of whom live in Colorado. And so we moved to Grand Junction so that they could visit her more frequently, and it worked out very well that way, because that's exactly what happened. They were able to drop over every two or three months.

Storey: And then you were retired for real.

Lopez: And I was retired for real, yes.

Storey: Do you still get offers to do things?

Began to Work Full Time at the Age of Thirteen and Before That Worked Part Time in Father's Restaurant

Lopez: I haven't had an offer now for probably two years. I think that there are stations in your life, and to really be successful in whatever station you are *now* in, you have to leave the one you were in before. I worked from the time I was thirteen years old virtually full time. Actually, I worked before that part time, because my father had a restaurant and I started helping him when I was three years old. So I had been working all of the life I could remember. I had *never, ever* been without a job. When I got out of the service, within two days I had a full-time job.

". . . when I finally did the retirement the second time, that it was time to really retire. And so I've turned down offers to do other things . . ."

So I felt, when I finally did the retirement the second time, that it was time to really retire. And so I've turned down offers to do other things, just simply because this is a different stage in my life. I'm doing different things. I volunteer at a nursing home two days a week, and we have an extensive family. We have ten kids, twenty-one grandkids, and there's

something *always* going on in that area. And so that's what I'm doing, and no regrets.

Storey: Now, you say ten kids. That's–

Lopez: Geneva's and mine, yeah.

Storey: Two families combined, right?

Lopez: Correct. Geneva had seven; I had three.

Storey: That would be quite a chore.

Lopez: Oh, that is. We've had about forty-six people for dinner here. You know, you do have obligations to your family. When you're working, you tend to either ignore them or pay them little attention, and I thought it was time to pay them attention. And I'm enjoying it. I'm enjoying my kids and my grandkids and just having a great time.

Storey: Tell me a little more about your early life. You mentioned your father's restaurant, for instance. This was in Tampa, right?

Lopez: In Tampa, right.

Storey: What was the name of it?

El Naranjal, Father's Restaurant

Lopez: *El Naranjal*, which means The Orange Grove. It was a Spanish restaurant. My father came to this country around, I think, nineteen or twenty. He was about nineteen or twenty.

Father Emigrated from Spain to Cuba Where He Became a Cigar Maker

He went to Cuba first, worked in Cuba in a cigar factory, and when the cigar factories moved from Cuba to Tampa, he followed them. He was a *lousy* cigar maker, absolutely lousy.

Storey: This is his own admission, I take it.

Lopez: This is his own admission, yes. And everybody that knew him said absolutely, he was. And so he became a waiter in a restaurant. He was a very personable man and had an absolutely unbelievable memory and very hard worker. And so eventually, within a matter of seven or eight years, he owned his own restaurant, and married my mother, who was a native of Tampa.

"My earliest memories of my family are of my working at the restaurant. I would bus tables . . ."

My earliest memories of my family are of my working at the restaurant. I would bus tables, take off dirty plates, wash dishes, until I got [old] enough to where I could be trusted with being a waiter. And a restaurant at that time was a seven-day-a-week job. I mean, you worked *every* day. So that's how my childhood was. We lived in Ybor City, which is a Latin community.

Raised in Ybor City in Tampa

Storey: Ebo City?

Lopez: Ybor, Y-B-O-R.

Storey: Okay.

Lopez: Ybor City, a *barrio*, if you will, of Tampa. It was populated almost exclusively by Spaniards, Cubans, and Italians. The language in the streets was Spanish. If you didn't know Spanish, you probably could not buy a loaf of bread, because that was the language that was spoken. *Everybody* spoke Spanish. The Italians spoke Spanish, the Cubans, of course, spoke Spanish, and so did the Spaniards, because the Spanish and the Cubans had been the first to come there and had established that as the street language.

Mother Was Trilingual

My mother was of Italian descent, but she was trilingual. She could speak either of the three languages, write either of the three languages, take dictation in any of the three languages, and then transcribe it directly into any of the three languages. Before she was married, she worked at an import/export house, because she was really very, very good at translating.

And so I grew up, really, in a Spanish-speaking house, until I went to school. And then when I went to school and came home, my mother said, "How was it?"

I said, "Well, I really don't know. I can't understand them."

Family Changes from Spanish- to English-Speaking

And she said, "Whoops," and she changed the family over into English immediately.

Storey: Were you the oldest child?

Lopez: I was. Of course, she sent my dad off to school so that he could learn English.

Storey: When you say they spoke Spanish, did they speak Spain Spanish or New World Spanish?

Lopez: No, they spoke really a mixture. There were some who spoke the New World Spanish, the Cubans especially.

Storey: With the S's and everything.

Lopez: With the S's and all that. The Spaniards spoke it with the "th," the Z sound, the th sound. I noticed that the second generation, which was people in my generation, largely adopted the New Spanish.

Storey: The New World Spanish.

Spent over Two Years in Spain During the Spanish Civil War

Lopez: The New World Spanish, yeah. I went to Spain and I spent almost thirty months in Spain, between the ages of eleven and thirteen, got caught in the Spanish Civil War. Part of that I was in Madrid, and I picked up and still speak

the *Madrileño*, which is the more Castilian form of Spanish. It really has helped me, I think, tremendously in my career to be able to speak Spanish.

Storey: And being bilingual.

Lopez: And being bilingual, yeah.

Storey: Tell me your recollections of the Spanish Civil War, if any.

Lopez: Well, I was thirteen. I thought it was a grand adventure, because you're thirteen, until one day my friends and I were out playing and there was a firefight maybe a block or two away, and suddenly the windows above us started shattering from the bullets and they started hitting the house that we were playing against. It hit me then suddenly that we were not playing here, this was something that was really happening. And then I actually saw people getting killed, and that was, I think, the first time I came face to face with the fact that I was going to die some day. It might be that same day.

I grew up very, very quickly in the few months that I was there during the Spanish Civil War. There is no such thing as a nice civil war. Civil wars, by their very nature, are very cruel, implacable, hate-filled situations, and as a consequence, there are a lot of atrocities associated with civil wars, because brother against brother, cousin against cousin, you don't do that unless you have a very intense emotional

feeling that you are right, that the other person is wrong.

Family Involvement in the Spanish Civil War

My cousins, who were older than I, immediately volunteered. We were Loyalists. They were Republicans. One of them died. He was killed during the Civil War. Another one was a pilot, was interned after the war in a concentration camp, and two in northern Spain were interned in concentration camps before they even went into service. [Generalissimo Francisco] Franco came in and just took *all* military-age men and put them in concentration camps.

After the war, one of them stayed in northern Spain and farmed the family farm. My other cousin in northern Spain emigrated to Brazil. The cousin that was down in Madrid, who had been the pilot, was allowed to leave the concentration camp on the condition that he leave the country, and he went to Venezuela. So of my cousins, the ones that I grew up with in Spain, only one stayed in Spain. All of the others emigrated out. And it's interesting that it took them, oh, about fifteen years or so to return to Spain. They didn't return to Spain until after Franco died, and they both came back, and they both were very successful businessmen when they came back. And it's interesting that neither one had married in all that time. They saved their money and they came back to Spain, established themselves, and then got married,

one of them when he was fifty and the other one, I think, it was fifty-five.

Storey: Did I ask you before *why* you became interested in engineering? How did that happen?

Lopez: Well, I came to Denver after I got out of the service because I had asthma in the service, and I got a job with the Bureau of Reclamation as a clerk in the Mechanical Branch. Up until that time, I had planned to be an accountant. I was going to DU part time at night to get an accounting degree. My mother was a bookkeeper, and I think that was one of the things that influenced me.

Became Interested in Reclamation's Work

When I got to the Bureau, I became interested in what they were doing. It seemed like a lot of fun and very interesting. And so the engineers would give me, from time to time, little jobs to do for them. I was always good in mathematics and in science. I graduated at the top of my class in high school, as far as the *boys* were concerned. I had nine girls ahead of me. I was the tenth in the class of 440. And so when they'd give me jobs I could do them, and I did them well, and I got to thinking, "Gee, this sounds a lot more interesting than accounting."

By that time I had become disillusioned with accounting because I found that *I* had changed from the time before the war to afterwards, and I just would get very, very impatient with the struggles of trying to balance

a set of books and finding two or three pennies when I was probably spending several dollars of my time to do this. It just was very boring for me, very boring, and engineering was not, and never has been.

Storey: So you stayed in engineering instead.

Lopez: Yeah. I went to night school at the University of Colorado and eventually got my engineering degree.

Storey: Well, we're at the point where I have to ask you, what about Reclamation that we haven't talked about should we have talked about? What stands out in your memory?

". . . my contemporaries, I thought, had a very strong sense of mission. . . ."

Lopez: Well, my contemporaries, I thought, had a very strong sense of mission. I have worked for other federal agencies, the Office of Saline being one, the Bureau of Labor Statistics, and I have never encountered anywhere the degree of dedication and sense of mission that the Bureau of Reclamation had when I was in it. We were believers. We believed that what we were doing was of *benefit* to the people in this part of country, and really a benefit to the whole country, but particularly to the West. All you had to do was drive around or fly around and you could see the stark difference between irrigated land and non-irrigated land. So I always felt *good* about what I was doing.

I don't know if that feeling exists today. I would doubt it. Number one, because the mission is not as clear-cut as it was before, and because people, I don't think, today are as dedicated to any one organization like they were. When you went to work for the Bureau, it was kind of tacitly understood that you would work for the Bureau the rest of your life. No one said it, but that was the feeling. This was what you were going to do the rest of your life. You know, today with R-I-Fs, with downsizing, with all of the other things, anyone who has a nice, warm fuzzy feeling of security about where he is doesn't honestly understand the situation. And so I think it breeds a different type of attitude between the employee and the organization that employs them. There's less of the feeling of permanence.

And today, even today, when I go around the country and see areas that I had seen before that were barren and unproductive and now they're producing, the technical term, food and fiber for the country, and I see the prosperity that Reclamation produced, I'm glad I worked for Reclamation. I've enjoyed my career. I think we did a good job, notwithstanding. We did some boo-boos, too, incidentally, but, you know, that happens.

Storey: Where were you when Teton failed?

Failure of Teton Dam

Lopez: I was down in Boulder City.

Storey: Do you remember the way people reacted?

Lopez: Oh, absolutely. Absolutely.

Storey: Tell me about it.

Lopez: Well, there was first a feeling of disbelief that it could happen to us, an absolute feeling of disbelief. I just couldn't *imagine* the Bureau being involved in a failure. I mean, it just seemed just *implausible* that that would happen.

Many of my contemporaries, I think, had almost the same feeling. There was a small group, however, I think, that felt that–and not people that were employed by the Bureau, but opponents, and I heard, "Well, *this* is the beginning of the end for you guys." It may well have been the beginning of the end for the Bureau, because I think that was our heyday and from then I think the Bureau *has* lost a lot of its reputation, a lot of its glamour.

I think it was a tragedy. It was a tragedy caused, to a large extent, by this cookie-cutter type of design that you and I–

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BEGINNING OF SIDE 2, TAPE 2. MARCH 7, 1996.

Storey: You had begun talking about the cookie-cutter approach to design.

Design at Reclamation "was kind of an assembly line. Each individual had a very specific and *narrow* area . . . and there was

really not an awful lot of communication between these areas. . . ."

Lopez: It was kind of an assembly line. Each individual had a very specific and *narrow* area that they worked on in the project, and there was really not an awful lot of communication between these areas. You had been doing your job for years, so there was no need to hold hands with anybody else. You knew what your job was.

"There were a whole series of accommodations made that in [and] of themselves would probably have survived. But when you added them *all* together, they exceeded the capacity of the structure to accommodate, and we had a failure. . . ."

And I think that's one of the things that happened in Teton. There were a whole series of accommodations made that in [and] of themselves would probably have survived. But when you added them *all* together, they exceeded the capacity of the structure to accommodate, and we had a failure.

"There was a tremendous amount of denial on the Bureau's part. . . ."

I think the way it was handled afterwards was, in retrospect, not really the wisest way of handling it. There was a tremendous amount of denial on the Bureau's part. You know, "Not our fault."

Storey: It had to be the contractor, had to be an earthquake, had to be something.

Lopez: Had to be something, *not* our fault, instead of using that as an opportunity to say, "Whoa, *what* did we do wrong?" and then being better for it.

". . . their conclusion was that what the Bureau did was shave off the factor of safety a little bit in a lot of discreet areas that all added up to having exceeded the capacity of the structure to adapt. . . ."

As I say, I think that probably was the beginning of the downward trend for the Bureau. It certainly was as far as reputation was concerned. Keith Higginson, I don't know whether you know this or not, *was* one of the *main* investigators of the tragedy and wrote a very, very good report on it, and their conclusion was that what the Bureau did was shave off the factor of safety a little bit in a lot of discreet areas that all added up to having exceeded the capacity of the structure to adapt.

Storey: Did Teton cause problems for you as regional director?

Lopez: It did, but not to a large extent. Our opponents used that as fuel to question more aggressively our designs. I'd been to several meetings where they said, "Well, yeah. But, hell, you guys screwed up in Teton. How do you know you're not screwing up here?" So, yeah, it was. It caused us some problems.

Our situations were somewhat different in that we weren't designing a very large dam at the time. I think if we had, it would have been much worse. But nevertheless, it was used by the opponents to point out that we were *not* an infallible agency and that we didn't really know *all* the consequences of what we were doing. Of course, that's always been true. No one knows all the consequences of what you're doing.

Storey: What about in terms of staff? Were you asked to send staff or anything to assist?

Lopez: No, we did not. Our region had not had a big construction project for many, many years, and so we were not typically heavy and highly technical people. We had to staff up when we started the CAP. Most of them came from Denver, the experts that went there to see it, which is another way of responding. It was like sending the fox out to the henhouse and see what's the security.

"When you concentrate . . . your technical talent . . . it's a two-edged sword . . . it allows you to do things much more efficiently . . . But . . . makes you too ingrown. . . ."

When you concentrate all your technical talent, or the great bulk of it, in one place, it's a two-edged sword. On the one hand, it allows you to do things much more efficiently because you have everybody you need and all the experts are there. But on the other hand, it, I think, makes you too ingrown. You tend to develop a tendency to *believe* yourself all the time and you

do not do, I think, a sufficient amount of self-criticism, and self-criticism and self-evaluation are absolutely *essential* to an engineer. He should *never ever* think that there's no better way of doing anything than the way he's doing it.

Storey: Was that a tendency at Reclamation?

Lopez: It certainly was. It certainly was. In fact, I remember many times when I'd ask the question, "Well, why are you doing it this way?"

"This is the way we did it in Grand Coulee." [Laughter]

Storey: So we're going to keep on doing it.

Lopez: That was the understanding. Grand Coulee's still there. So, yes, I think there was a tendency to *not* condone criticism, and that was evident many times to me when I went out to the field to inspect structures.

Addressing Gate Issue at Heart Butte Dam

There was a little dam in North Dakota– or I think it's South Dakota–called Heart Butte Dam. It had a high-pressure gate. I went down to look at it, to inspect it, and I asked the fellow, "Can I see how it operates?"

He said, "I don't think we want to do that."

I said, "Why not?"

"No, I really don't think we want to do that."

So I started talking to him. He had had a lot of troubles with that gate, and he had written the Chief Engineer a letter and it'd come back pretty nasty. In essence it said, "If you knew what the hell you were doing, you wouldn't have that problem."

So anyway, I said, "I promise you that I'm not going to take *that* attitude. I just want to know what the problem is."

Well, it had two valves that he had to open. He closed one and he opened up the other one simultaneously. And so he was in there closing these off, turning one on and closing the other off, to get the oil to go into the underside of the cylinder. He had the pump on, and the pump would stall. So he was in there turning these two valves and kicking the pump with his foot at the same time that he was doing this.

I said, "My God, man, is that what you have to do all the time?"

He said, "Yeah. That's the only way I can get it to go."

So I came back into Denver and I talked to the designer, and I said, "You know, he's having this problem."

"Well, he just doesn't know what he's doing."

I said, "No, no, wait a minute. I was there. He *does* know what he's doing. Something's wrong with that damn thing."

Well, it took me a lot of cajoling before I finally talked the designer into going up there–he had never been there–and looking at it.

Storey: This is the person who had designed this gate?

Lopez: That's the person who had designed it, the same individual. And when he came back, I said, "Well, what did you find out?"

He said, "Well, you know what was wrong with that?"

I said, "No."

He said, "The impeller on the pump was in backwards." That poor guy had been trying all these years to get that thing to work, and he had written a letter and they had told him he was just full of it, that it wasn't the design's fault.

The Denver Office Felt it Could Do No Wrong

But we did that frequently, where we *squashed* any adverse comments on what we were doing. It was part of the aura of the Federal Center that it was a group of experts and that we could do no wrong. *Dangerous* attitude to have in any enterprise.

Storey: Well, that has to be an attitude that comes from the top, though. Tell me about the Chief Engineers that you knew.

Reclamation Chief Engineers

Lopez: Well, I knew several. Barney Bellport, of course, and Harold Arthur, Leslie McClellan. They were all of the old mold, autocratic, did not suffer criticism *at all, at all*. Anyone who criticized was immediately a pariah. They were very forceful people. I mean, they *ran* the organization with absolutely *no* question as to who was boss.

It wasn't until after Bellport that we began to have committees or groups of people get together to discuss anything. Before that time, I don't recall *one*. Whatever the Chief said, you did. That's it. The only question was, how quickly? It was a very autocratic organization.

Storey: Do you remember Grant Bloodgood?

Grant Bloodgood

Lopez: Yes, I do.

Storey: What was he like?

Lopez: Grant was more of a politician than the others, but he still had that same attitude, that whatever he said *went*. You never questioned him. You never brought up that maybe we ought to do it

some other way. That just simply was not done. Wasn't Grant the one that became Commissioner, also?

Storey: No, Grant Bloodgood was never Commissioner.

Lopez: I remember one that started as a Chief Engineer and went over to Washington and became–I can't remember his name now.

Storey: I can't think of any Chief Engineer who was–

Lopez: No, you're right. He was not a Chief Engineer. He was head of one of the–

Storey: Oh, you're thinking of Mr. [Wilbur] Dexheimer, I imagine.

Lopez: That's the one. Yes, Dexheimer.

Storey: He was one of the engineers. I don't think he headed an office, maybe, even.

Lopez: He headed an office, but it was a minor one.

Storey: So nothing stands out individually for these guys, in your mind?

Leslie N. McClellan

Lopez: Oh, with McClellan, what stands out, it's ludicrous, but what stands out is that I had to write a lot of letters for him. I was a clerk at the time. And he *loved* the word "inasmuch as." If you could include an "inasmuch as" in a letter, you could sail it right past him. But he detested

"since." You could not say, "Since I've done this." Uh-uh. He liked inasmuch as. Like I say, that's an odd thing that that's what sticks out in my mind about McClellan because I wrote a lot of letters for him.

Harold G. Arthur

Harold Arthur–and I knew him probably better than the others–I think was very, very *possessive* of the position he had and what the Denver office was supposed to be, and so he did not like [challenges to his expertise]–and I had difficulties with him on the design of the desalting plant, because I was down there by then. He did not like for people to kind of have different opinions on what the capability of the Denver office was. His feeling was that the Denver office could do anything. If you wanted it to design a 747–wheel it out there to the parking lot, and we'll do it.

That's an admirable view to have. It's nice that you feel that way about it. But I think it's unrealistic. There *is* an *art* to all design. It's not all science. And the *art* is developed slowly through experience. If you don't have experience in doing a particular type of design, there's a very good chance that you're not going to do it as well as you should. There was a certain arrogance, I think, in the chief engineer's office that was part of the reason why Teton failed.

Storey: How about Barney Bellport? Anything stand out regarding him?

Barney Bellport

Lopez: No. I really can't think of anything that stands out, other than the outward appearance of Barney Bellport. He was just kind of a blustery, very *positive* sort of an individual. But that was not unique to Bellport. Most chief engineers were very positive individuals. That seemed to go with the territory.

Storey: What about the commissioners you knew?

Floyd Dominy

Lopez: I knew Dominy, but not very well, because I was a pretty young engineer when he was commissioner. I do remember many people disliking him, and when I became regional director down in Boulder City, there was strong feelings about one of the fellows in our office who had been a friend of Dominy's, and when Dominy had come down there had apparently arranged for Dominy to find a woman somewhere. Dominy had come down there several times, and this fellow actually was ostracized by the majority of the people in the regional office.

"So Dominy was not well loved by many people. . . ."

So Dominy was not well loved by many people. He was very competent on one side, but he was a chameleon.

"He also had this gutter part of his character that was almost unbelievable that someone as capable as he was could stoop to some of the things that he did. . . ."

He also had this gutter part of his character that was almost unbelievable that someone as capable as he was could stoop to some of the things that he did. He was not a very moral man at all, and that was too bad.

Gil Stamm

Gil Stamm was very, very hard working, very straightforward, straight shooter, had an almost Puritan view on what we were doing. He was through and through a Reclamation man. He'd spent his entire career in Reclamation, and he was a very strong believer in Reclamation. He really believed what he preached.

Keith Higginson

Keith Higginson was probably the one I knew the best. I liked Keith. He was a very honest, straightforward individual who I think sincerely was trying to do the very, very best job he could. He worked very hard at doing his job. He had virtually no ego at all. You could talk to him very openly about *any* subject, even when you disagreed with him, and he would listen to you. He may not do what you were saying, but

he would listen to you with*out*, I believe, any prejudice afterwards even if you disagreed with him.

He was probably the most democratic of all of the Commissioners that I knew. He *wanted* to get the input of the regional directors into what was going on. Up to that time, every Commissioner that I knew was a Washington person, and by that I mean that he did whatever the Washington office wanted to do, and *they* pretty well set all the *policy*. When Keith came in, he was not a Washington operative. He hadn't ever been in Washington. And so he started seeking the counsel of field people, because he felt they were closer to what was going on, and they had the pulse of the constituency that we had. So he was much more democratic than the others.

Storey: What about Ellis Armstrong?

Ellis Armstrong

Lopez: I knew Ellis, but not too well as a Commissioner. Ellis, I think, was a little more pompous. By that I mean that he kind of tried to, I always felt, put on kind of an air of being fully in charge of anything that was going on. Anything that left the office had to go through Ellis. I mean *everything*. And so as a consequence, I think he was pretty overworked, because he had a tremendous amount of stuff that was going back and forth. Personally, I liked him. He was an easy guy to talk with. But

he just simply had *tremendous* difficulty delegating.

Storey: When you were consulting after you left Reclamation, did your view of Reclamation from the outside change?

Organizations Should Be Judged on the Totality of Their Work

Lopez: No. No, it didn't. You know, I'm a realist. I understand that even world-class athletes from time to time do something that is not world class, and that you have to judge organizations on the *total* task that they are doing. Yes, Reclamation made mistakes, and every once in a while you'd run into a Reclamation guy that you wondered how did he ever get this job. But by and large, the people I have always dealt with knew what they were doing *and* were sincerely trying to do the very best job they could. Like I say, I think that's kind of unique. Not too many organizations had that kind of dedication.

Outsiders Views and Attitudes Regarding American Government Workers

One of the things that I found when I was doing consulting work was that many of the people I dealt with were always amazed that I was able to work hard and efficiently. At first I thought they were just complimenting me, and then I realized that what they were *really* saying was that, "The government people aren't any good. You're just an exception."

There's a–or was, and probably still is–a large group of people who think that government people are totally incompetent, and that's unfortunate, for many reasons. It's unfortunate for the people in this country themselves, because that means that you cannot attract into government work an awful lot of very competent people, because, first, the pay isn't all that great; and secondly, if they're not going to get any warm fuzzy feelings of being appreciated, there's not much inducement to taking abuse. And yet the government represents the *biggest* single enterprise in this country, and what happens in government affects people *much* more than *whether* the Nuggets *beat* the Suns or anybody else. But we aren't willing to pay, I think, government workers, and we certainly aren't willing to give them any pats on the back for doing what they're doing, and to me that's a very, very bad situation.

"One of the things that I felt all the time when I was working for the government was that the government itself treated their people shabbily. . . ."

I think that *no* organization can survive if it doesn't have a high caliber of people, and we accept IBM or any other company, say, giving bonuses to people who are doing a good job, but we become totally unraveled when government workers are treated in that same way. One of the things that I felt all the time when I was working for the government was that the government itself treated their people shabbily. I still think they do. And the only thing that kept me going,

without getting *really* angry, was that I felt that what *I* was doing was important. And so if the rest of the government didn't appreciate it, that was really their problem, not mine. But I do feel very strongly about that. I think that we treat government workers shabbily. I don't think we appreciate them. We have different standards for what we think are good management practices in private industry and what we do in the government with our workers. End of my soapbox.

Storey: Anything else we ought to talk about, though?

Lopez: No, I can't think of anything. I think we covered it all.

Storey: Well, I appreciate your spending time with me. I'd like to ask you again whether or not your willing for the material on these tapes and the resulting transcripts to be used by researchers.

Lopez: Certainly.

Storey: Good. Thank you very much.

END SIDE 2, TAPE 2. MARCH 7, 1996.
END OF INTERVIEWS