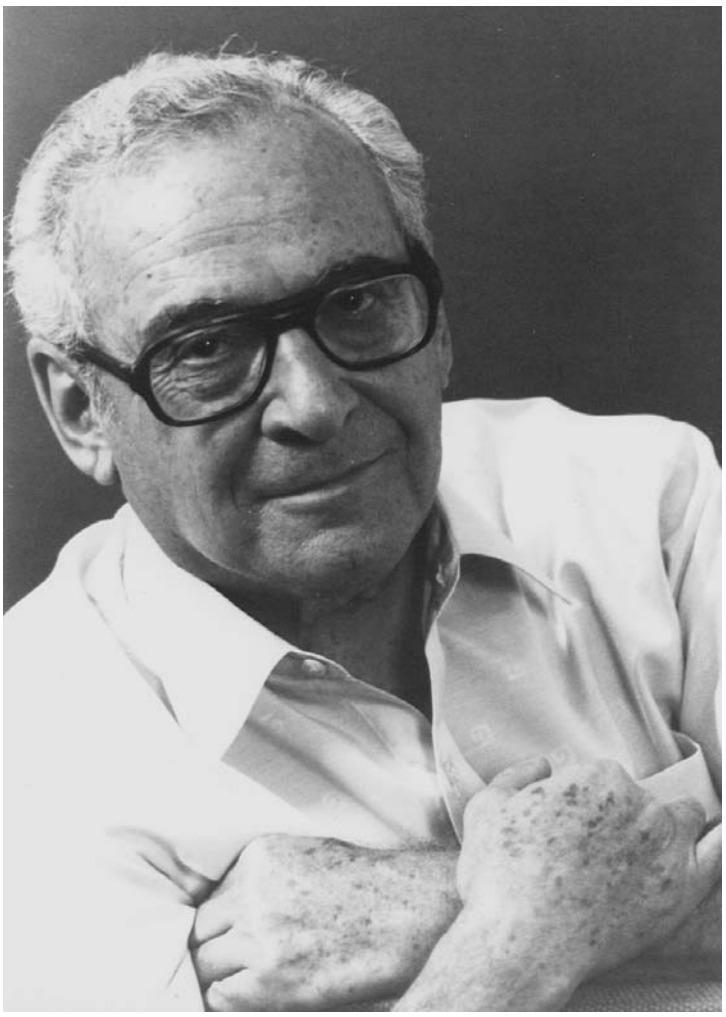

Carl J. Hoffman during his consulting days

ORAL HISTORY INTERVIEWS

CARL J. HOFFMAN

Denver, Colorado

♦ ♦ ♦ ♦ ♦ ♦

STATUS OF INTERVIEWS:
OPEN FOR RESEARCH

♦ ♦ ♦ ♦ ♦ ♦

Interviews Conducted by:
Brit Allan Storey in 1995
Senior Historian
Bureau of Reclamation

♦ ♦ ♦ ♦ ♦ ♦

Oral History Program
Bureau of Reclamation

Processed and Printed: 2006

Hoffman, Carl J. ORAL HISTORY INTERVIEW. Transcript of tape-recorded Bureau of Reclamation oral history interviews conducted by Brit Allan Storey, Senior Historian, Bureau of Reclamation, in 1995, in Denver, Colorado. Edited by Brit Allan Storey.

Repository for the record copy of the interview transcript is the National Archives and Records Administration in College Park, Maryland.

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STATEMENT OF DONATION
OF ORAL HISTORY INTERVIEWS OF
CARL J. HOFFMAN

1. 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, Carl J. Hoffman, (hereinafter referred to as "the Donor"), of Denver, 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 February 3, February 10, March 3, and March 17, 1995, at my home at #201, 955 Eudora Street, 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: May 4, 1995 Signed: Carl J. Hoffman

INTERVIEWER: Brit Allan Storey
Brit Allan Storey

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Date:_____ Signed:_____
Archivist of the United States

Department of the Interior Citation for Distinguished Service

THE SECRETARY OF THE INTERIOR
WASHINGTON

CITATION

FOR DISTINGUISHED SERVICE

CARL J. HOFFMAN

in recognition of eminent Government service with the Bureau of Reclamation in the field of engineering design.

Mr. Hoffman was one of the early pioneers in the design of spillways for earth and concrete dams. When he began developing concepts for spillways and outlet works for unprecedented structures there were few guidelines. His pioneering has resulted in established procedures in the design of spillways which were incorporated into the book, "Design of Small Dams" now used throughout the world by engineers engaged in water resources development. He served with distinction as an authority on design of spillways and dams in advising foreign Governments such as those of India, the Philippines, and Taiwan. In 1961, he was a member of a team which made a study of the potential water resources development on the Mekong River. In addition, Mr. Hoffman was highly effective in training engineers from other countries. His performance during his career was so outstanding that he was recognized with three cash incentive awards. In recognition of significant contributions in the engineering design of spillways, a highly specialized field, and his contributions to his Government's assistance to foreign Governments, Mr. Hoffman is granted the Department of the Interior Distinguished Service Award.

Secretary of the Interior

Rocky Mountain News WEDNESDAY, DECEMBER 29, 2004

OBITUARY

Carl Hoffman designed major dams of the West

By Jim Erickson
ROCKY MOUNTAIN NEWS

Civil engineer Carl J. Hoffman, of Denver, who helped design Hoover Dam and several other Western dams, died Sunday. He was 96.

Mr. Hoffman was born on Oct. 4, 1908, in Kalamazoo, Mich.

His family moved to Pueblo, then to Cheyenne, where Mr. Hoffman attended high school.

In 1932, Mr. Hoffman graduated from the school now called Colorado State University with a degree in civil engineering. Mr. Hoffman moved to Denver to work for the U.S. Bureau of Reclamation, designing dams and spillways.

In 1934 he married Edith Goldfarb.

In a 28-year career with the bureau, Mr. Hoffman helped design some of the West's biggest dams, including the Hoover Dam on the Colorado River and the Grand Coulee Dam on the Columbia River. He also worked on the Big Thompson water diversion project in Colorado.

After retiring from the Bureau of Reclamation, Mr. Hoffman spent the next 30 years doing international engineering consulting work, first with the World Bank and later with private engineering firms.

Between 1960 and 1990, Mr. Hoffman worked in Korea, Japan, Thailand, the Philippines, Indonesia, India, Pakistan, Spain, Nigeria, Brazil and Argentina.

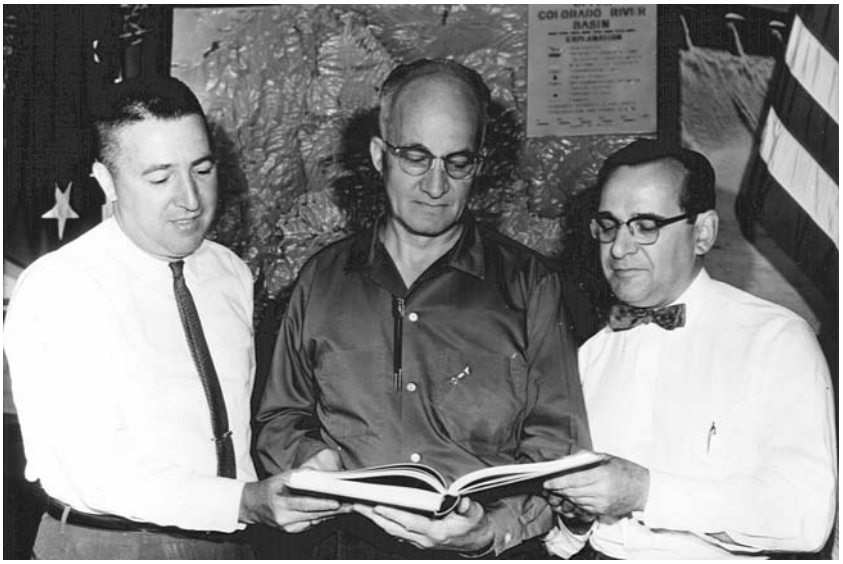
In 1990 he retired for good, and spent most of his remaining years in Denver.

Mr. Hoffman wrote many articles on engineering topics and contributed to the widely used book *Small Dam Designs*.

He is survived by his son, Robert Hoffman, of Lynchburg, Va., and two grandchildren.

A graveside service will be at 11 a.m. today at Mount Nebo Cemetery, 11658 E. Colfax Ave., Aurora.

Carl J. Hoffman with other Denver Office staff in 1945. Hoffman is on the far right. John (Jack) L. Savage is third from the left.



Carl J. Hoffman with Everett N. Larson and Jack W. Hilf in 1961, all of whom worked on *Design of Small Dams*. Larson is in the center and Hilf is on the left.

Carl Hoffman with Commissioner Floyd E. Dominy in Dominy's office in the Main Interior Building

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.

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Oral History Interview of Carl J. Hoffman

Storey: This is an interview by Brit Allan Storey, Senior Historian of the Bureau of Reclamation, with Carl J. Hoffman, a retiree from the Bureau of Reclamation, at his home at 955 Eudora Street, in Denver, Colorado, on February 3, 1995. This is Tape 1.

Mr. Hoffman, I'd like to ask you first of all where you were born and raised and educated, and how you ended up working for the Bureau of Reclamation.

Born in 1908 in Kalamazoo, Michigan

Hoffman: Well, I was born in Kalamazoo, Michigan, in 1908, which makes me past eighty-six years of age now. At the age of six, my father, who was suffering from asthma, was told to seek a drier climate, and we moved to Pueblo, and remained there for three years, until 1914, at which time we moved to Cheyenne, Wyoming, and I got my education through high school in Cheyenne.

Went to Colorado Agricultural College

I'm one of six children, and because Fort Collins[, Colorado,][1] was one of the closest places

1. Note that 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.

(continued...)

and I was interested in the sciences – I wanted to be an architect. The closest school that taught – not architecture, because there was no school west of Chicago to teach architecture – and I had a brother who was going to Colorado Agricultural College, so I ended up at Colorado Aggies, or known later as Colorado A&M [agricultural and mechanical] and now as Colorado State University. Graduated there in 1930, in civil and irrigation engineering. The school was small, we had a graduating class in civil engineering of seven – the entire graduating class in the entire college was 178. And I was accorded the *honor* of being the one with the best grade average, which is not here nor there.

Took the Civil Service Exam in 1930

I took the Civil Service Exam [in the spring of 1930] and did quite well in the Civil Service Exam. At that time, because the Boulder Canyon Act had been passed in 1928, that was something forthcoming – at that time there were no appropriations for that.

Offered Several Jobs with the Federal Government

And when I decided . . . . I got many offers from various government agencies: Bureau of Public Roads and the other one was from the Navy from the experimental station in Annapolis, and other offers. And I decided "no," [I'd wait for an offer from Reclamation] because I'd been interested in dams and dam construction, took courses leading to that, went

1. (...continued)
The transcriber and editor have simply 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.

out on the Poudre [River where] we had a summer camp where we surveyed, came back and worked up the studies for a dam. I thought, "Well, I'd like to pursue that."

Interviewed by Erdman B. Debler
Decided to Go to Reclamation in Denver

And the Bureau of Reclamation seemed like a likely place. ~~At that time, it wouldn't.~~ When I applied, I came down to Denver and interviewed [with] Mr. Debler. (Storey: Erdman B. Debler.) Erdman B. Debler, who was in planning or I don't remember exactly. He offered me a job at Saratoga in the field, Saratoga, Wyoming. And I said, "No, I'm going to wait until there is an opening here at the Bureau in Denver. And I waited through until mid-August of 1930, and I was contacted, and I ~~was the~~ [became the] first [new] employee that was put on the staff for the work that was being done in Denver on the Boulder Canyon[/Hoover Dam design].

"I became the first new employee . . . put on the staff for the work . . . on . . . Hoover Dam design"

Offices in the Wilda Building

At that time, the Bureau had their offices at the Wilda Building, if you've heard of that (Storey: No.), at [1440] Welton. The entire staff was in the Wilda Building, on the second floor, with *not more* than twenty or thirty employees – a lot of the people that were brought in from the field, in preparation for work on the Boulder Canyon [Project]. Now I'm not sure about many of the people, I don't know ~~whether~~

[how long] Mr. Savage was a part of the staff before that time, or whether he'd been brought in [from the field] shortly before I came. I remember R. F. Walter was the Chief Engineer, [John (Jack)L.] Savage was the Chief Designing Engineer, and there were [many other] people that were brought in from the field to staff various [newly created branches and] sections. If you can look at this picture, [photograph of Denver office personnel taken on the steps of the New Customs House, summer, 1932] these were the people (Storey: In the front row?) in the front row, who were . . . . Here's R. F. Walter. John Savage was the Chief Designing Engineer. [Sinclair O.] Harper was the Assistant Chief Engineer.

Storey: That's S.O. Harper?

Hoffman: Yeah, S.O. Harper. Savage was Chief Designing, Nalder was the Assistant Chief Designing. Byron Steele was the Head of the Dams Division. Is this McClellan? Yeah, [Leslie N.] McClellan was the chief electrical. Anyway, Bonnet was the head of Personnel. This one is – is he Debler? No, Offutt.

Storey: According to this, Debler is sitting next to Harper. Is that right?

Hoffman: No, that's Nalder. Debler is . . . . Steele, Harper, Savage . . . . (Storey: Debler, here.) Here's Debler, yeah. Day was Head of Mechanical. Houk was in Special Studies.

Storey: H-O-U-K?

Expansion of Denver Office into the Public Market on California Street

Hoffman: H-O-U-K, Ivan Houk. (Storey: Uh-huh.) Well, anyway, what happened was that when I was hired, they had already contemplated expanding, and they rented the second floor of the Public Market on California and Fifteenth, which was across the alley [,with a connecting footbridge,] from the Wilda Building, and they had already prepared the offices.

How the Dams Branch Was Set up in the Public Market

We [Dams Branch] had a big bullpen with about thirty or forty ~~desks~~ [drafting tables], all in one [room]. And they had different people from the different sections [, within the branch,] situated around. McConaughy was assigned to be the Head of the Spillways. Across the way was Blomgren who was supposed to take care of [design of] the intake towers. And there was Warner who had [responsibility for the] the diversion tunnels. And Hammond who was at the other end of this big bullpen, and he was assigned to take care of dam design.

Staffing up in Preparation for the Design of Hoover

And so this is a~~n all~~ big empty space. I was the first one brought in there on the seventeenth [of August], and by the first of September they started filling it up. There must have been seven or eight others that came in. And gradually it expanded to where it became a staff of this magnitude.

Storey: So this is maybe . . . .

Move to the New Customs House

Hoffman: What happened was that we stayed in the Public Market Building and in the Wilda Building until 1931, at which time they had constructed the [New] Customs House on Nineteenth and California. So we moved into the Customs House sometime in the summer of . . . . Yeah, I guess we stayed in the Public Market until ~~1932~~ [late 1931], and then moved into this building at that time.

Storey: Into the Customs House. And this picture is a group picture, and it's listed up to, what is it, 203 people, I believe. So the staff had grown quite a bit.

". . . the only work we had was [working] on the Boulder Dam."

Hoffman: Yes. Well, as the work progressed, the staff grew. Now the only work we had was [working] on the Boulder Dam – the entire staff was Boulder Dam. The positions were filled, and there was an urgency to get started. And so specification design was the first order of business, and the entire staff of the Bureau [in Denver] was employed just on working up specification designs and issuing specifications. I don't recall – and I suppose the history would show – I don't recall whether they had a separate contract for the diversion [tunnels] ~~dams~~ and then a main contract for the rest of it, or whether they did it all at one time. But in any event, probably just one specification, but I'm sure the history will show that, if you can dig that out, (Storey: Uh-huh.) or if you've already dug it out.

Originally Assigned to the Concrete Dams Section

So I was assigned, when I came in, to the Concrete Dams Section, Mr. Hammond.

"I lasted there about a week"

I lasted there about a week, and then Hammond told me, he said, "Well, you go over to the Spillway Section," and Mr. McConaughy was in charge of that, "and you stay there just for a short while and then come back" [and design dams].

Stayed in the Spillway Section

Well, I never did – stayed with the Spillway Section from then on, and all the way through to where the work was all completed on that, both the specification design[s, estimates] and the construction [drawings] work, and the model testing, and all of that. So in effect, I became a spillway expert, continued in that for the entire time of my career with the Bureau.

John L. Savage Used to Come down to the Drafting Tables

Interesting the way the Bureau operated then. When we had something worked out, had made a study, we didn't take it up to the boss to show it to him, the boss came down to us. So *Savage* used to come down. ǂ Remember here I was just a junior engineer, we only had drafting tables, with one drafting stool. He would come down from his office and Mr. Steele, who was the head of the Dams Section, and Mr. Savage, and my boss, Mr. McConaughy, and I – for hours we'd be sitting there [conferring and discussing designs, drawings,

and calculations] – or I wasn't sitting, I was always standing. I had *one* stool, Mr. Savage was accorded the one stool, so he'd sit there and conferences were always around what was on the drafting table, the work that I had worked out. Instead of my pulling up the drawings and bringing them to the boss up in front, he came down and they'd scribble on the drawings and make changes and ask my judgement, even though I was just a lowly junior engineer. I can recall that when the specification was issued, the spillway was entirely different than as it turned out to be, because we were just green – everybody was green. We, of course, there'd been *some* experience on dams and dam design and construction and spillways and all.

". . . something of this magnitude was beyond what had been experienced before. . ."

But something of this magnitude was beyond what had been experienced before, and so there was an awful lot of discussion continuing. If I can recall, the specifications had one spillway, which had a 700-foot-long crest. It turned out that we ended up with two spillways of 400 feet each.

Hydrology at Hoover Dam

As far as hydrology was concerned, *nobody* knew about hydrology. So everybody depended on Debler, who was supposedly the hydrologist. And the practice at that time was to look at the records and see what the maximum flows, those that have been recorded, and apply a factor to that, and from that decide on the size of the spillway. And that actually continued until the science of hydrology

took hold, maybe ten years after that time. So the first thing we had to know was how big to make the spillway. And I recall that maybe they had a record flood of a little over 200,000 cubic feet per second. So the original design on the spillway was, I think, about 300,000 cubic feet per second. And that was, I think what the specifications were predicated on. It finally turned out that they raised the ante, and then the design was 400,000 cubic feet per second, 200,000 for both the Arizona and the Nevada spillways. In order to work up a proper design, of course, the first thing that we were working for was to work out designs or concepts for model testing.

Model Testing for Hoover Dam

And at that time, there was no model testing facility here [in Denver], so everything, all the model tests that were started were done in Fort Collins. And not until the Customs House was finished did they build a [hydraulic] laboratory in the basement of the Custom House, and that was done at about this time[, but after the tests on the Boulder Dam spillway were done]. As a matter of fact, there are no people from the laboratories here, so that the laboratory was still operating out of Fort Collins at that time. (Storey: In the summer of '32?) In the summer of '32. But I think they might have been building, or had started a laboratory in the basement of the Customs House.

There aren't any people here from the Concrete Laboratories, because they had their offices on Welton Street on Twenty-second and Welton, and Twenty-first and Welton, and had the laboratories

there for the testing, and with limited facilities. They didn't build the testing machine until – well, actually until they moved to the . . . . What is it?

Storey: Oh, the [Denver] Federal Center?

Hoffman: The Federal Center, yeah.

Storey: They didn't have it in the basement of this building?

Hoffman: Yeah, but not the big machine, see. The big machine, if you saw the big machine . . . . (Storey: Yeah, the five million pound one.) Yeah. But they did have enough facilities there. They're old garages, and they'd converted these garages to laboratories. So that, in general, was what was going on in '32, and until . . . .

Effects of the Depression at Reclamation

Well, to backtrack a little bit. When I was employed in 1930, that was after the [Stock Market] Crash, and the conditions didn't show up until after I was employed. That's the time of unemployment, and then the effect of the Crash and all. So the Depression was getting started in 1930, and by 1932, of course it was almost at the depths of the Depression, before Roosevelt got in. But we were engaged in Boulder Dam work, and then we weren't affected by it. But about that time, or at the time Roosevelt got in, the first thing that happened was the WPA – that was the Works Progress Administration – and they were looking for ways to get to employ those that – to try to get us out of the Depression. And I remember that they started hiring people at that time, and brought in other projects to work on. One

of the first things that I can recall that they had a parade here, and we were at the head of the parade as being people who exemplified being employed, and being put to work by the Bureau of Reclamation. So we marched down Sixteenth ~~Avenue~~ Street.

Reclamation Hired Staff Through the WPA

And from the WPA they started hiring people [for Bureau of Reclamation staff]. I was assigned as a junior engineer when I came in at $2,000 a year, and they cut us to $1,600. And when WPA came in, they started hiring people at $1,640.

"Here we had two years, some of us, the older people that are in there, had two years of experience, and we were getting less than the [newly hired] WPA people . . ."

Here we had two years, some of us, the older people that are in there, had two years of experience, and we were getting less than the [newly hired] WPA people – which is just an aside. But they started bringing in these people and started the projects to work on for the WPA and then later for PWA, which was the Public Works Administration.

"So until about 1933, Boulder Dam was the only work that was done [in the Denver Office]. . . ."

So until about 1933, Boulder Dam was the only work that was done [in the Denver Office]. *After* that, why then we started getting assignments for small projects [under PWA auspices].

Most Design Work and Construction Administration Was Done in the Field Previous to Hoffman's Arrival in Denver

Now to go back – although it wasn't in my experience, but I knew about it – was that until the time that I came in, most of the design work for various projects was done by field people, and that's the way Savage got his start, that's the way all of these people in this front row [referring to photograph] got their start. The Denver Office was a very small organization, and I don't know exactly when and to what extent the Denver Office, what their particular duties were, because most of the [previous] project work was done in the field, and there was no construction administration done [in Denver], and they didn't issue any specifications for these. This was all done in the field. So I think Boulder [Dam] was the *first* one in which the Denver Office was given the responsibility for all of the design and the construction administration, and before that time it was all done in the field.

Most of the Denver Office Staff Had Come from the Field When Hoffman Arrived There

But most of these people came from the field. I know *my boss,* McConaughy, came from Yuma. He served in World War I, and then after that – I think he came in the Bureau before then – and then went to war in World War I. [He worked some time in the Phillipines,] and when he came back [to Reclamation], he was out in the field. And the majority of these people, the same way. Now whether Walter was ever a field man or whether he headed up the Denver Office [much before 1930],

and what the size of the office was, [I do not know] ~~is hard to say~~.

Storey: So McConaughy is M-C-C-O-N-A-U-G-H-Y?

McConaughy

Hoffman: Yeah, here's McConaughy. These were the people that were assigned to the various sections, you see. This was Hammond, who was [head of] the Dam Section. This was Warner who was the tunnel. This McConaughy with the Spillways. This is Blomgren that had the responsibility for the intake towers, and the outlet. So this was the Dam Section. Keener was the assistant. All right, now, they were under Steele, you see.

Storey: Uh-huh, standing right behind him in the picture too.

Hoffman: No, Byron Steele was somewhere here.

Storey: Oh, I thought he was over there.

Hoffman: And this group [referring to picutre] was part of Warner's group. And this group here was part of the Dams. And this group here – well, we can tell here, it tells you, I guess.

Storey: It only gives the titles for these.

Hoffman: Yeah, but it says here, here's specifications, here's electrical, in this front group.

Storey: Yeah, I see.

Hoffman: Does it say Dams there somewhere? Yeah, here is dams. Schultz [phonetic spelling] is still living. It might be of interest for you to interview him. I don't know, he's out at some nursing home. Now whether he's well enough or alert enough for an interview, I don't know.

Storey: Who are the other person that're still living?

Hoffman: Well, Schultz is still living. (pause) I don't know if you want to take the time.

Storey: Yeah, we can do that later.

At First There Were Three Stenographers

Hoffman: So that's how the [Denver Office of the] Bureau got started. Interesting. Our steno pool, with all these people, three women comprised the whole steno pool. These three women did all the steno work for the entire staff.

Storey: Including typing all those specs?

Hoffman: Including . . . . Well, I would imagine that mostly I think it was for correspondence. But there was no dictation at that time, we wrote out our own letters, and we would send it up to one of these gals, and then in due course we'd get it back to where we'd submit it. That isn't the way things are nowadays.

Storey: Now, did you sign the letters?

Hoffman: *I* didn't. It depended on if it was our memos, we signed them. Letters were generally signed by – Steele would be the lowest one – but generally they

would go up to the front office and Savage would sign most letters that went out of here. So that's the way we operated then, compared with how things are now, you see. (Storey: Um-hmm.) It was a rather close-knit group, there was no formalities at all. If we wanted to confer with somebody at one of the other sections, the other divisions, even though I was only maybe an assistant engineer at that time, we had free access to anybody we wanted to. As I told you, the bosses came to see us instead of we having to go and see the boss. But I guess as time went on . . . .

END OF SIDE 1, TAPE 1. FEBRUARY 3, 1995.
BEGINNING OF SIDE 2, TAPE 1. FEBRUARY 3, 1995.

A Fairly Informal Organization

Storey: You were saying that Jack Savage was always available for consultation. (Hoffman: Right.) And it was very informal, you could go to anybody.

Hoffman: Whenever we wanted to see anybody, even at later times, there was no great formality, we didn't have to make a reservation a day ahead of time to go up and see the boss or anything. If he wasn't busy, we walked in to see him. And even I, as just a lowly engineer at that time, if McConaughy thought that I could be of any help to him, when we took up a problem, why I was always there even as a junior engineer or as an assistant engineer, to go up, or have Savage come to my desk and confer.

Storey: What was McConaughy's manner as a manager?

McConaughy's Manner as a Manager

Hoffman: Well, he had a reputation. If he had anything to say, he said it. But somehow he and I got along famously – not some of the other people. But we used to sit, he would take a negative position to any problem, in order to get you to try to convince him that you were right. And even if he *knew* you were right, he would still give you enough trouble so that you had to state your position and make sure of it before he would accept it. But he was, to me, I think one of the best bosses. Of course he was the *only* boss I had. But of all the people, he and I got along much better than some of the others did between a boss and a subordinate. And it turned out that people came and went in our section. But I stuck with him. When it came to promotions, he was looking after my interests as much or more than some other bosses might. That comes a little later in my position with the Bureau, and you want to talk about that, (Storey: Oh, we do.) but that comes a little later.

Storey: What about Jack Savage's manner in dealing with employees?

John (Jack) L. Savage's Manner in Dealing with Employees

Hoffman: Wonderful! He was the kindest man, and the most considerate man, and as far as a person was concerned, I thought very, very highly of him. And never overbearing, never exercised his prerogatives, but a wonderful listener and a man of good judgement. Unfortunately he, if you know, he ended up with Alzheimer's.

Storey: I didn't know that, no.

Hoffman: (coughs) You'll excuse my coughing.

Storey: Don't worry about it.

John (Jack) L. Savage

Hoffman: Of course, as time went on, after Boulder Canyon, why then it became a little more hectic with all the other projects and all, and a lot of the responsibility trickled down more to the branches and the sections. So unless there was something that was extraordinary, why we didn't take those problems to Savage. And he developed a reputation nationally and internationally because he's a pioneer in dam design, and had run the Bureau, which was attaining an international reputation, so about the time of World War II, he started thinking of doing consulting work. So I think he took his spare time and did consulting work. I remember he was called to China on the Yangtze, which was, I think, an independent thing – we didn't have a foreign activities [office] at that time – and did other consulting work. So he started thinking more about international and consulting and was always available at the Bureau, and I don't know whether – I guess he still had the position of Chief Designing Engineer, until sometime during World War II, at which time *I think* he decided that he would take a retirement and go to consulting.[2] And he did that for a year or two. Now I'm not sure, and you'd have to look at his personnel records to know exactly. But it wasn't much after that, in the mid-40s that I think he was retired from

2. John (Jack) L. Savage retired from Reclamation in 1945, at age 65, with 34 years of service with Reclamation.

the Bureau at that time, and he'd start wandering off from his home. He didn't have any children, [was a widower,] and I think he had a housekeeper, and she just couldn't keep track of him. And it wasn't much after that that he passed away, I think.

Storey: Here in Denver?

Hoffman: Yes.

Storey: How did people address him? Did you say "John," or "Jack," or "Mr. Savage"?

Hoffman: Oh, it was always Mr. Savage, for most of us. I don't know who called him Jack. They called him Jack, not John. I don't recall they ever called him John.

Storey: But his official given name was John?

Hoffman: It was John, John L. Savage. He was a graduate of Wisconsin, I remember. And then in the early days before the Denver Office, he was out in Idaho, did a lot of work in Idaho. This one may be of interest to you. You've seen this one, haven't you?

Storey: No, I haven't. This is a book.

Dams and Control Works

Hoffman: This is *Dams and Control Works*.

Storey: Uh-huh, with a letter to you from John. C. Page, Commissioner, dated, April 26, '38.

Hoffman: Yeah.

Storey: Oh, you prepared a chapter for this one too.

Hoffman: Yeah, well the reason I brought it out here, I thought maybe you'd want to know about Savage. And there~~'s some~~ [are articles written about Bureau] projects here, like the Owyhee. And in references [are publications written by Savage] . . . . So you see here he *was* on the Owyhee Project.

Storey: Uh-huh, and that's widely recognized now as preparation for the construction of Hoover, in terms of design and so on.

Hoffman: Well, yes, but you see, he got started, was interested, here. So he was on Owyhee. He got started in this idea of – before Hoover, there wasn't much text.

Storey: Much text about what?

Hoffman: About dams, design of dams. And I remember in college, we used Wegmann.[3] Wegmann was the text for dam design. Well, that was entirely for gravity dams. Now the design of arch dams hadn't gotten much headway, until about the time that Boulder Dam was started, thinking about Boulder Dam. In the meantime, here were these dams that they were constructing: Owyhee was one of them, American Falls was another. Let's see if we can . . . . (sounds of paper being unfurled) Arrowrock was another. Now, Arrowrock, if you've heard the name of Julian Hinds . . . .

3. Edward Wegmann, Jr. *The Design and Construction of Dams*. New York: John Wiley & Sons, 1888 [1st edition]. There were several subsequent editions.

Storey: Um-hmm, H-I-N-D-S?

Julian Hinds and *Engineering for Dams*

Hoffman: Yeah. Julian Hinds was part of the Bureau at that time, see. So these are the people that got started in the design. Now Julian Hinds got to be an expert enough to co-author a book, see.

Storey: Called *Engineering for Dams*?

Hoffman: Yeah, three volumes there. It's a wonderful book, at that time, when this was done in the late 20s, I guess, or 30s. This was the text, you see. When is this?

Storey: Did you know him personally?

Hoffman: No, I didn't ever meet him personally, but Creager I met.

Storey: C-R-E-A-G-E-R?

Hoffman: Uh-huh.

Storey: Let's see, there should be a date on that book. "Published in London and New York by John Wiley, copyright 1917 and '29, and renewed in 1944."

Julian Hinds Left Reclamation to Work for the Metropolitan Water District of Southern California

Hoffman: In '29, yeah. So Julian Hinds left the Bureau, went to work for the Metropolitan Water District in Los Angeles. And so this is the early history of the people in the Bureau. There was Hinds and Savage

and then some of these other people that came. There are a couple there that were people from the projects.

Storey: Now which chapter did you write in this book?

Hoffman: This was not a chapter, this was just [the article] I wrote on Arrowrock Dam.

Storey: There it is.

Hoffman: Yeah. This is interesting, because this is a *good* history of these particular dams. Some of them are old ones. Boulder Dam was being . . . . This was written around '35. (sounds of papers shuffling) Now, did they date it? So this is maybe '36 or so. This isn't dated. But this is a wonderful history of those [dams] that had been constructed at that time. And some of them were just being completed, when I came to the Bureau after the Denver Office was built, or was started, and some of these are older ones now. Arrowrock was an older one, as I recall.

Storey: Twenties, I believe.

Hoffman: See, 1915.

Storey: Fifteen! Even earlier than I was remembering.

Hoffman: [In] 1916. But if you want to go back in history, one of the first ones, ~~that~~ was Pathfinder, and the other was Buffalo Bill. It wasn't Buffalo Bill, it was Shoshone Dam at that time.

Storey: When you were designing, working on Hoover . . . . You know, I'm a historian, right?, and I sort of think

that engineers, they go do the design and they're all done. Tell me how the design *process* worked. You've already mentioned that the spillway design evolved, but what kind of specs were they bidding on, and how did they change over time?

Julian Hinds Developed the Theory for the Side Channel Spillway

Hoffman: Let's talk about Boulder Dam's spillway. Julian Hinds was the one that developed the theory for the side channel spillway. He applied that *first* to Arrowrock. So Arrowrock spillway was one of the designs that was evolved, based on his theory of side channel spillway design.

Storey: Instead of?

Hoffman: Instead of a straight chute spillway.

Storey: In the center of the dam or something?

Hoffman: If the spillway was over the face of the dam, why it was just a question like Grand Coulee, you see. In this case, we had these gates.

Storey: In the case of Arrowrock?

Hoffman: Of Arrowrock. Same thing was applied to Grand Coulee, same thing was applied to Hoover. We had these . . . .

Storey: Tainter gates? Are we talking about?[4]

4. The gates at Hoover Dam are drum gates.

Hoffman: No, no. (pause) My memory, you'll have to forgive me – at eighty-six, sometimes it fails me.

Storey: The gates at those dams are easy to find out about.

Hoffman: Yeah, I should know that! Are they called tainter gates?

Storey: Well, those are the ones that sort of revolve on a pivot, I think.

Hoffman: Yeah, but they have a name, see. (pause) Drum gates!

Storey: Oh, okay, those are a little different, I believe.

Guido Wyss Worked on the Drum Gates at Hoover

Hoffman: So these drum gates were . . . . This was an adaptation from European designs. I remember the fellow they got to work on the drum gates was Guido Wyss, who was a Swiss, and he spoke with a Swiss accent.

Storey: Do you know how to spell his name?

Hoffman: Yeah, Guido Wyss, W-Y-S-S. Guido ought to be here.

Storey: (referring to printed source) Oh, just W-I-S-S.

Hoffman: G. W-Y-S-S, 115.

Storey: Okay, so what was he working on then?

Hoffman: He was working on these drum gates.

Storey: I can find the 115, maybe, right there.

Picked up Staff Based on Their Experience

Hoffman: Yeah, that's. They had another one, Pete Bier who worked on steel pipe.

Pete Bier from the Ambursen Dam Company

Pete Bier was another one that was a ~~foreigner~~ [European]. So they picked up these people at that time, based on the experience. Of course when I came to the Bureau, I was a greenhorn, I was just a junior engineer. But some of these that was brought in later, this fellow by the name of Rockwell, that was in ~~this~~ [our] section, before he came to the Bureau, he worked for the Ambursen Dam Company, which ~~is~~ [developed] a specific type of slab and buttress type dam. So he applied [for a position at the Bureau] back there for whatever reason, I guess Ambursen Dam wasn't doing anything and he was an expert or was qualified in Ambursen Dam [design], so they hired him. They had an Ambursen at Stoney ~~Gate~~ [Gorge].[5]

Storey: Stoney Gorge, I believe, in California.

Hoffman: Yeah, Stoney Gorge. So this was before Rockwell's time. But they employed him, put him on the staff because he'd had experience in that. And that's the way *all* of these people had had – except for the

5. Stoney Gorge Dam on the Orland Project in California was built in the period 1926-1928.

younger ones that came in directly out of school – why they had some qualification, and that's how they were considered for the positions to staff the Bureau. So a lot of them had ~~enough~~ [previous] experience, and then we talked about these oldtimers that had worked on here, people like Julian Hinds, who was at that time a Bureau individual. Savage came. I think Julian Hinds and Savage may have been working on the same projects in the field.

We learned these things, it's unfortunate that we didn't delve more into it at that time, to know what the history of these people were and how they were responsible for whatever the Bureau's achievements were. *But*, this whole group, preceding that time, and some succeeding this time, were people of qualifications that were the ones that gave the Bureau of Reclamation the reputation that it achieved, and, incidentally, because of the projects that they were working on, like Grand Coulee, and Hoover Dam, and the California (Storey: Shasta?) Central Valley, the Shasta, and Friant and so on. So that's what made the Bureau and the reputation. *But* it was not the Bureau, it was the people.

Storey: When you came in '30, they started you working pretty much almost right away on spillways. (Hoffman: Yeah.) So were you working on the specification that went out to bid for the spillways?

We Had a Drafting Board and Used Twenty-inch Slide Rules

Hoffman: Yeah, I was on the drafting board. That's the only thing, an engineer, you get them a drafting table; and we thought it was wonderful at that time, instead of

"T" squares, why we had a drafting machine, an old drafting machine. I've still got one here that I picked up from sales[6] or so on, and I suppose I could still use it if I have to. So anyway, we didn't have computers, we had a twenty-inch slide rule, and all calculations were done on the twenty-inch slide rule. We didn't have calculators either. We'd have to either do it longhand and I guess that was the only way. If you wanted accuracy that you couldn't get out of the slide rule, you used logarithms. Are you an engineer?

Storey: No, I'm a historian. (chuckles)

The First Calculator

Hoffman: Well, that was our tools of the trade, was logarithms and slide rules. The first calculator we got, we had this big bullpen, you see, with thirty or forty people in it. We started out, we had [only] two or three calculators, hand cranked. And in order to get accuracy, if you wanted to get to the first or second decimal place, ~~we had to go not at our desk,~~ we had to go to the calculator, which was maybe five or six desks away, and hand crank this thing. So in order to ~~hand crank~~ [use it], you'd crank, crank, crank, and when you got to a certain point, you came back, flipped to the next decimal; crank, crank, crank, back, flip. That's the only way we could do multiplication, other than to do it manually, the way we were taught. So that's how Boulder Dam was designed.

Storey: Now when that first spec went out to contract . . . .

Hoffman: That was about 1931.

6. Sale of surplus government property.

Storey: How detailed was that?

"We *had* a *lot* of orders for changes [at Hoover Dam] . . ."

Hoffman: Detailed enough that I don't think that they had any great problems as far as order for changes. We *had* a *lot* of orders for changes, because as I indicated, we started out with a spillway that was entirely different from the one that we ended up with.

Everything in the Contract for Hoover Dam Was Unit Priced

But, the way you got around it, everything was unit priced, so that you *knew* that you could make changes and whatever changes you made, if you could agree to the same unit price, why that was it. The concrete in the dam, they didn't know exactly what the shape of the dam was at that time, what the exact radius was, *but* they had a unit price on it. So at four dollars a cubic yard for concrete, it didn't make any difference to the contractor whether the curve was with a 400-foot radius or with a 412-foot radius. And the same thing with excavation. Excavation was so much per cubic yard, and if you gave him more, he was more than delighted. And if it became less, then he'd probably put in a little bit of a complaint. But with the spec, and with negotiation for order for changes, Boulder Dam I think was built for $50 million or $75 million – it'd cost you *billions* now to do it.

Storey: Yeah. But I think it's the change orders that I'm sort of interested in. I'm interested in the internal process that occurred as the dam was being built.

S. O. Harper, the Construction Division, and Writing Specifications for Hoover Dam

Hoffman: But you see at that time, we didn't have a Construction Division. Harper was the Head of Construction.

Storey: S.O. Harper?

Hoffman: S.O. Harper. He didn't have a staff. Orders for changes, specifications, we had one specification writer, Stetson. Stetson was the specification writer. Other than that, all the responsibility for the specifications were down in the section level. Order for changes and so on, we didn't have an Estimates and Analysis Branch like they had later on. Of course now they don't have anything, I'm sure. But at that time, Estimates and Analysis was an unthought thing.

Specifications, Estimates, and Negotiation for Changes Occurred down at the Section Level in the Early Days of Hoover

We (raps table for emphasis) made up the estimates and we decided on the items of the specification and everything, right down at the very section level. And negotiation for changes would come back to us at the design group, not at a special branch, not at a special branch.

Storey: Okay. For instance, you sent out that first spec for bid . . . .

Hoffman: Yeah. This was Stetson's responsibility to get the specifications out. Now how he went about it, what

assistance he had . . . . You know, most of the specifications, they come to a point where they're standards. So what you do is, you go to the drawer and you pull out the standards. Now, there are specifics, you see. The specifics we had to write ourselves. The designers did that, see. We had one man that was writing specifications, so in our branch we had one man writing specifications.

Lester Bartsch Later Headed the Specifications Branch

Later on they had a Specification Branch ~~in Bartsch there, who was~~ [headed by] Lester Bartsch, [who] ~~at that time~~ was [previously] with Blomgren ~~at that time~~. They put him in charge of a Specification Section. I don't think Silverman was there at that time. And another one was Bartsch and Don Searles[7] and Icky Silverman. I think that was the Specification Section, assigned not to the Dams Branch, but assigned to the Construction Branch.

Storey: Let me ask this question a little differently. I don't think I'm quite conveying what I'm trying to get at. How did the design that you were working on, evolve as the dam was being built?

Hoffman: Well, the first thing that you do is you issue a specification, with drawings, and that becomes the "bible" as far as the contract is concerned. Okay, now, there are provisions, I'm sure, in the specifications – it's not exactly clear to me now, I don't remember – *but* if we wanted to make a change, then at that time we sent the change out to the field,

7. Searles assisted Bartsch.

and the construction engineer was the one that negotiated for an order for change. And in most instances, the order for change either involved an adjustment or no adjustment in the contract in the unit prices.

". . . there were hundreds and hundreds of changes that were made between the time of the first issuance of a design and the final construction. . . ."

Now from the time that we issued – this isn't inherent only in Boulder, but it was the same thing in all of them, that there were hundreds and hundreds of changes that were made between the time of the first issuance of a design and the final construction. And that then was a question of having to have negotiations or contract adjustments or whatever was involved in that particular procedure.

Storey: And so if the designers in the Denver Office thought there needed to be a change, they would *design* it out?

Hoffman: We would make the changes, send out the drawings . . . .

Storey: And the new specs?

Negotiations for Change Orders Occurred in the Field until the Denver Office Created the Construction Branch

Hoffman: Yes, if there was a question. In most cases, the same specs would apply. And the order for change then would have to be worked out. And that was done (Storey: That was done out in the field?) out in the field, until the time that they set up a Construction

Branch. See, at this time there wasn't any Construction Branch at all. Harper was in charge of construction, but he didn't have a staff, so there wasn't any special Construction Branch.

Deciding When Construction Changes Were Required

Storey: So how did you in, say, the Spillway Section or branch (Hoffman: Section.) – Section – decide that something needed to be changed? How did that happen?

Evolution of Spillway Capacity as Erdman B. Debler Worked on Understanding the Hydrology of the Colorado River

Hoffman: Well, at the time that we worked up the scheme – let's say the scheme, not the design – on the spillway, and put it in the specifications, that was the time that we were making model testing. So, when we issued the specification, Debler told us we should have a capacity of the spillway of 250,000 cubic feet per second. I can't remember exactly. Later on he had a change of heart, and we didn't dispute him ever, as far as hydrology was concerned. We had nothing to do with it, see. Same thing was true with the reservoir. They decided on the height of the dam, whether or not they made a reservoir . . . .

END OF SIDE 2, TAPE 1. FEBRUARY 3, 1995.
BEGINNING OF SIDE 1, TAPE 2. FEBRUARY 3, 1995.

Storey: This is Tape 2 of an interview by Brit Allan Storey with Carl J. Hoffman, on February 3, 1995.

You were talking about reservoir design.

Hoffman: Yeah, reservoir design is based on the yield of the river, see. You can't build a reservoir for a million acre-feet of storage when you have a river that'll only yield 100,000 acre-feet. So a reservoir study is a planning phase. And that's based on reservoir operation studies: taking the records for as many years back as you need it, as it was available, and from that making a reservoir operation study and saying, "Well, over a period of this many years, you would then be able to have a yield of so much, *if* you built the reservoir to a certain size." And that's where they got into trouble on Boulder Dam, on Hoover Dam.[8] At that time, Debler was the one that was making the studies, and he said, "Well, you can have a yield of 15,000,500 acre-feet annually, based on his study, based on whatever he did. He was a hydrologist. He was the kingpin, see. And he says, "Well, we should have a reservoir of 32 million acre-feet of storage." I can't remember exactly, but I think that may be what he said. With 32 million acre-feet, we can guarantee you a yield of 15½ million acre-feet annually. So they went out to all of the states and they negotiated and they worked up a compact that California is entitled to this many acre-feet, and Arizona this many, and Colorado this many, and so on. Turns out that the yield isn't 15½ million acre-feet. I've been out of it so long that I can't recall it all, but I think maybe the yield is only 13½ [million acre-feet]. So there's a big squabble now between California and Arizona and whatever the other states,

8. Originally named Hoover Dam by Secretary of the Interior Ray Lyman Wilbur in 1931, Secretary of the Interior Harold L. Ickes ordered the name changed to Boulder Dam in 1933. In 1947 the Congress officially changed the name back to Hoover Dam.

because they were too optimistic in yield. But that's the way they decided on the height of the dam, or on the spillway. Nowadays, they make hydrology studies, and they take rainfall [records], ~~and they say with rainfall~~ and the net rainfall, and then you work up charts of whatever. (Storey: The flows and things.) The flood flows and all. *From that*, we can sit down and we can make a study of the capacity of the spillway. Whether we want to take this flood hydrograph and want to take and put ~~it all~~ [flood yields] in storage and make the reservoir higher and have a smaller spillway, or whether we don't take any of that and we make the spillway [capacity equal to] the size of the peak of the hydrograph, these are studies that we make now in order to determine the optimum relationship between spillway, and dam, and so on. Way back at *this* (raps table for emphasis) time, nobody knew ~~anything~~ [much] about hydrology. Everybody was basing hydrology on records.

Storey: And on the Colorado River Compact, it sounds like.

Erdman B. Debler and Randy Ryder

Hoffman: Well, but even before then. And Debler was the kingpin, and Randy Ryder if you know Randy Ryder (Storey: No, I don't.), his assistant. Debler was in planning and Ryder was in Hydrology, so it was between the two of them, that they decided exactly what the size of the reservoir was, and what the size [capacity] of the spillway was. They put out a memorandum, and this was the bible, see, and everybody stuck with that. And now they *are* stuck with it, see, because Safety of Dams now comes

along and they're super-cautious, you see, and so they say, "Well, here, this spillway was too small, and so we ~~got~~ [have] to increase the size of this spillway." And Roosevelt [reservoir] was not the right size, so they've raised the capacity of Roosevelt *twice* now. And in my time there were some of these spillways that had to be modified. *Now* I don't know what's happening.

Storey: Yeah. But I'm fascinated with what you said a few minutes ago. You said they sent a "scheme," that you really wouldn't call it a plan.

At Hoover Dam Relied on Model Tests Undertaken after the Specifications Were Issued

Hoffman: Well, it was a plan, but let's take Boulder Dam. We didn't know what we were doing. I mean, we knew what we were doing, but we didn't know what was the best. So we relied on model tests. We didn't have *time* to make the model tests *before*, so we issued the specification, indicated a spillway, and at that time – this is kind of hazy to me – but I think in here he says that . . . . ~~(referring to photograph) This is Charlie Carter at Hoover Dam/Boulder Dam.~~

Storey: But it was 200,000 or maybe 250,000 cfs?

Hoffman: Well, but I think it was one long spillway, and then it turned out to be . . . .

Storey: To be two. And what happened to cause the change?

Site Conditions Altered Plans

Hoffman: Site conditions, for one thing. Foundation condition is another thing. Capacity is another thing. So everything could ~~be~~ [warrant] a change. I can't remember on Hoover.

Storey: (aside about water for cough) I sort of have the image that a specification was put together for Boulder Dam, and because of the unit pricing, Reclamation could change the details of the design. I mean, we knew we were going to build a dam, right? And we knew it had to have certain features, it had to have the powerhouses, or a powerhouse, and so on.

Hoffman: . . . concept was retained except the details.

Throughout the Construction Process Details Changed

Storey: But throughout the process, the details were evolving.

Hoffman: Yeah, but you see, at that time we had one geologist, Frank . . . . We didn't have a Geology Section. I suppose we had some field geology, but we designers didn't have a lot of information on foundation. Testing was done, always, but never in sufficient amounts. So we were really working on meager information. And so, ~~as construction developed,~~ after specifications were written, as construction developed, why then of course there always were changes in concept, changes in actual conditions as they were encountered in the field, and so on. So you had to have changes. The same thing is true if you build a house – you don't always build a house the way the architect tells you in the first place, you make modifications and changes based on conditions.

So this is engineering, you see. As a project developed, as a problem develops, then you have the prerogative of either making the changes, or you're forced to make the changes because of the conditions that are encountered. So this has been true throughout Reclamation and throughout all construction – you don't always end up with the same concept that you start with.

Storey: Do you have any idea how late into the construction process you would have been making changes on Hoover, on Boulder Dam?

The Majority of Projects Have Ongoing Changes

Hoffman: 'Til the very last. Always. I suppose as you finished up, why then that's it. But it isn't always it because they keep making changes on these projects – not with the same contract maybe, but you take a majority of these projects, there's always something comes up. Either safety of dams comes up or something else, or enlargement or whatever. Or like on Glen Canyon where you can't fill the reservoir and things like that.

Storey: Uh-huh. Now, you were in Denver at a drafting table in the bullpen . . . .

Originally Assigned to the Concrete Dams Section

Hoffman: Okay, to get back to me, huh? (Storey: Yeah.) Okay, I came as one of the first employees on the Boulder Canyon Act, on the appropriation. As I started to tell you, I came and was assigned to the Concrete Dams Section with Mr. Hammond, stayed

there a week and was lent to the Spillway Section, and somehow remained.

Loaned to the Spillway Section

And people came and went, [but] ~~and then~~ I stuck it out, and advanced as time went on from assistant to associate. The war came along and a lot of the people left, some came back, some didn't.

At the End of World War II Became Assistant Head of the Spillway Section

So at the end of the war, I became the assistant head of the Spillway Section. McConaughy, at that time he was maybe – well, he retired, he stuck it out 'til the last, retired at age seventy in 1951. But after the war, they decided that they were going to reorganize again. We had a Spillway Section at that time under McConaughy, and ~~the~~ [for] outlets [design it was] decided they'd have a separate section. So the Dams Branch was the Concrete Dams Section, Earth Dams Section, Spillway Section, and an Outlet Works Section. And after the war, they started up again in 1946. We made another move, I don't know whether you heard about *this* one, but we moved from – it got to the point *before* that, that the Canals Branch, there was no room for them, so they moved downtown. We were in the Customs House on Nineteenth. They put them into some office building over there on Seventeenth and Stout, I think, or California or Stout. So they had to separate [the staff] ~~that~~ to some extent.

Moved into Customs House and Golden Eagle Building after World War II

Well, after the war, it got to the point where there were all kinds of projects coming in to make work for the returning veterans and all. So they moved us out of the Customs House and into the Golden Eagle Building down on Larimer and Fifteenth, if you've heard of that one.

Storey: Golden Eagle Dry Goods Company.

Hoffman: Golden Eagle Dry Goods Company. And that had closed up at that time, was an empty building. So after the war, they moved us over to the Golden Eagle Building. We stayed there maybe as much as a year or so. And then they redid the Arms – what do you call it?

Storey: Oh, the Remington Arms Plant?

Move to the Remington Arms Plant at the Denver Federal Center

Hoffman: Remington Arms Plant. And that then became then the Federal Center. Then they moved us into the Federal Center.

Reorganization of the Spillway and Outlet Works Sections

Well, in the interim, they decided that they had the Spillway Section and the Outlet Works Section as separate sections. They decided that they would make two sections, two Spillway and Outlet Works Sections, instead of having a separate Spillway and a separate Outlet Works Section. Before that time, Rockwell, who I told you was supposedly the expert on Ambursen Dams, he came and he worked with the

spillway people, and then they gave him the Outlet Works Section. So there was a separate Outlet Works and separate Spillway Section. And then when more work came in, they decided that they would call us the Spillway and Outlet Works Section Number One, and assign a Spillway and Outlet Works Section Number Two [to Rockwell]. So McConaughy was head of one section, Rockwell was the head of the other section. And Rockwell left – I guess he retired – and they took a fellow out of the Concrete Dams Section by the name of Tabor and put him in charge of Outlet Works Section Number Two. Well, I was the assistant head of the Spillway Number One Section, McConaughy was in charge, and in 1951 he turned seventy and he had to retire. And I was supposed to succeed him. But a little politics, I suppose, and I'm not going to delve into that – instead of continuing the way they did, they combined our section with the other Spillway and Outlet Works Section of which Tabor was the head. So he had an assistant, I was the head of the other, so we were two assistants under Tabor. And Whinnerah was the one that was the assistant to Tabor. So he was number one assistant, because Tabor wasn't going to say, "Well, you can be asistant and my asistant's going to be a Number Two." So I became a second assistant. So I was kind of a fish out of water, you see, because you don't need *two* assistants. So anyway, I had my group of people and Whinnerah had his group of people, and everything went along all right with Tabor until Tabor developed . . . . What do you call the disease where the lymph . . . .

Storey: Oh, leukemia or something?

Hoffman: Leukemia, yeah. So in 1954, Tabor passed away. So, since Whinnerah was the assistant, he took over as head. So I became assistant to Whinnerah. And Whinnerah didn't have the qualifications. I shouldn't speak ill of the dead, but Whinnerah[, in my judgement,] didn't have the qualifications to head up a [section] ~~group~~. He wanted to exercise his prerogative and be the boss all the time, and he was going to dictate, so I ~~did~~ [was relegated to] the odd jobs. I had a little group, this group thought it futile to come to me, and then have me go to them, so they went directly to him ~~with~~ [for] their [directions] . . . . So I didn't feel comfortable in that. But what are you going to do? You carry on. He'd throw me these jobs – he was a very poor letter writer, so when it came to letter writing, he threw that job to me.

Asked to Work on *Design of Small Dams*

Well, in 1958 – I'm sure that you talked to Harold Arthur – Harold decided when he was ~~writing~~ [assigned as editor of] *Design of Small Dams*, that I was his man to write on the spillways, and so I did that. And Whinnerah was glad to get rid of me, and I spent some time, spent three or four months working on *Design of Small Dams*. So I suffered along with that.

Went to Thailand to Work on the Mekong River

Came 1961 and there was a call from Foreign Activities for somebody to go to Thailand and work with the United Nations people on the review of the potentials of the Mekong River, development of the Mekong River. I can't remember the name of the United Nations organization. Anyway, there was

Cecil Jacobsen [phonetic spelling] from Utah; and I was the engineer, Cecil was the planning man, and they sent an economist – Bush, I guess is his name – from McCook, Nebraska. We spent several months there. So I got a feel for foreign activities work. And later on, the Indians wanted somebody to work with them on Beas Dam.

Storey: The which Dam?

Hoffman: Beas. It's an Indian dam.

Storey: Oh, *in* India.

Worked on Beas Dam in India

Hoffman: In India. So I did some work here beforehand, [making various layouts,] and then went to India. They sent a representative from India, a fellow by the name of Patak [to Denver]. As a result, I spent a couple of months in India, being one of the advisors to the Indian government – can't remember the department.

Storey: Do you remember how to spell the name of the dam?

Hoffman: B-I-A-S (sic.). And enjoyed that very much. Was accorded a royal welcome there, all the fineries. The Governor of the State of Orissa was on the board, and he took a shine to me. Was a very prominent engineer, wrote quite a bit ~~here~~ [on engineering], studied here, came to the Bureau. I can't think of his name now. But I enjoyed it very much. So, that was another foreign activity.

Worked in the Philippines on the Central Luzon

And then there was a foreign assignment to go to the Philippines, on [a study for the] Central Luzon. There was a team of eight people there: Don Burnett was in charge of that, if you've ever heard of Don Burnett. (Storey: No, I haven't.) Have you heard of Grady Burnett that used to be at the . . . . (Storey: Um-hmm.) Well, both Don and Grady were in the Bureau. Oh, Don went there as head of this group. And so there was no design engineer in the group. So they asked for some assistance [from the Chief Engineer's office], and so who did they send but me. That's fine. But they would only send me for three weeks at a time. Well, you can't go in there and engineer anything on a three-week basis. So it turned out that I went there three times on short-term assignments, to give them some assistance. Well it didn't work out at all. Don said, "Why don't you come and join our team?" So I was bumping my head at the top of the grade – associate engineer, I guess it was – so I would be accorded the title of "full engineer," Chief Designing Engineer of the group. So I finally decided, "Well, I'm not accomplishing anything here," so I went there and spent a year in the Philippines, in 1965.

By 1965 Reclamation Was a Very Static Organization

Well, I'd broken away from the [Denver Office of the] Bureau here because I'd been gone, and I said, "Well, after the assignment was over, I could come back to the Bureau, but where would I end up?" It was a very static organization. Practically everybody that was here for the last fifteen to twenty years was still in the same position. There was ~~no movement at~~

~~all~~ [little opportunity] as far as working myself [back] into the organization again. So I decided, "Well, here I've got some recognition because I wrote *Design of Small Dams* and it had gotten worldwide acclaim. And I got recognition from different people that wrote to me, and so on. Maybe the thing to do is to pull away from the Bureau and see what I could do on my own." I had thirty-five years of service in, in 1965. And so I said, "Well, I'll take retirement." And so I retired at the end of 1965.

Chose to Retire at the End of 1965

Storey: You became a consulting engineer?

Worked for Jack Berger after Retiring

Hoffman: And I became a consultant. And I'd made contacts, I'd gotten some recognition from *Design of Small Dams*, a name. I got an assignment immediately in Venezuela as a consultant. There was a fellow here, way back in the early 30s, that moved to Utah, went to work for the regional people in Utah, a fellow by the name of Jack Berger. His brother is a Ph.D. out of Pennsylvania [State] University, I guess, ~~or Penn State,~~ that set up a consulting organization and started to do world-wide work and became very successful, still a very successful organization. So the first thing, when Jack heard that I'd retired, put me to work for his group. ~~He was out of somewhere in~~ [His office was in Harrisburg,] Pennsylvania. So I got work from them, went to Iran for them. And so I've kept pretty busy since then, and am *still* busy if I want to be. I had to take a few years off. My wife had developed Alzheimers and I had to care for her

here. She passed away a couple of years ago. But I'm doing a lot of work in Brazil now, if I want to. At my age, why I'm not that anxious to overdo it.

So that's been my career.

Storey: Let's go back to Hoover again (laughs) and work our way up. When you were working on designing Hoover, you were in the Denver Office, in this bullpen with your drafting table, designing something, what, about 800 miles away. Did you ever go down and see it?

"Unfortunately, none of the designers ever . . . went down there to look at the job . . ."

Hoffman: Unfortunately, none of the designers ever . . . . You know, they were working on a tight budget. R. F. Walter, to get him to agree to a field trip was an impossible thing, because, see, he was running a tight budget, because that was his nature. So there are very, very few of the designers that ever went down there to look at the job. *None* of the designers, whoever it was, none of them ever went down ~~on~~ [to inspect] the job. It was all done by correspondence. And at Boulder they'd set up their construction group there, Bloodgood and Page, [and Young, etc.,] and they were running the [construction] show there, and we were the ~~ones~~ [designers] responsible here.

"And everything [between disciplines and offices] was by correspondence. We didn't *telephone* then. Telephoning was a taboo thing. . . ."

And everything [between disciplines and offices] was by correspondence. We didn't *telephone* then. Telephoning was a taboo thing.

Storey: It was considered extravagant?

Raymond F. Walter

Hoffman: Extravagant, yeah. The old man, if you've heard about R. F., he was a hellion!

Storey: Tell me about him.

Hoffman: Well, ~~all I know~~ [for instance], he would come in after lunch and stand at the door of the bullpen and see (rapping on table for emphasis) that everybody was at their desk by the time the lunch period was over.

Storey: How did you know when the lunch period was over?

Hoffman: Well, we had a time. See, we'd have to go out for lunch, wherever it was. Of course a lot of us were brown bagging it, I'm sure, at the start. But the craziest thing – you'd expect to see the Old Man standing there, waiting when the clock struck . . . . We got three-quarters of an hour for lunch at that time, I remember. But the designers had very little to do with the Old Man, see. But when he was over at the Wilda Building, it was in another building entirely. When he was at the Customs House, why our bullpen was on the third floor, he was up on the fourth floor, up in a corner. So it wasn't always . . . . We had very little contact with him, hardly at all. I don't even think that he knew our names, excepting

for those in his own office. But he was one of the reasons I wanted to get with the Bureau, because he was a Colorado State graduate. *Hammond* was a Colorado State graduate. So I thought, "Well, they're pretty special people."

Storey: And Elwood Mead had taught there, I believe.

Hoffman: Right, Elwood Mead. At that time, he was in Washington, but before that, sure, he . . . .

END OF SIDE 1, TAPE 2. FEBRUARY 3, 1995.
BEGINNING OF SIDE 2, TAPE 2. FEBRUARY 3, 1995.

Storey: You were saying that you never met Elwood Mead. I believe it was Charles Lory [who was] the president of the school when you were there?

Charles Lory, President of Colorado Agricultural College

Hoffman: Sure.

Storey: Can you tell me anything about him?

Hoffman: Yes, sure. My father – I'm Jewish – my father was a rabbi in Cheyenne. It so happened that he and my father met in Fort Collins and got along very nicely. And Lory took an interest in *me*. And I remember the time of graduation, as I've told you, he announced publicly that I had the highest grade average and then afterwards he spoke to my father at that graduation and complimented me to him, which I thought was – well, it was a small school, so he knew practically everybody, I suppose – but I thought that was a nice gesture from Lory.

Storey: Yes. What was he like personality-wise?

Hoffman: As far as I can remember, he wasn't a dynamic personality, but college was run nicely. And my dealings were more with Dean Johnson than they were with Lory. And I remember a few instances where I had contact with Johnson, but I don't remember that I had anything personally, no contact with Lory, excepting for the pep rallies and things like that.

Storey: Was just interested in whether you happened to know him personally, because he was pretty prominent in the Colorado-Big Thompson [Project].

Hoffman: Yeah. Well see, Lory had a son who graduated a couple of years earlier than I did. So I wasn't close to him because I was an undergraduate. He, I think, graduated about 1927. But I knew *him* casually. But Lory himself, we students didn't ~~know anything about that~~ [have much contact with him].

Experiences at Colorado Agricultural College

Storey: How did you evolve away from your architectural interest into civil engineering and irrigation?

Hoffman: Well, it was a question of necessity more than choice, because if I wanted to go to an architectural school, I would have had to gone to somewhere back east. And as I said before, I was one of six children – I was the fourth. And there were four of us – well, there were two ~~up~~ [older]brothers besides me that were in school at the same time. One was going to University of Colorado, and the other to Colorado

State, so I had no choice but to go there. My *whole* cost for the four years, including board and room, in which I had to pay forty dollars a month for my board and room, amounted to $1,600 for four years of education. I was an out-of-stater, so I had to pay a tuition of $25 a semester. An in-stater would have had free tuition. So the fourth year, I decided that I was going to register as a Colorado citizen, so that I could get by without having to pay the tuition. And I did very, very well in mathematics. Old Prof McDonald[, of the math department] took a shine to me, so [in] my fourth year he made me a student teacher, paid me a dollar a class, a dollar an hour, two classes a week. So I got two dollars a week for teaching class, which was something that at that time it was not a usual thing at all. [The math department consisted of three teachers, so] he decided that he needed some help, so he put me on as a student teacher.

Storey: After you had worked on Hoover, what other projects did you work on?

"Well, my pride and joy is Davis Dam, that whole concept is mine. . . ."

Hoffman: Well, my pride and joy is Davis Dam, that whole concept is mine. See, I was an assistant at that time, assigned to the job, so the ideas stem from you first, you see. So this whole idea on Davis, of digging the diversion channel – are you . . . . (Storey: I understand what you mean.) You've been to Davis?

Storey: No, I've never been to Davis Dam.

Hoffman: This idea of diverting the river around [the abutments], cutting this *deep* channel in there, and then putting the structures, the spillway and intake structures there, that was my idea. So I take pride in the idea that I conceived the whole layout, you see.

Storey: The layout for the construction period?

Hoffman: Layout for the design.

Storey: For the design of the dam.

Hoffman: Of the dam and the appurtenances, because the dam across the river is an earth and rock-filled dam. So the concept was to take this material out of the channel and stockpile it, and then use that stockpiled material to build the rock-filled portion of the dam. And we worked very closely with the earth dams people. So this is the way we conceived the thing, and then from that it evolved that once you had the diversion and you planned on how you were going to arrange the structures so that you could unwater the river and then make your closures and all, this was all evolved with the whole concept. So on Boulder Dam/Hoover Dam, the concept evolved from mostly model testing. On Davis Dam, the whole concept evolved out of somebody's idea to arrange it so-and-so, and work it out so that it'd all work out together.

Storey: Now where is Davis?

Hoffman: Davis is below Hoover. It's the reregulating dam below Hoover. If you want to turn it off, I'll show you a picture. I was just down there at Davis.

Storey: Sure. (tape turned off and on) You were saying that you wrote most of the Davis Dam and Powerplant technical record of design and construction?

Hoffman: Well, I wrote all of this.

Storey: The spillway part?

Hoffman: Yeah, the spillway and the diversion.

Storey: Uh-huh, spillway and outlet works. Let's see, when was that one published? Did they put a date on it?

Hoffman: This was bound 1948.

Storey: In 1955 is when they published the book.

Hoffman: This is the kind of work that I was doing as assistant, you see.

Storey: Um-hmm, the Chapter Seven, "Spillway and Outlet Works" _____, kind of.

Hoffman: I was telling you that . . . . (Storey: He didn't write well.) He didn't write well. He had nothing to do with this, because this was done before we moved over. But the writing of it was done afterwards, you see.

Storey: What about between Hoover and Davis? Did you work on Coulee? Did you work on Shasta?

Spillway and Outlet Works Were Associated with Earth Dams

Hoffman: No. No, you see, the Bureau was divided into . . . . We had the Dams Branch, and we had the Concrete Dams Section and the *Earth* Dams Section. Now anything that had to do with concrete dams was done by them entirely. Anything where there was an earth dam in there, the Earth Dams did only the earthwork specialty. And then the spillway and outlet works was the associate part of the earth dam work, you see. So on Davis Dam, since it was an earth dam, or earth-and-rock-filled dam, the spillway and outlet, the hydraulic works, was assigned to us, rather than to [the earth dams people] . . . . Because the earth dams people only did the earthwork, and the concrete, the appurtenant works, were assigned to the Spillway and Outlet [sections]. But on Grand Coulee, where the spillway was a part *of* the dam, see, that was done by the [Concrete] Dams [Section] ~~Branch~~, because they did the hydraulic works as well as the dam, if it was an integral part of the dam. But they did deviate, because at Glen Canyon, the spillway was a separate [structure] ~~part~~. The outlet works was a part of the dam, because it went through the dam. The spillway was a separate part, because it was part of the diversion tunnel and it's own feature of the spillway. But somehow or other, whoever made the assignment said, "Well, as long as they are responsible for the dam, we'll let them work on the spillways as well."

Storey: Let the ~~Spillway~~ [Concrete Dams] Section?

Hoffman: Yeah.

Storey: Did you work on Glen Canyon?

Hoffman: No, because Glen Canyon is a concrete dam.

Storey: But you didn't work on the spillway?

Hoffman: No, because whoever it was, made the decision that the spillway should be (Storey: Oh, part of the dam's works, I see.) part of the work of the [Concrete] Dams Branch. So there were a few of those that were done that way.

Storey: Now Shasta is another one where the spillway is over the face of the dam, I believe.

Hoffman: That's an integral part of the dam. So you can't separate that, see, because it's the same structure. But on Glen Canyon, on the one in . . . . On the Green River in Wyoming – what's the name of that?

Storey: Flaming Gorge?

Hoffman: Flaming Gorge. The spillway there is the same idea. It's like Glen Canyon, it's a separate structure. Both of them were the same concept, the same spillway concepts. So at Flaming Gorge, the same thing was true. The one in Montana, near Custer's . . . . (Storey: Yellowtail?) Yellowtail, same thing, because even though it wasn't the same structure, it was assigned to them. So the Spillway Section, they were involved only in those projects in which there was an earth dam involved in it.

Storey: Well, I'd like to keep going, but we've been talking for two hours, and that's about enough for one day, I think. I'd like to ask you now if you're willing for the tapes and the transcripts from these tapes to be used by researchers from both inside and outside Reclamation.

Hoffman: If you think it's worthwhile.

Storey: Absolutely, I think it's worthwhile.

Hoffman: I don't know if I told you anything new or different.

Storey: But you said "yes," right?

Hoffman: Yeah, sure.

Storey: Okay, thank you.

END OF SIDE 2, TAPE 2. FEBRUARY 3, 1995.
BEGINNING OF SIDE 1, TAPE 1. FEBRUARY 10, 1995.

This is Brit Allan Storey, interviewing Carl J. Hoffman, at his home in Denver, Colorado, on February 10, 1995, at about two o'clock in the afternoon. This is Tape 1.

Storey: You were saying that you had found drawings dated as early as 1922 in the Denver Office for Hoover.

Found Drawings Dated 1922 for the Site at Hoover Dam

Hoffman: Yeah, this was Boulder, this was Hoover. And I recall that the drawings were prepared in 1922. Whether they were prepared in the Denver Office or whether or just exactly which office was functioning at that time, I have no idea. But I *presume* that there was a Denver Office and it was in fact in the Wilda Building, and the Wilda Building might have been organized, or the office had been organized even much before. My boss, McConaughy, he was an oldtimer, and I think he left – he was with the Bureau, and left to serve in World War I, which was

in 1917, because I remember that he was a veteran from whatever engagements there were in Europe. So whether he was in the Denver Office before that time, or whether there *was* a Denver Office, when I came to the Bureau, he had been at the Yuma Office and had come in, had been brought in from the Yuma Office. So I don't know who would know exactly what preceded my entry into the Bureau, what function, if any, the Denver Office had, and at what time. But I can surmise that it might have been functioning at an earlier time. For what reason, I don't know, because most of the engineering that was done on the various projects, was done in project offices.

Storey: Until Hoover Dam came along.

Hoffman: Until Hoover Dam.

Storey: And some of the work on Hoover had been done before the office you were in was created, I think.

Hoffman: Certainly, because there must have been a lot of work done, because the [Colorado River] Compact was done in 1928.[9] And in order to have a compact, it certainly had to have some engineering that was involved in that for some period before that. Could have been for twenty years that it had been contemplated. In 1922, something happened, I guess, in regard to the project, as early as 1922. The Compact was done in 1928, so there must have been a lot of preliminary work that'd been done for years before that time. Now where the engineering was

9. The Colorado River Compact was negotiated in Santa Fe in 1922, and the Congress, in 1928, agreed to ratify the Compact once six states ratified it officially.

accomplished, I have no knowledge, but it might have been in the Denver Office.

Storey: Well, when you came, they were in the Wilda Building, W-I-L-D-A, right?

Hoffman: W-I-L-D-A.

Storey: At 1440 Welton.

Hoffman: Yes, and the only one that might have some knowledge of that would be Warren Koehler [phonetic spelling]. He was in the Mechanical Branch, and he's still around.

Storey: Here in Denver?

Hoffman: He's still around here in Denver. So it might be worth your while . . . . I think with Warren, he started earlier than 1930. He started as a tracer, I think when he was just a young man, maybe seventeen years old. He's eighty-seven now, so that would be seventy years ago. So that would be as early as (Storey: About '25 maybe.) '25 or somewhere in that, maybe '25, '26. And they did have a Tracing Section there. Old Man McConnell and Joe Smith – Averill [phonetic spelling], McConnell, Smith – they were in the Tracing Section. Then Koehler, at that time, I think he [transferred later to] ~~was in~~ the Mechanical ~~Section~~ [Branch]. And whether he had completed school or not, or whether he just got his academic degree while he was working for the Bureau, I don't know. But it's worthwhile talking to Koehler. And maybe he can shed some light about what happened in the Wilda

Building, because I think when he came to the Bureau, it certainly was in the Wilda Building, and whether he has any history . . . . The trouble was, we were just junior engineers, and we didn't know what was going on with the organization – only as it developed. And the only reason *I* know a lot of these things, [is] because maybe I was a little more inquisitive than a lot of people. And so it's entirely possible that he knows something more than I do, and entirely possible that he doesn't. I remember here a few months ago we were having a little conversation, he and Skippy Noonan and I, and we were talking about the early times of the Bureau. Well, he took exception to what I remembered about the Loop Building, the Open Market Building, and the bridge that went across from the Wilda Building over to the second floor of the Loop Market. You'll get his slant on it, if I've erred in that, because what *I* remembered was what I had indicated. Whether it's entirely right . . . . I know we had the bridge and I know all of these offices were not occupied, or only occupied here and there when I came in, but they soon filled up as they started hiring people. And most of the people they were hiring were junior engineers, especially in the Dams Branch. And there were a few that they brought in, like I indicated Rockwell from Ambursen Dam Company, back east, and a few that weren't just juniors starting.

Storey: Well now this picture that you have of the Denver Office in the summer of '32, with I believe it's 203 folks in it – it looks to me as if every single man there is wearing a suit and a tie.

Dress at the Denver Office in the 1930s

Hoffman: Yes, that was common at that time. Whether or not we were asked to dress up, I don't recall. This fellow here, Harold Davis – we called him "Stinky" Davis, because he would come to work in just casual clothes. And for some reason he got the reputation "Stinky Davis" because he wasn't as well groomed as a lot of us. So that would indicate perhaps that this was the style, that we were well groomed. I'm sure that some of these people up here at the top, the tracers, they had no reason to dress up. And we had no reason to dress up, but that was the style at that time. I remember I used to – I wore bow ties for many years. At that time I had here a four-in-hand tie. Why, I can't recall now.

Storey: But you don't remember any rules about dress or anything like that?

Hoffman: No.

Storey: Did you have bells or something that started you to work?

We Had One Timekeeper for the Denver Office

Hoffman: Yes, I think so. And we had *one* timekeeper for the whole outfit, Frank Gawn. And he would come around once a day and take time. And so if he didn't find us at the desk, then he had to inquire as to our whereabouts. If we were around, but not at our desk, it was so explained. If we were taking leave, why then he knew because the others would tell on us. But we didn't punch a clock, we didn't . . . . More or less on our honor system. As I indicated, the Old Man (Storey: R. F. Walter), R. F. Walter, he used to

sometimes come down about the time after lunch when the bell was supposed to be rung, and would stand there. Well, whether or not . . . . He got a little bit brusque once or twice, I guess, but ordinarily we didn't know what his purpose was in that, but we thought, well, he was trying to exercise a little discipline, that we wouldn't want to keep coming in a few minutes late if he was standing there. The Old Man had a very rough manner, tight-fisted as far as the Bureau was concerned, [hitting table for emphasis] because we couldn't make a long distance telephone call without sitting down and writing a memorandum as to the purpose of the call, where, and so on. And it was always sent up to the front office. So everything that was done, mostly, between the Denver Office and the field offices was done by correspondence. And very few telephone calls.

". . . we junior engineers or assistants or engineers, we *never* had an opportunity to go out in the field . . ."

You asked about [hitting table for emphasis] visiting the projects – we junior engineers or assistants or engineers, we *never* had an opportunity to go out in the field – neither did many of the heads, because it was all done by correspondence. The only way there was an opportunity to go out to the field – not during the time before specifications, because we didn't have site inspection before specifications – and we only went out to the field *if* there was a problem that had arisen, insofar as the field conditions, whether or not the geology corresponded with what our interpretation was, or whether they had a conflict between contractor and the field people, insofar as the interpretation of specifications were concerned and so on.

Storey: Do you remember having to make a telephone call, and going through the process?

Hoffman: Not me, it was always the head of the section.

Storey: And he would make the phone call *instead* of you?

Hoffman: I presume. If it was a problem, it was a problem that was discussed beforehand and either some solution that we wanted to convey to them, or an inquiry always came through the section head. And very few instances where there was a lot of correspondence over the telephone. But that's the way the outfit was run, that's the way the Old Man wanted to run it, and so everybody adhered to it.

Storey: You mentioned S.O. Harper in this photo. Did you ever have any dealings with him?

". . . S.O. Harper was a construction man . . ."

Hoffman: No, S.O. Harper was a construction man, and he had very little to do with design. He was the Construction Division at this time, because whatever construction problems there were, was handled through him. At this time he didn't have a staff, or much of a staff. This was him there (referring to photo). And I don't see where there was any listing of a staff here.

Storey: Uh-huh, but you didn't have any idea of his personality or his management style?

"We in the design office had very little to do with the front office . . . We were dealing mostly through Savage. . . ."

Hoffman: We in the design office had very little to do with the front office – especially we subordinates. And even as far as the section heads, I don't know that they had much to do. We were dealing mostly through Savage. Savage was Chief Designing Engineer, and we were a design group, and most everything was done through Savage. We did our own estimating, there was no Estimates and Analysis Branch. We set up all items for specifications, and we helped in writing certain of the specifications, the specifics. The general specifications, Stetson was the one. Stetson might have been, then, an assistant to Harper. Stetson handled all the specifications, all that went through Stetson, and he was the only spec writer. So as far as construction was concerned, it was Harper and Stetson. And there was no construction supervision staff here – that was all out in the field. Everything on Hoover was Page and Bloodgood and who else were the big shots there? Walker Young [and Dexheimer]. They were all out in the field. They handled everything that had to do with construction and contract administration and whatever arose there, they handled that on their own, excepting if they wanted some assistance from the Design people.

Storey: You mentioned that you were interviewed by Erdman Debler. (Hoffman: Yeah.) Do you remember anything about the interview, or what he was like in the interview?

Interviewing with Reclamation

Hoffman: No. Well, I came down as early as June in 1930, and they were very cordial. Of course I had passed the

Civil Service Exam, and so they had the results of that, and I was qualified here. I came down and of course my dealings were with Bonnet. Bonnet was the personnel man and he referred me to Debler. The dealings were very short. I don't know how much Debler interviewed me, there wasn't much there, because I was just fresh out of school. All I had to demonstrate to him was my schooling. But I had no experience. As I recall, they were apologetic that they couldn't put me on the Denver staff, because they had no appropriation at that time. I guess I was referred to Debler after that, and Debler says, "Yeah, well, if you want to go up to Saratoga, Wyoming, I can put you on as a junior engineer." What I had to do at Saratoga, I have no idea. But probably would have been on a survey crew.

Storey: Did you approach Reclamation, or did Reclamation approach you?

Hoffman: I think I approached them, because I was anxious . . . . They had no way of approaching anybody at that time, because they had no authorization to staff anybody, until the money was available. So then, sure they didn't approach, or if they did, it was just inquiries. But there were no commitments, and they wouldn't give *me* a commitment, until the appropriations came in. At that time I guess it was through Bonnet, Bonnet had all of the data that he needed and the information he needed to staff various people. I was on the list and I was the first one that was brought in.

Storey: Had you met any of the people in the Bureau of Reclamation's laboratories up at Fort Collins, by chance?

Hoffman: I knew them . . . . Well, I knew Jimmy Ball. Jimmy Ball's a graduate [of CSU] – whether he got out at that time, or whether he got out a year later, I don't know – but Jimmy Ball was one of them that was on the staff. But the staff then was Warnock, and where Warnock came from, I have no idea. And Joe Bradley – whether he was new or whether he had had experience, might have been a new hireling, same as I was. There was Warnock, and there was Bradley, and there was Jimmy Ball, and that was the staff up there.

Storey: When you were going through your engineering classes, and your irrigation classes, did anybody from the Bureau of Reclamation come and talk to those?

Hoffman: No. No, there was no reason for it, because they probably didn't know when or if they would ever get appropriations for it, and the question of staffing, I suppose was not the first order of business for them.

Storey: What did you do after you were done designing Hoover?

The Depression and WPA Hires at Reclamation

Hoffman: Well, about the time that we got a good handle on Hoover and we'd gotten out the specifications and all, and made all the changes, well that was the time of the Depression, when the Depression was, in 1931 and '32. And when Roosevelt got in, the first order of business for him was to put people to work. So

there was the WPA, Works Progress Administration, and they immediately started to staff people. They had the CCC [Civilian Conservation Corps] camps started at that time, and various regional or local project offices established for the WPA. And they needed to have designs. And it was political – I presume a lot of it was political – as to exactly what projects were to be undertaken, and we got the hurry-up call to get out designs for these various works. And they staffed the Bureau with additional people to do all this, and as I told you, one of the first things that happened was that they took all of the Bureau people that were available and they had a parade down Sixteenth Street, and we were supposed to be a demonstration of how the new government was putting people to work in the Bureau of Reclamation. They hired people not from Civil Service qualifications, but they just hired people on the basis of availability and need, with any kind of experience, and they had cut us from $2,000 a year as a starting salary for a junior engineers, down to $1,600 – cut us twenty percent. And when they started to bring in these WPA people, Works Projects people, they dispensed with hiring from Civil Service Exams, they just hired them on the basis ~~if~~ [that] they thought they were qualified, *without* taking an exam, and they put them on at $1,640 a year. So here we [had]people with *three* years of experience ~~were~~ getting less than new hirelings that had no experience at all. And that went on for a while. They finally, I guess, got it adjusted.

These projects and the requests came in for different works that ~~was~~ [were] initiated in the field by the WPA people. And then as time went on, WPA

went out and they put in the PWA, Public Works Administration. And a lot of this work that was done between 1933 and 1936, or maybe up to '37, '38 – I'm just guessing at this – was initiated on the basis of putting people to work under the PWA, Public Works Administration. And as far as the Denver Office was concerned, as far as we were concerned, we were just the design group that was acceding to requests for designs on the basis of work that was planned and initiated in the field, and a lot of that was done through a lot of political activity.

Storey: Now as I recall, working on Hoover was actually sort of unusual for you, because most of the time you designed spillways for earthen embankment dams.

Hoffman: Oh no, that came later. (Strorey: Ahhh.) We didn't know about earthen embankments or anything. The only thing that the Bureau was involved in was Hoover at that time.

Storey: Okay, but *after* Hoover, what were you involved in?

The First Earth Dam Design Assigned to Denver Was Cle Elum

Hoffman: Well, after Hoover, then we started to expand to other works. And then it became a question . . . . ~~You see, what it was, there was no Earth Dams Section.~~ And Earth Dams Section said there were no earth dams to do, because Hoover or Boulder was the major activity there. The first earth dam that was assigned to the Denver Office was Cle Elum, and there was only one man that worked on that, Russell See, and he did the whole design on the Cle Elum.

Storey: "See," like S-E-E?

Hoffman: S-E-E, let's see if I can find his name here.

Storey: And he designed the whole dam? It wasn't a great big dam, then, I take it?

Hoffman: Cle Elum was up in Washington. It was an earth dam, and nobody knew [much] about earth dams at that time. Earth dam design was ~~an un~~ [a little] known thing. Earth dams that were designed before were designed [mostly] by [chance] . . . who knows. They decided [on] a three-to-one upstream slope, and a two-to-one downstream slope, and they had material that was available at the site, and they used that material, and nobody knew anything about soils [characteristics], nobody knew about [design] analysis or anything.

Frank Smith Is Brought into the Denver Office Because of Experience Designing Earth Dams

And the only one that had had *some* experience was Frank Smith, if you've ever heard of Frank Smith. Frank Smith was in the field, and they brought him in – this is *after* See's time – and set up the Earth Dams Section. In addition to [having] ~~they had~~ a Concrete Dams Section, they had a Spillway Section, they [also] had the sections they had for Herb Warner and Blomgren. Herb Warner was responsible on Boulder [Dam]. I think he was responsible for the intake towers. And Blomgren was responsible for the diversion tunnels and the gating of the diversion tunnels, upstream gates – they're fifty-by-fifty [foot] gates, and they had [associated] structures. Maybe it

was the other way around, I don't know exactly who had which responsibility. But when the work was done on Hoover Dam, then both Herb Warner's and Blomgren's particular assignments were over with. And where they went . . . . Blomgren, I think he retained his section. And where Herb Warner went, it's hazy, I can't remember. But finally, as we got into various project works, those sections faded away somehow. So the Concrete Dams Section was functioning, the Spillway Section was functioning, and the Outlets Section was functioning. And then they established an Earth Dams Section.

Storey: Do you have any idea about when?

Russell See Did the Cle Elum Work

Hoffman: It must have been maybe the Earth Dams Section was established as early as '34, maybe, or '35 – maybe '33. But Russell See did the Cle Elum work, I think in '32. And there was no [Earth Dam] Section, and See was working for the Concrete Dams Section. So they gave him this job because he'd had some [field] experience [on an earth dam, and since] he was one of the older field people. They said, "Here, you handle that." And everything was done on his desk, he made the layouts and all, and I don't know exactly how much more was involved in that. Cle Elum Dam, I *think* the Spillway Section ~~had~~ [designed] the spillways, and See had the dam itself.

Storey: Did you do any designing on the Cle Elum spillway?

Hoffman: I doubt it. Could be. There's so many of these projects that I have no idea. And I was just a

fledgling too, so whether at that time – well, I don't know.

Storey: Of course Ray Walter had a little earth embankment experience – he was at Belle Fourche when they built it.

Karl Terzhagi Lectures at Reclamation

Hoffman: Yeah. Belle Fourche is a wonder. ~~and~~ It's *one* of the wonders of something that's still standing on the basis of the knowledge ~~that they had~~ [available] about earth dam design and construction [at that time] ~~too~~. You see, the theory [of design of earth dams was] ~~in it, the main design concepts, were~~ done by academia – [Karl] Terzaghi, if you've heard of Terzaghi – a professor, I don't know exactly where – but he developed [the design] ~~a~~ theory on it. [Arthur] Casagrande, after that, in the late thirties. So it's Terzaghi, I remember he came and lectured here at the Bureau around 1937. [His were the first concepts that most people accepted for earth dam analysis and design.] ~~It was the first concept that most people had on . . . .~~

END OF SIDE 1, TAPE 1. FEBRUARY 10, 1995.
BEGINNING OF SIDE 2, TAPE 1. FEBRUARY 10, 1995.

Storey: You were saying that in '37, I think, Terzaghi came and lectured.

Hoffman: I think it was around that.

Development of Soil Science and Its Use at Reclamation

Storey: And that was the first concept people at Reclamation had of soil science.

Oscar Rice and Frank Smith and Theory about Earth Dams

Hoffman: Of the science, yes. And before that, Frank Smith was the one that was supposed to be the one that was the theoretician or whatever you have – knowledgeable one on that. There were people that *had* some idea, some knowledge – Oscar Rice. He came in – he's one of these in the picture – he came in from Echo [Dam on the Weber River Project], in Utah, so he was on that. Somebody was on Guernsey, an earthen dam. So they had knowledge of some of the construction [methods and procedures], but they had no theory about the design, or how an earth dam functioned. Nobody had any theory of an analysis of stability. They may have had a simple one [analysis], the wedge theory of analysis, but they didn't have the slip circle method and so on. That was developed mostly by people in the academic [arena at a later time] . . . .

Storey: Do you remember how to spell Terzaghi?

Hoffman: T-E-R-Z-A-G-H-I. I'm [not] sure whether he published a book, I think he did. And Casagrande was at Harvard.

Storey: Oh, Casagrande is a person?

Hoffman: Yes. Terzaghi was, I think, the mentor for Casagrande. But this is all in the academic field, not in the practicing field.

Storey: Can you tell me quickly what slip circle is?

Hoffman: Yeah. Let me show you something. (tape turned off and on) Special articles here in this.

Design Analysis of Earth Dams at Reclamation Was Mostly Undertaken after World War II

Storey: This is a book titled *Dams and Control Works*. That's the one with the papers that we all wrote. He's one contributor. (sound of flipping pages) See, at that time . . . . Here's an article by . . . . (coughs) "Testing of Dams" here, was hydraulic testing. I guess if I looked in the Index . . . . (flipping pages) [Page] 252, here you are. "Design and Construction of Small Dams." There's nothing here on analysis, see. So if you read this, analysis was not . . . . And I think you can glean that from this. This design was done mostly on the basis of cut and dried experience. And so this is 1937, so Frank was there at the Bureau thirty . . . . So this is about the time that they set up the Earth Dams Section, in 1937. And the Bureau got involved in [design analysis] ~~it~~ mostly after the war.

Storey: After World War II.

Hoffman: After World War II. And the reason was that, see, from the time, this 1937, to 1941 or so, they were still going on the basis [that] Frank Smith dictated what to do. He was the kingpin, see. And Oscar Rice was the assistant, I guess, to Frank. And so the analysis, *if* it was done, I think the wedge theory was probably still there. But the slip circle method, which was the one that was finally accepted, had not been developed to any great extent.

Jack Hilf Introduces Arthur Casagrande's Slip Circle Theory to Reclamation

Now Jack Hilf wasn't with the Bureau before then, but during the time when he got into Army, he took a course from Casagrande [at Harvard] on the slip circle [theory]. When he was hired in 1946, he and a few other colleagues were the ones that had a fair notion of the theory and the procedure in that, and *that's* when the Bureau started to develop the analysis of soils – especially since before that time nobody knew [understood] the property of soils, what was the specific properties as far as shear was concerned, and optimum moisture and such things as that. It was just roughed-in by somebody that thought that he knew enough about it, Frank Smith, and he was the kingpin on it.

Storey: Well, how soon did you start designing spillways for earthen dams, then? Was it after the war or during the war?

Designing Spillways

Hoffman: Oh no, we started right away when WPA got [us] started in '33. And as the projects developed, why we were there to do the design, and whether it was all done . . . . ~~All we knew~~ As engineers, we knew something about the theory of hydraulics, see, so that the ~~property~~ [theory] of how water reacted and so on, the theory was something that we had studied way back in school. And what we did was the application of that theory [to practice]. So whether it was a spillway for an earth dam, or whether it was a canal or whatever it was, the hydraulics [design] is the same. Now the thing that was an innovation~~, for~~

~~many years,~~ was the concept, the imagination of the designer as to exactly *how* he would apply the theory of hydraulics to the specific problem, and that's [regardless of] whether it was earth dam or concrete dam, or ~~whether it was~~ whatever it was. The Bureau [up to that time had little design precedents and] ~~had~~ no foregone concepts of it, so we that came in were the conceivers. We were the ones that decided whether it should be tunnels. Well, conditions are the thing that dictated. You knew at Hoover Dam[, because of the steep abutments,] you couldn't put in an open channel spillway – that was almost an impossibility. ~~You could have, I suppose, and whether they did or not, thought about it, the idea though, the concept was, here we got~~ [We understood, on the other hand, that we had four tunnels here that *have* [initially] to serve as diversions. How can we utilize those tunnels in the specific designs that were required [after the diversions were not longer needed]? So we took the two outside tunnels and we say, "Okay, they will serve to accommodate spillways." We took the two inside tunnels and we say, "Okay, they will accommodate penstocks that will lead to the powerplant or penstocks that will lead to outlet works, or whatever." So the first [design] concept was, we needed the tunnels. So this was our starting point. *Now*, if we didn't have the tunnels, or for some reason they could have accomplished the diversion another way, who knows whether we'd have had tunnel spillways?

Applying Theory and Testing to Spillway Design

But we were working with concepts, and only applying the *theory* as it was needed, in order to arrive at the right solution. We in the Spillways [Section] were privileged to be able to take and test whatever we conceived, and it wasn't always the first try that was the final one.

Storey: This was in the hydraulics lab in the basement there?

Hoffman: Well, this was first of all in Fort Collins, and then in the basement.[10]

Storey: Now did you ever go up to Fort Collins to see tests, for instance?

". . . designers . . . made the changes as the models demonstrated whether we were going in the right direction or not . . ."

Hoffman: I don't recall, maybe I went up there once or twice. It was mostly the boss that went up there, McConaughy was up there quite a bit, *and* they were down here quite a bit. And it was only through pictures and through conversations, either letter, or maybe there was telephone conversations, that – what happened was, we conceived of a design. When we thought that it was proper to test it, we sent the design up to Fort Collins and they built the model. And when they started to operate the model, they saw the shortcomings. So we had to make changes. And there wasn't just one design [tested]– I don't know *how* many, there were quite a few. And to know how many it was, the laboratory published many reports,

10. In addition, considerable modeling for Hoover Dam was done at Montrose where high-head models were practical.

it came out in book form. So there are five or six different reports on the model tests for Boulder [Dam], and how it advanced from one phase to the other. But it wasn't the laboratory that could take the credit for [the design development, but] ~~that, that had to be~~ the designers that made the changes as the models demonstrated whether we were going in the right direction or not, to where we finally ended up with the proper sort of design. So as I think I mentioned, when the specifications were written and published, that the spillway was nothing like what had finally occurred.

". . . the specifications were . . . nothing like [the spillway that] finally occurred . . ."

Storey: Yeah, you did mention that. Do you ever remember any model testing over at Montrose, Colorado?

Hoffman: No. You want to turn it off for a second, I'll look.

Storey: Sure. (tape turned off and on)

Hoffman: (reading [from page 11 of *Dams and Control Works*, Bureau of Reclamation, 1929, 1st edition)] " . . . [elevation twelve] thirty-two [1232] was selected for the preparation [of] spillway designs. The designs included in the specifications were based on a 700-foot free crest, a long concrete-lined channel, and an inclined tunnel leading to the diversion tunnels, and a fifty[-foot] by fifty[-foot] stoney gate installed at the *upper* end of the channel." ~~It's~~ [The final design turned out] entirely different now. ~~because~~ I remember the stoney gates. I didn't remember the *700*-foot length, but it finally

developed into each (aside about a little friend out there) developed into 200-foot crest lengths [on each side of the dam], four drum gates, two on each side, so that we had *two* spillways. So there was quite a change from the specification, and you asked how did we reconcile the specification with what was finally constructed, and how they handled the order for change and all – I think there was a lot of rigmarole that went on as far as orders for changes and extra work orders. But it was resolved very amicably, because I don't think that there was a big hassle [in cost adjustments]. The contractors did whatever we demanded of them, on the basis of unit prices.

So here was one spillway, a 700-foot length, with a stoney gate, a fifty-by-fifty gate at the upper end of it, and it turned out to be an entirely different side channel arrangement with drum gates and so on.

Storey: Well, after Boulder, what's the next project you remember designing, doing work on?

Hoffman: They were the small ones, all of them. I suppose the only way to know for sure would be to take that great big volume of Reclamation projects – you've seen that book.

Storey: Uh-huh, *Project Data* book.

Hoffman: *Project Data* book – and look through there and then sift through various dates.

Storey: Do you remember any of them in particular that presented interesting problems, or anything like that?

Hoffman: Well, of course . . . .

Storey: Say before and during the war?

Hoffman: Yeah, well, we developed ~~inclined~~ [curved channel] chutes, like at Bartlett, at Mormon Flat, at Stewart Mountain, at Vallecito. ~~Now when they came about = but~~ This was a concept of instead of having a straight chute – you try to turn water [in a curved channel]~~, why you run into all kinds of trouble, if water's going in one direction, to try to change it = but~~ by superelevating [the floor] like you do on a race track, ~~you see, you could come in here and incline/superelevate the channel, you see,~~ and have the water going in a different direction. So we had some interesting [design] problems, all checked by model tests on Bartlett, which was done around the time of the war, [as well as those at Mormon Flat] and Stewart Mountain. These were jobs on the Salt River [Project in Arizona]. And Bartlett was a new job, the rest of them were rehabs – Stewart Mountain and Mormon Flat. And of course the one on – what did I just mention?

Storey: Vallecito?

Projects Were Managed by Small Design Groups Responsible for Specific Projects

Hoffman: Vallecito. That was a new project [in southwest Colorado]. But there was always more than one project that we were doing at one time, see. And what we would do in the section would be [to assign] one individual [who] would take the responsibility for one [specific project], and maybe two or three would get together in little groups, so there were little design groups within the section, each assigned to a

specific job. ~~Up until the wartime, of course, I was one of them that was taking one job at a time.~~ [After the design work on Hoover Dam was over, I was one of those directing individual jobs.] ~~After that, after World War II, why then I was . . . . Well, even until around, well, almost to maybe starting about the war . . . .~~ When the war was over, that was '46, we still had two or three people that came back that had seniority.

In 1948 Became Assistant Section Head

In 1948, they were gone, and I was the one with the seniority, and I became assistant section head at that time. And so it's hard to single out just exactly what the sequence was of the work, and what jobs I did at any specific time, now, unless I were to go back and review it a little bit and say, well, I know Davis Dam was initiated before the war, and then during the war it wasn't put on hiatus, but there was nothing accomplished there, because they didn't award the contract. So we were more or less just hanging on and doing a little work on it. But *after* the war, one of the first jobs was Davis.

Storey: Davis was one that you talked about last time, I believe.

Recent Visit to Davis Dam

Hoffman: Yeah, this is Davis Dam here. I had a brochure on [it] there. I went down and visited this last December. It brought back a lot of interesting memories. They have a self-guided tour there, with this brochure. I went into the office and I said, "Well, I had a lot to do with the design, could you

show me around a little bit and show me details that you wouldn't ordinarily point out on the tour?" So the Superintendent, who is an electrical engineer, said, "Oh, sure, I'd be very happy to." And he started showing me around, and we went into the galleries that you wouldn't ordinarily do, and looked at the seepage. There were a few little details on seals that I was interested in, and seepage through the dam and so on, and the concept that we started out with at Davis – [placing] the powerplant was at the edge of the river, paralleling the river, and [how] we put in an intake structure that was [immediately] behind the powerplant. And then when they started to excavate, they ran into a fault there, so we had to ~~take and~~ move the intake dam so that it paralleled the channel that we had dug, or that *was* dug, for the diversion. And so there were a few little ideas there that only I could remember, and probably never ~~was~~ [were] recorded anywhere. So he was guiding me around, and then all of a sudden the alarm came on – something in ~~the~~ [a] generator started smoking, so he had to leave. So I was left to my own devices, and I looked around a little bit, and it was very interesting. I'd been there during construction, I think I saw it while it was being built, I guess once just before it was finished, so it was twice that I was there.

Storey: Reclamation sent you those times?

"If we wanted to see what was going on, or the finished product, why it was always on vacations. . . ."

Hoffman: No, no, that was done on my own, on vacations. That's the only way we saw anything. If we wanted to see what was going on, or the finished product,

why it was always on vacations. I remember in 1933, Lester Bartsch and [Glen] Sudman and I went on a tour, and we went down to Boulder [Canyon]. The coffer dams were in, the diversion [flow] was going through the tunnels, and they were excavating for the dam [foundation] in deep holes there, and they had this cableway, tremendous cableway. And so they invited us to get on the cableway and go across the river. Well here is this little box about like that, that was attached to the cableway, and I was supposed to go in there and go across the river. This was six hundred feet above [the bottom of the canyon] . . .

Storey: You mean a box about three foot square?

"But if I didn't go on my own, I never *would* have had an opportunity to go there. But the Old Man [Raymond F. Walter] was tight-fisted, and he wasn't letting anybody go. . . ."

Hoffman: No, it must have been about six or seven feet square. And so they attached [the box to] the cableway, and we were supposed to go across the river on this cableway. It was the first time I'd ever been *up* at that height, in something that was very poorly protected. That really gave me a thrill. But at that time, the dam wasn't even started then, and the spillways, they were just doing the excavation on them, so there wasn't really [much to see] . . . . So, at least I got to go see the project while it was being built. But if I didn't go on my own, I never *would* have had an opportunity to go there. But the Old Man [Raymond F. Walter] was tight-fisted, and he wasn't letting anybody go. What was the reason? Probably had to sign your life away in order to get a field trip.

Storey: Did you ever travel before you became assistant section chief, to a project?

Hoffman: Yes.

Storey: Tell me about it.

Gate Issue at Sherburne Lake on the Milk River Project

Hoffman: Well, Sherburne Lake was an interesting thing.

Storey: On the Milk River Project.

Hoffman: On the Milk River Project, up right next to Glacier Park. And this was designed very early, built very early. They had a spillway that had initially been lined with timbers – not log, but it was cut timbers, ~~but~~ planking. And this project or this site is [built on] a morainal deposit.

Storey: A glacial moraine.

Hoffman: Glacial moraine. Big boulders and gravels, and ~~this thing~~ [the spillway] was built on that. And the earth dam, and it was also built to a great extent with the morainal material. And I presume the reservoir was lined with this morainal material upstream. Well, they had a unique – I don't know if it was unique, because they tried the same thing on another job up there in [the state of Washington] ~~Idaho~~, I can't remember which one – I suppose in time I can recall – but they had a tower, see, an intake tower with a conduit. The intake tower came down vertical, and then it [emptied into a horizontal] ~~had a~~ conduit.

Well, the intake tower was made of (phone rings, tape turned off and on).

Storey: We were talking about visiting Lake Sherburne and the intake tower and the material in it.

Hoffman: Well, here they have no spillway because the planks have all rotted out, no foundation under that, because it's morainal deposit, and if you'd run any water [over] ~~off of~~ it, [it would have washed] ~~it'd wash~~ out everything. And this intake tower had an outer shell and an inner shell [where] ~~And then on~~ the inner shell is the one that led to the outlet pipe. And they had a cylinder gate, which is supposed to operate up and down, and that was their outlet. What happened was that over the years, ~~all of this~~ morainal deposit, the gravel and the rocks and all that were in the reservoir somehow were washed into this inner shell and just stayed there, because they couldn't [be flushed] ~~go~~ through. This inner shell [was in the form of] ~~had~~ a "U" bend.

Storey: Yeah, and a soil bottom.

Hoffman: Soil at the bottom. So anyway, What to do? So I was sent up there, and Charlie Anderson, C.G. Anderson . . . . ~~At that time when I went up there,~~ he was the Regional Engineer. ~~So I went there and we got into there, into this inner cavity was, where all the rocks and all, and these rocks~~ [We climbed into the inner base of the tower to observe how the rocks and debris] had ground around and ~~ground~~ around and just pretty much put the gates out of commission and everything. The gates were closed, fortunately. So, what to do?

Hoffman: So [I] took pictures and gathered certain impressions and all. And at that time I took a stereo camera and the pictures that came out were vivid. I've got the pictures here somewhere. But anyway, [when I returned to Denver] ~~came back and~~ we had to devise some kind of a solution to it. So the idea was then to instead of having the gate here, we would put the gate in line with the outlet tunnel, not a tunnel, it was a conduit and carry it all the way through to the upper end and put in a high-pressure gate. So that was the solution to the outlet. Well, what do we do about the spillway? So I got the idea, "Well, let's take this space between the inner and the outer shafts and put a spillway lip on the outer side on the perimeter, and have this serve as the spillway, so when the water got up to a certain point, it would spill down through the outer areas there, and connected it to the outlet pipe and that would serve as a spillway." So this was kind of make-shift, but kind of a unique arrangement. To solve the problem of the spillway to some extent, and have the outlet function properly, because it had a conventional high-pressure gate down there.

Storey: And so the pipe just went straight into the outlet. How did they operate the gate then?

Hoffman: Well, the best way is to give you a little picture of it, if you want.

Storey: But basically . . . .

Hoffman: You don't have that [tape] on, do you?

Storey: Yeah, it's on.

Hoffman: Oh. Well, this won't show up. (makes drawing) This was the tower here. It was a tower like this, and here was a cylinder gate.

Storey: Oh, the cylinder gate was not right up at the top, it was down inside.

Hoffman: It was down near the bottom, see.

Storey: Oh, okay. And then there was a "U" in it, sort of like you see in plumbing – a "trap" so to speak.

Hoffman: Yeah, and this was the outlet. Then (continues drawing) this was the tower and this was connected to the dam here by a . . . .

END OF SIDE 2, TAPE 1. FEBRUARY 10, 1995.
BEGINNING OF SIDE 1, TAPE 2. FEBRUARY 10, 1995.

[This is Tape 2 of] an interview by Brit Allan Storey with Carl J. Hoffman on February 10, 1995.

Hoffman: The dam came down like this, and this was an inlet pipe that led into the outer periphery little area, you see. The water would come in here, and this was down lower, I guess, like that.

Storey: That'd be open to let the water inside.

Hoffman: And the water would come in here and occupy the outer, and then would flow through the gate openings (Storey: Into the inner.) into the inner and then go out to the outlets. (Storey: Okay.) So here was where all the debris was, right in there.

Storey: Down in that "U."

Hoffman: Yeah, and there's nothing but rocks and pebbles and what-have-you. So we decided what we would do then is to come in here, and instead of having this come in here, we would then continue this (Storey: Straight on through.) straight on through, like this, and come in here with a high-pressure gate that would operate from inside.

Storey: And so the high-pressure gate would be in the tower still.

Hoffman: It would be in the tower in this portion of the shaft here, and that then would be a continual straight flow into the tunnel. And then for this outer area, this would no longer be flooded, so what we did was we came in here and put in an overflow, so that when the water, when it reached a certain level here, would flow in here, *into* this inner passage, and then connected this inner passage to this tunnel. In this case, you had here the tunnels like this, and the intake like that. We came in here and we put in this conduit with a high-pressure gate here. That's this one. And then broke this out in here, and connected this to the outer periphery, like that.

Storey: Okay.

Hoffman: It was an interesting problem. It didn't solve the *whole* thing, because the capacity of this is limited. It was limited by the diameter of the tower, and also we could only get so much water through it. We had to abandon the old spillway site, because there was nothing but deteriorated boards and all. So we put in an emergency cut, way off to the side somewhere, in the event that this spillway would *not* be able to

handle the total flow, then it would overflow the emergency cut. And if there was any erosion or a breaching, it would be done way over on the abutment, rather than to breach the main dam.

Storey: That was the first major trip you took with Reclamation?

Hoffman: No, there were others that I'd taken.

Storey: Do you happen to remember when you went up to visit Sherburne?

Hoffman: Not off hand.

Storey: Well, that's all in the record. How did your job change when you became the assistant section head?

How His Job Changed after He Became Assistant Section Head

Hoffman: Well, after the war, there was a lot of work going on, so what we still had were group heads, if I recall correctly. There's Wolverton and Deedel [phonetic] and myself – there were three group heads, and we each had a few people assigned to us. When Wolverton and Deedel left, I don't know, but around 1948, as I recall, they had left. So I was the only group head that there was there out of the rest of them. And so, in essence, I became an assistant, because I was the only one that had the seniority. I still had my own group.

". . . that's the first time that I'd gotten a flat-topped desk. . . ."

Then with the other people, I don't know just exactly how we did, but that's the first time that I'd gotten a flat-topped desk. The only people that ever had flat-topped desks were the section heads. McConaughy and Hammond and Warner and Blomgren, when we first started, *they* had flat-topped desks, but the rest of us were all on the drafting table[s]. And I stayed on the drafting table practically to 1948 or something like that. So that's the way the outfit operated – you didn't have a flat-topped desk, you [couldn't] ~~didn't~~ sit back and be able to put your feet on the table and enjoy the comforts. You were sitting there with a stool, and you had your drafting table, and you had a drawing on the drafting table, and you were working on the drawing all the time. Or else you were doing your computations. We didn't have a ~~computer~~ [calculator] on every desk – we had one ~~computer~~ [calculator], to start with, for the whole section.

Storey: One calculator?

"One calculator, and it was one of those hand-crank things. We had the twenty-inch slide rule, and that was our tools. That and triangles and a little drafting machine. . . ."

Hoffman: One calculator, and it was one of those hand-crank things. We had the twenty-inch slide rule, and that was our tools. That and triangles and a little drafting machine. Did you ever see one of the twenty-inch slide rules?

Storey: No, I don't think I have.

Hoffman: You want to see one?

Storey: Sure.

Hoffman: Okay. (tape turned off and on)

Storey: So Reclamation provided them, huh?

Hoffman: Yes. The only reason I have this one was because as I indicated to you, I had that in the Philippines and then I never turned it in afterwards.

Storey: That's *quite* a slide rule.

"If you have to get down to the nitty-gritty, why then you had to use either longhand or a calculator. . . ."

Hoffman: And it got to the point where I could operate . . . . It'd probably take me a little while to relearn this, but I could operate this [slide rule] faster than I could a calculator. The trouble was that you can't even go to the first decimal place on it, you see. So everything is approximate. If you have to get down to the nitty-gritty, why then you had to use either longhand or a calculator. (pause) I see where this has gathered dust.

Storey: Were you supervising people when you became a group head?

Hoffman: Yeah, sure. I started supervising people shortly after I got there, to one extent or the other. (referring to photograph) Here was our whole section in '32. It was me and Davis. (Storey: Stinky Davis?) Stinky Davis. And that was all! At this time, the sections [were] – McConaughy was over here, and me and Davis.

Storey: In 1932.

Hoffman: In 1932. So I was probably doing everything that had to be done, whether it was filing or whether it was computing or whether it was making drawings, or whether it was sitting there for hours while Savage and Steele and McConaughy were gathered around my desk talking, and me too, because I had some input to it, because the drawing was the one *I* made, so whatever was on the drawing either it was okay or it was argued. And finally whatever was resolved, then I started again, and changed the drawing or started a new drawing or whatever had to be done.

Storey: Well, then in '48, though, you became a group head.

Became a Group Head about 1936

Hoffman: Well, *long before that*. I became a group head around 1936.

Storey: What did group heads do?

Hoffman: They had the responsibility of the work on this particular job, on this particular project – layouts, computations, whatever had to be done. So we were the innovators, we're the ones, along with the section head, that conceived of everything that was on the drawings and what finally developed into whatever the final solution was.

Storey: And did you have people assigned to your group in '36?

Hoffman: Yes.

Storey: How many, do you suppose?

Hoffman: Oh, as many as three or four. I don't know how big our section got. I don't think our section *ever* got over fifteen people or so. That's right in the heydays, when there was work coming in as fast as we could handle it. But that was because of Roosevelt and his Work Project Administration or PWA.

"We didn't initiate anything, we only designed it after the field initiated it. . . ."

We didn't initiate anything, we only designed it after the field initiated it. And how that came about, whether that was due to pork barrel, or whether that was due to pressure – I can't remember the senator's name from Grand Junction.

Storey: Congressman Taylor?

Hoffman: No, this was a senator.

Storey: We're not talking about Wayne Allott?[11]

"So [before] ~~until~~ the job got to *us*, it had gone through the political aspects, it had gone through the planning (rapping on table for emphasis) aspects, it's gone through the investigation aspects, so we didn't get to the job until it was ready for design. . . ."

Hoffman: Yes, possibly. But he was a kingpin in Congress, see, for Reclamation projects, and for the initiation and for the sponsoring, and for actually promoting

11. Gordon L. Allott served in the U.S. Senate from January 3, 1955, to January 3, 1973. This may be a references to Wayne Aspinall who served in the House of Representatives from January 3, 1949, to January 3, 1973.

most of this. So those projects were done here in this particular area, were probably ones that he sponsored, due to political pressures of one kind or another. So [before] ~~until~~ the job got to *us*, it had gone through the political aspects, it had gone through the planning (rapping on table for emphasis) aspects, it's gone through the investigation aspects, so we didn't get to the job until it was ready for design.

Storey: What's the difference between investigation, and what was the other one you said?

"But that's a different aspect from what we're talking about, because we were the designers, and we didn't get into that. That was the planners, and those were the field people. . . ."

Hoffman: Well, there was investigation, and there was economic evaluations. Now how much of that was done, I have no idea. But the Reclamation Act was set up on the basis that the government would construct a project, and that would have to be reimbursed by the water users. (Storey: Right.) These are supposed to have been self-liquidating projects. Well, it turned out that very few of them were self-liquidating: the moratoriums that, of necessity, were imposed on a lot of them. Irrigation in most instances were *never* able to pay their way for these projects. But that's a different aspect from what we're talking about, because we were the designers, and we didn't get into that. That was the planners, and those were the field people.

Storey: So when you were a group head, you were coordinating the work of, say, three or four people, to get a specific job done?

Hoffman: Or two or three jobs at one time, I could imagine. It depended on what the flow of work was.

Storey: And so in '48, you became the only one who was left, of the group heads? Is that right?

". . . I was the first one to start with McConaughy, and I was practically the last one that hung out with him. . . ."

Hoffman: Yeah, of *our* group, and that left me clear to be an assistant, because whether or not on the chart that I was classed as the assistant, or what it was, I was second senior to everyone. And then we had a lot of turnover – I don't know a *lot* of turnover, we had some good people that came, and didn't see any chance of advancement, and left. We had quite a few of those. We had a few of them that I don't know for what reason, they transferred to other sections. But I was the first one to start with McConaughy, and I was practically the last one that hung out with him.

Storey: You were telling me that you started out at $2,000, were then reduced twenty percent. Do you remember anything about what your grade or salary was in '48 when you became the assistant?

Became a GS-14 in 1948

Hoffman: In '48 I became a GS-14, and I stayed GS-14 until I went to the Philippines, and then the reason I went to the Philippines was that I got a GS-15. But I was bumping my head at the top of the grade, and you got an advancement every year-and-a-half, I think, or something like that, and there were ten different steps in the grade. So I advanced pretty fast to start with, see. I became an assistant at $2,300 ~~but there was an~~

~~Assistant I had, he arrived in 1933.~~ And then became an associate somewhere in the later 30s.

Storey: These are titles – assistant engineer, associate engineer?

Different Titles and Salaries for Engineers

Hoffman: Yeah, yeah. Junior engineer was the first grade, and that led from $2,000 to $2,600. Assistant went from $2,600 to $3,200. Associate went from $3,200 up to . . . . Well, anyway, in the Bureau, they cut you down to where you could be an assistant at $2,300, instead of $2,600. And an associate, you could be at $2,900 instead of $3,200. So it was a junior up to $2,300, an assistant to $2,900. An associate up to $3,500 I think it was. And then a full engineer – at this time I think (Storey: In '32, yeah.) McConaughy was a full engineer, and I think he was getting either $4,200 or $4,500. But that's the way it went, as far as advancements were concerned.

Storey: So in '48 you were a Grade 14, earning what, roughly? Do you remember?

Became a GS-15 When He Took a Job in the Philippines

Hoffman: I have no idea. Of course it went up as time went on. I ended up at $14,000, I think, at the top of the grade. And then I got this job in the Philippines as a full fledged engineer, Grade 15.

Storey: Now as assistant to the section chief, what was your job then?

Hoffman: Same as it always was, to get the work out. I think at that time, when I was assistant, I probably had the responsibility for more than just one group. So there were several different groups, and I had the responsibility for *all* of the groups. But it wasn't a very rigid type of relationship – McConaughy was still the boss, see. (Storey: Uh-huh.) And I was responsible for all of the groups, but a lot of this either went through me, or went directly. It was very informal. See, because I was the group head doesn't mean that anything that was done subordinate to me had to go through me to go to him. In some cases he went directly to them, in some cases I went directly to him. So it was a very flexible arrangement. Not buddy-buddy, but it was very informal.

Storey: And how long were you assistant to the section head?

In 1951 the Outlet Section and Spillway Section Were Combined

Hoffman: Until he retired in '51. And then is when . . . . I don't know whether we want to discuss it here, there was a little bit of politics, I'm sure there was, as to why they disbanded us and put us over to another section. As I explained to you, it developed that they had two Spillway and Outlets Sections. They originally started the Spillway Section was one section, and Outlet Works Section was the other section. And then they started making these assignments to where they got to the point where [both sections] ~~they~~ were doing identical work, because they'd assign some of the spillway work to what was initially only the Outlet Works Section. We got outlets as well as spillways, so there were two sections. So there may

have been a [12]justification for saying, "We don't need two sections, we only need one."

Storey: Uh-huh, and they did that in '51, was it?

Hoffman: After McConaughy retired.

Storey: Uh-huh, so *then* what were you doing?

Hoffman: Well, I became second assistant, because they combined the sections. They couldn't *demote me* – not in title, anyway, they couldn't demote me, or in grade – but they demoted me in that the section head that was there continued as section head. He had an assistant head, so I was . . . really dispensable if they wanted, because I wasn't . . . .

Storey: Do you remember any particular projects at that time that you were working on, that were interesting, that presented unusual problems?

"Every site condition presented its own particular problem. . . ."

Hoffman: Well, I would say that ninety percent of the projects were interesting projects, because there were no two that were exactly alike. There's no duplication, because you did one one way, you didn't say, "Well, we'll do that one exactly the same way," because conditions were different. Every site condition presented its own particular problem. So innovations, yes, a lot of innovations. Could we have done one job exactly the same as another? To some

12.

extent. *Did we*? To some extent. But there wasn't anything *rigid* about what we were forced to do or assigned to do. We had a free hand as to exactly what we did – keeping in mind that there was an economy involved, and there was an engineering problem involved. And you tried to put everything together to give you the best solution. You could have had a much more expensive type of solution, but you tried several different trials to see whether or not you could have one solution that gave you an advantage.

Storey: Now, you were working at this time later, mostly on embankment dam spillways, is that right?

Competition Between the Earth Dam and Concrete Dam Sections

Hoffman: Yes. You see, when they set up the Concrete Dams Section, we only had one type of dam, the concrete dam. Then when they got involved in earth dams, and the science of concrete dams and the science of earth dams is (Storey: Very different.) very different and entirely apart. So, when the spillway became an integral part of a concrete dam, it was part of the dam, and the spillway was an incidental adjunct to it. When it got to the point where they couldn't combine, like on Boulder Dam, you couldn't combine the spillway with the dam, because the dam is an arch dam and it would be difficult to try to place a spillway over the face of the dam. It *could* have been done to some extent, but instead of that, we had this other solution. But on many of the dams, where they decided that they *had* the big diversion tunnels, and they wanted to avail themselves of that particular tunnel for a spillway, it became a separate part of the

dam. But the concrete dams, somehow or other . . . . It was up to the head of the Dams Branch as to what the final solution would be. And there was always a competition between earth dams and concrete dams as to what kind of a dam there should be. Like for instance, it got to the point – it used to be that the head of the Dams Branch would make the decision, *this* is a concrete dam.

Anchor Dam

You [take] ~~got up to~~ Anchor Dam, if you know anything about Anchor Dam, and on Anchor Dam, nobody could make up their mind. They sat down and there was a competition between the earth dams and the concrete dams as to which should prevail. They made economic comparisons, and they couldn't come to a conclusion on that – one was the same as the other. What did they do? They got out specifications asking for bids on *two* types, either the earth dam or the concrete dam, because people here, whoever it was in charge, didn't feel competent, or for one reason or another, politics or whatever it was, couldn't decide whether to leave it as an earth dam or a concrete dam. Well they finally built the concrete dam, ran into all kinds of problems on Anchor, which may or may not have been the case if they would have built an earth dam, because they ran into very deep sink holes there for the concrete dam. It might have cost a lot more than what the initial estimates were. But once they got the bids in, they made the decision on the basis of the bid price. [The] concrete dam ~~s are~~ [was] a little cheaper, according to the bid, but whether or not it was actually cheaper, because they got into all of the foundation problems, is

debatable. With the earth dam they wouldn't have gotten into those problems, because they wouldn't have [had to go] ~~gone~~ down to solid rock [for the foundation] as much. Well, it turns out, whichever dam they built was a fiasco, because if you talk to Harold Arthur – he was the regional man at the time – I guess the caretaker or whoever it was there, calls him up one night in the middle of the night and says the reservoir has disappeared. They had these big sinkholes there, and I guess it broke through[and emptied the reservoir]. And so they didn't have a project. They got a dam sitting there, I don't know what's ever happened to it, but it's probably an eyesore, or it's an embarrassment for the Bureau.

Harold Arthur

Storey: When did you meet Harold Arthur?

Hoffman: I met him in the late 30s. He was up at Casper – on which project was it at that time? I can't remember. It wasn't Guernsey, it wasn't (unclear).

Storey: Was it Alcova?

Hoffman: Could have been Alcova. That's where he got his job, his appointment. Then he came down to Denver and he was [assigned to] ~~in~~ the Earth Dams Section. And [when] the war came along, and he was eligible for the draft, and he didn't know which way to go, so he left the Bureau and went to work for an aircraft outfit, I guess. Then when the war was over, he came back and went back into the Earth Dams Section.

Harold Arthur Made His Reputation Coordinating Work at Falcon Dam

As he probably explained to you, he made his reputation being the coordinator for Falcon Dam.[13] It seemed like Falcon was a project that needed a project engineer, and that's something the Bureau never *thought* to assign – have one engineer [responsible] for the entire project, to have him be a sponsor, and to coordinate the work of the various sections and divisions and all. One thing, you see the prime movers are we designers, the dam designers, because everything, the decisions that are made, revolve around us. The mechanical engineers, even though they had a branch, what they were was just service people for us. If we needed a gate, we went to them for a gate. True, they had the responsibility of designing their gate or their valve or whatever it is, but they were service people in that they didn't initiate the concepts that went into [a design] ~~it~~. See, we initiated the concepts. We wanted a particular type of gate, and we designed the structures to [accommodate it] ~~do it~~. Then we went to them and said, "Okay, here, furnish us the [design of a] gate or the valve, or whatever it is." Electricals [electrical engineers], to some extent, were the same way.

". . . most of the groups that were divisions were in fact only service people to the Dams Division. . . ."

So most of the groups that were divisions were in fact only service people to the Dams Division. *And*, for

13. Falcon Dam was an IBWC, International Boundary and Water Commission, project on the Rio Grande between Mexico and Texas. Reclamation provided technical expertise on the part of the United States through Harold Arthur, who acted as a coordinator with Mexican technical expertise provided to the project.

any particular project, the people that were supposed to be responsible for [the design concepts] ~~that~~ were the Dams people. Now, if it was a small project, somehow, somebody took the initiative to try to herd this thing through, and got the mechanicals together with the electricals and with the designers, with whatever [was needed in the design] ~~it is~~. But on Falcon, this became a major problem, because there were so many different features on Falcon. There was the dam, and there was a concrete dam . . . .

END OF SIDE 1, TAPE 2. FEBRUARY 10, 1995.
BEGINNING OF SIDE 2, TAPE 2. FEBRUARY 10, 1995.

Storey: You were saying there were two powerplants, two outlets.

Hoffman: Yeah, and one was one kind of an outlet, and one was another kind of an outlet. One had a concrete inlet, the other had a tower intake. It got to the point where they had to have somebody that would coordinate everything, that if I wanted a gate or three or four different kinds of gates, how was the Mechanical Branch handling *their* part of the project? and *how* would it dovetail in with what we were doing? So the exchange of information and coordinating the various concepts and putting everything together was something that was lacking. So what they did is, they assigned one man – this was not only on Falcon, this was on several [projects] – where they assigned one individual as coordinator. And the coordinator took on the responsibility for seeing that everything flowed smoothly and the information flowed smoothly, and that the proper information was gotten to the right people at the right time. In many organizations, he's the project engineer.

Storey: And that was a new concept?

Harold Arthur Succeeded at Job Coordination for Falcon Dam

Hoffman: And that was a new concept and it was done on several [design projects], but Harold was the only one that made a success of it. They had other coordinators on other jobs, and in most cases, they *weren't* the type of people that were able to accomplish what was intended.

Storey: Why was Harold able to?

Hoffman: Because Harold is Harold! Why did he become Chief Engineer?

Storey: Didn't that cause a bit of consternation, that here he was for the first time doing this?

Hoffman: No, his personality overcame any obstacles. I think Harold at that time – he was a very capable man, see, and he had a good understanding of what was going on, and he did a little prodding when prodding was necessary, and he got the backing, and Falcon turned out much better than it would have, had it foundered the way it was doing, I presume, at that time. This set Harold up to where he got some recognition. And as I say, to become Chief Engineer, you must have a little bit in back of you, see, and he did.

Storey: Did you know Ellis Armstrong at that time also?

Hoffman: Yeah, very well.

Storey: Tell me about Ellis.

Ellis Armstrong

Hoffman: Ellis was a politician. Ellis said, "I'm going to be Commissioner of this organization before very long." He started in, in the Earth Dams Section, the same as Harold Arthur, and somehow or other – I don't know what he knew about construction, but he went out to Region Six, out to Kansas, and he became Construction Engineer on Enders.

Enders Dams and Dike on the Frenchman-Cambridge Division of the Pick-Sloan Missouri Basin Program

Storey: Enders? E-N-D-E-R-S, I believe.

Hoffman: Yeah. So he was Construction Engineer. Left the design group, got into construction. Now, I don't know that I can follow his progress as he went on, but from that, with a little bit of pull, I suppose, from his congress people in Utah, he became commissioner.

Becoming Involved with Design of Small Dams

Storey: How did you get involved in *Design of Small Dams*?

Hoffman: As I told you before, this was a question of Harold being assigned the job of editing or coordinating the preparation of it. This was in the 50s. I was just floundering, I guess, didn't have anything special to do, and he was given this job, and he decided that if he's going to make the right kind of a product here, he's got to have somebody that knew what was going on. So he hand-picked Jack Hilf and me and himself

to be the principal authors [in our] ~~of this~~ particular [specialties]. And then, of course, for the various other assignments, for their specialties, there were a [number of others assigned] ~~bunch of them picked~~. And he prevailed to take Hilf away from his work, and me away from my work, and he, and we went and got a private office, sat there in a private office, and wrote most of it, and then got other contributors. I guess I haven't showed you . . . . (sound of shuffling papers)

Storey: How long did it take you all to do this, do you remember?

Hoffman: I think we were closeted for about three months. (pause) He was the head of Publications.

Storey: The man in the middle.

Hoffman: Everett Larson, but he had very little input, hardly at all, because Harold did most of the editing – he was supposed to be editing [and assembling the text]. And this is Jack Hilf.

Storey: And this is?

Hoffman: This is me.

Storey: Okay, and you're looking at the book, I take it.

Hoffman: We're looking at the book.

Storey: Uh-huh, news articles, even, in *The Denver Post*. (pause) Let's see, this is a Letter of Award for you, signed by Grant Bloodgood as Chief Engineer, giving

you a $600 merit award for working on the dams book.

Awards for Work on *Design of Small Dams*

Hoffman: See, here [is] ~~was~~ about the awards. Harold got the biggest one, because he was editor – he got $900. Jack Hilf got $600, I got $600. Everett Larson, the one I showed you, his contribution was not that big, got $350. Lewandowski, $150; Paul Bock, $150. These are all people that (Storey: Contributed articles). And we got by-lines, which was nice. But each of us got the by-line [for our specific chapter], and that made a world of difference, because that gave us a little recognition. Now, Joe Lara, he got his name along with my by-line, [but] ~~and~~ he wasn't entitled to that, because his contribution was not that big. Let me show you here, because you might be interested. (reading) "Three of the Washington Office who received the award were Ted Mermel . . . ." Now why he got that, I don't know, he had nothing to do with the writing, but he probably was the one that suggested in Washington that we ought to rewrite [the original] ~~that~~ book of small dams [published much earlier].

Storey: And he got a $725 award! (laughs)

Hoffman: For doing nothing! Because [he didn't have much input] ~~he *did* nothing~~. He probably helped coordinate the printing, maybe. Now these people I don't know, why they got anything, I have no idea.

Storey: And this is a newsletter, July 17, '61, saying R. J. Walter is retiring. This is a different Walter though.

Hoffman: This is his son.

Storey: Yeah, because that was R. F. Walter.

Hoffman: Well, we got notoriety in here.

Storey: Well, you know, I'd like to keep going, but we are way past our four o'clock time now. (laughs)

Hoffman: Okay, we'd better quit. Not only that, you see, we got recognition in the *Congressional Record*. So here it is in the *Congressional Record*.

Storey: (reading) "New Reclamation book presents data for use and design of small dams," in the *Congressional Record*.

Hoffman: And this is a publication entitled Design . . . (Storey: Small Dams.) Now who Mr. Murray [phonetic spelling] is, I . . . . Let's see, (reading) "Honorable James Murray, Chairman of the Committee on the Interior and Insular Affairs."

Storey: In the U.S. Senate.

Being One of the Authors of *Design of Small Dams* Provided Valuable Publicity

Hoffman: In the U. S. Senate. So he's the one that got us some recognition, which was publicizing the Bureau of Reclamation, but incidentally (chuckles) (Storey: Publicized you.) publicized me. Well, it's surprising how much benefit I got from this, because it seems like I got three or four different assignments from people that I *didn't* know, mainly through the fact

that they saw my by-line in here for that work, and they were interested in that particular work, and then I got a couple of jobs. In [Venezuela] ~~Columbia~~ I got a nice consulting assignment, based on the fact that the fellow that was doing the work in [Venezuela] ~~Columbia~~ set up a little office, had been a student at Fort Collins, and he contacted Fort Collins and wanted them to hire me into their organization so that he could use me as a consultant.

Storey: That was later when you were a consultant?

Hoffman: Yeah. And you asked me what works did I do? I found ~~someplace~~ a listing of all the consulting jobs. You said you wanted me to . . . .

Storey: Okay, good. Well, let me ask you now if you're willing for the material on these tapes and the resulting transcripts to be used by researchers, both from inside and outside Reclamation.

Hoffman: Well, I already signed the consent I guess.

Storey: Good. That means yes, I take it.

Hoffman: Yeah, all right.

Storey: Okay, thank you.

END OF SIDE 2, TAPE 2. FEBRUARY 10, 1995.
BEGINNING OF SIDE 1, TAPE 1. MARCH 3, 1995.

This is Brit Allan Storey, Senior Historian of the Bureau of Reclamation, interviewing Carl J. Hoffman, at his home in east Denver, at about two o'clock in the afternoon on March 3, 1995. This is Tape 1.

Hoffman: During the 40s and 50s, before the Geology Branch got to the point where it kind of got out of hand, there were just too many geologists around. The first geologist, Frank something – I can't think of his name – he [worked] ~~was~~ with Savage. The way it was, we only had one local geologist here in Denver that did all the geological interpretation. Of course there were geologists out in the field at various times.

Bill Gardner Was One of the Early Geologists

And Bill Gardner was one of the early ones. Here's his résumé, which may give you an idea . . . .

Storey: Okay. Well, I can copy any of these things you're willing to let me take.

Wes Holtz Was in the Laboratory and a major author of the *Earth Manual*

Hoffman: And I'm sure that his heirs would not want to keep any of this confidential. Here is [the résumé of] Wes Holtz in the Laboratory, if you've heard of Wes Holtz.

Storey: No, I don't know him.

Hoffman: Well, Wesley Holtz was one of the ones in the early life of the [earth] laboratory. I think he started in the [field at the] All-American Canal and then came here [to Denver] in the late 1930s I guess. But this will tell you . . . . (Storey: Okay.) And he's responsible for a lot of the authorship for the *Earth Manual*.

Storey: H-O-L-T-Z.

Jack Hilf

Hoffman: Wes Holtz, yeah. He just passed away last year or so, and it would have been worthwhile interviewing him. Dr. Hilf, I'm sure you've heard of Dr. Jack Hilf. Here's his résumé. He did an awful lot of writing, lecturing, and he put Reclamation on the map, technically. It would be worthwhile having his résumé. (Storey: Okay.)

Harold Grout

Harold Grout was in hydrology. I don't know that this is that notable, but here is a résumé of his.

Melvin Jabara

Here is Melvin Jabara[‘s résumé], who succeeded me when I left, as assistant to the section, and then later climbed up the ladder to where he became the head of the Dams Section. So you might be interested in that. (Storey: Okay.) This is something that's lacking in any of the personnel records, because no one has ever, at the Bureau, kept a detailed glossary or diary of the activities of the various people.

Working on Ross and Gorge Dams for the City of Seattle, on a consulting basis

Storey: That's right. One of the things you mentioned as we were quitting last time, was working on Ross Dam for the City of Seattle, on a consulting basis. Could you tell me about that?

Hoffman: You have these pictures here. [Photograph of Bureau of Reclamation personnel and visitors from Seattle Power Co.].

Storey: Yeah, I have this picture. Now, this of course has to do with Savage.

". . . in . . . the late 1930s . . . or it may have been after World War II started, Savage took less and less of an interest in the Bureau, because his reputation was mounting, and he got offers for consultations . . . all over the world.

Hoffman: About in either the late 1930s or shortly thereafter, or it may have been after World War II started, Savage took less and less of an interest in the Bureau, because his reputation was mounting, and he got offers for consultations, specifically where – I suppose all over the world. But I remember that on the Yangtze River, he was a consultant there for a dam on the . . . . What was it, the Yangtze River Dam? which the Bureau . . . .

Three Gorges Dam in China

Storey: Yeah, Three Rivers Gorges.

Hoffman: The Gorge Dam.

Storey: Three Gorges, yeah.[14]

Hoffman: Anyway, that was one of his consultations. But I think the electric company of the City of Seattle was one ~~of them~~ that enlisted him to consult on their

14. Three Gorges Dam.

dams. I don't remember the name of the river now,[15] where Ross Dam was concerned, and Gorge Dam. And they made a contract with the Bureau for consulting work. And that's the way that he enlisted a lot of his subordinates here to give him consulting assistance. As far as [consulting for] Gorge Dam is concerned, which is above, I think, upstream from Ross Dam,[16] they set up a separate [design] company, Savage did, outside of the Bureau, and enlisted John [Hammond] ~~Savage~~ to head up a design group. [Hammond] ~~And he~~ took five or six other people from the Concrete Dams Section and set up a little shop of their own and did the design work on Gorge Dam. And on Ross Dam, [Savage] ~~he~~ called on some of these people, amongst them, as far as the spillway was concerned, was Joe Bradley, to make a model of the second stage of Ross Dam. [Ross Dam was planned to be constructed] ~~it was staged~~ in three different stages at a time – heights – and this was the second stage. [So Savage] ~~And he~~ asked me to work up the spillway design for the second stage, which [needed to be] ~~was~~ different, of course, than the final design would be [of] ~~on~~ the higher dam. And Joe and I worked up a [design to be modeled] ~~model~~ – I worked up the details and they built the model and tested it here. And I presume that some of the rest of these people were somehow involved with him in advising him, either under the contract with the Bureau, because these were the pictures taken. This is a picture of the people that were involved, and I presume this was under the contract. But he also had Hammond, who was the head of the Concrete Dams

15. Ross Dam, on the Skagit River in Washington, was completed in 1949. It is 540 feet high.

16. Gorge Dam is downstream on the Skagit River from Ross Dam. It is 300 feet high was dedicated in 1961.

Section, and employees which he enlisted to work privately, to do some of the design work. And I think the design work that *they* were working on was the Gorge Dam, the high dam.

Involved with a Project to Divert Water from the Mediterranean to the Dead Sea for Hydropower Production

Another interesting [project] ~~thing~~ – he got involved with somebody that was planning or thinking about a project that would divert [water from] the Mediterranean Sea into the Dead Sea, and have a hydro plant [to develop power]. This was in, at that time, Palestine, to work up a plan for utilizing the Mediterranean water and spill it into the Dead Sea, which is probably a 200-foot drop or so, which, of course, would have involved canals and tunnels and pumping plants and hydro plants and all. But [Savage] ~~he~~ didn't pursue it too much further, because at that time why he was getting to the point where he was having trouble remembering. This is probably about 1944 or '45. So I don't know, he wasn't retired at that time, but he retired shortly after that, and did other consulting jobs later.

Reclamation Placed Restrictions on Private Consulting for Its Staff

One interesting thing was that about that time, he was getting people to do private consulting while they were with the Bureau, and then there was a restriction put on, [where] ~~that~~ no one could do outside consulting work. Ireal Winter who was the head of the hydraulic machinery, turbines – and I guess his specialty was turbines – ~~he~~ was called on the carpet

and told that he should not do any consulting work. So it got, I guess, to the point where everybody was doing it. John Parmakian was doing a lot of consulting work, and I guess continued to do it with the sanction of the higher-ups.

So when you talk about Ross Dam, this was extracurricular work that was being done, either by contract, with the Bureau, or privately. And of course the Bureau did an awful lot of foreign activities work, which was sanctioned, but mostly with foreign governments, rather than with local. (Storey: U.S. entities.) U.S. organizations.

Storey: You don't have any more idea why outside consulting was banned?

Hoffman: Well, I think they were taking advantage of it, they were doing [outside] consulting work ~~outside~~ during working hours, or without the sanction of the Bureau, and they just clamped down on it. I don't remember who was the Commissioner at that time, but somebody, I suppose, got wind of the fact that people were spending too much time doing outside work, and put a ban on it.

So does that seem to be the question you asked?

Storey: Yeah, that's the kind of thing I'm interested in. Now, you told me before that in 1961 you went off to Thailand. Could you talk more about that?

Hoffman: Well, let's go through a résumé of this thing, and I'll . . . .

Storey: Let's see, do you want your résumé back?

Hoffman: Did I give it to you?

Storey: Yeah.

Hoffman: This thing goes to '80, if you're interested. And here's a copy too, part of it. Well, here, just a review of what I did *with* the Bureau, up until 1960.

Work on the Mekong River in Laos, Thailand, Cambodia, and Vietnam

Storey: What was the work on the Mekong about?

Hoffman: Here we are, here. (reading) "From 1961 through '65, while at the Bureau, I served on the Special Advisory Missions related to design of projects outside the United States. For two months in '61, was a design engineer member of a team of three specialists sent to Southeast Asia by USAID, to inventory and evaluate engineering data being assembled for a study of potential water resource developments on the Mekong River in Laos, Thailand, Cambodia, and Vietnam." Well, we went [under the auspices of] ~~there. At that time, the~~ USAID . . . . This was for the United Nations. They were studying the Mekong River and the potentials on that [river for hydro and irrigation development], and they enlisted people from various countries [through the U.N. to study such possibilities]. I remember the Japanese were assigned to study developments, and dam designs, for [the] tributaries to the Mekong. And the Australians [and Israelis] were enlisted to do investigative work. And there were two or three other countries that were also involved in it, and everybody was going in different

directions, there was no coordination. So the United Nations says, "Well, let's find somebody that'll make a review and see if we can't get some report as to how we can coordinate all of these efforts. So there was Cecil Johnson, and I don't remember whether he was out of Washington, or whether he was out of Utah; and there was me that was from the Chief's office. Johnson was a planner, I was the design engineer, and then a fellow by the name of Bush, who was an economist out of McCook, Nebraska – what's his first name? Frank Bush. Well, it was the three of us, and we went there and visited [and reviewed] all of the projects that were being considered. I know we went up the Mekong River [to review the Pamong Dam site] between Laos and Thailand, and that was at the time of the activity of the Lao . . . . What was it, the Communists . . . .

Storey: The Pathet Lao?

Hoffman: Pathet Lao. And we went to visit the Pamong Dam site, and we said, "Please don't send any big contingent of people to accompany us, because that would attract attention." *But* the Laotians had a little gunboat, so they sent it along there, and we got up to the Pamong Dam site and [someone] ~~they~~ started shooting at us from the hillside. Well, we scattered into the brush, and it lasted for a little while. But that's about the time, in '61, that the Communists were [becoming] ~~being~~ active. I know we went all through Cambodia, had no problems at all. Thailand was safe, of course. And Vietnam, we went to . . . . What's the name of the capitol? Anyway, we weren't able to go very far into . . . .

Storey: I want to say Saigon, but is that it?

Hoffman: Yeah. But they wouldn't let us go. We went and visited a few places, but we couldn't go too many places, because Communist activities were already started then. Then we came back [to Washington] and made out our report, that was it. About a two-month trip. So that was the Mekong River assignment. That was the first time I ever went on a foreign assignment.

Storey: And what did you recommend, do you remember?

Hoffman: Well, I think it wasn't a question of recommending. I know I made quite a detailed study of the Pamong Dam. And the rest of it were just different potentials that were possible on the Mekong itself. Visited, of course, with the Japanese, on my way home I spent a week in Tokyo, talking to the Japanese that were involved. This was [with] a private [engineering] organization that was working for the Japanese government. So [just] enough to gather information as to what they were planning on and what their thinking was.

Storey: On the tributaries? They were working on the tributaries?

Hoffman: They were working on the tributaries, yeah, on different dam sites. We came back and reported to the Commissioner – that was Dominy at that time – and wrote a report, and that was it. Now what happened to the report, I have no idea. So that was just a one-time proposition, one-time problem that we satisfied the United Nations people. It was the U.N. Development Project or something. I can't remember the agency for sure. So that was it.

Okay, the next one . . . .

Storey: Now you were still employed by Reclamation then?

Hoffman: Yes.

Storey: Okay, so this was a detail.

Consulting on Beas and Ramganga Dams in India

Hoffman: This was a detail. And then in 1963 I spent two months in India, consulting with the government of India Central Water and Power Commission on design problems for their Beas and Ramganga Dams in northwest India. They came and requested assistance on the design, and I was delegated to do that. A lot of preliminary design and study here [in Denver], and then went to India, New Delhi, and they had a board of review people there for their agency – I don't remember the agency's name. I reported to them the possibilities for various designs – mostly the question was the [details of the earth dam and the] arrangements of the spillway and outlets and diversion and such things. I remember that they gave me a crew of [Indian people to assist me] ~~people~~. I'd go to a meeting during the day, and the board would ponder and review and suggest, and during the night we used to sit down and work up a different design. The next day we had a new concept ready for them[, the board,] to deliberate on. And that went on for quite a while.

Floyd Dominy Visits India on a Foreign Activities Review

And Dominy came to India at that time, presumably on a foreign activities review, but I think mostly it

was for a vacation. And so I got to enjoy a lot of the amenities that they showered on him, visits to the various places of interest, around New Delhi. I remember one day he was scheduled to go visit the Taj Mahal, and I was to accompany him. But unfortunately, that was the day that the board was to undertake a review of something, and I had to be in New Delhi to confer with the board. So I gave him my camera, and I said, "Here, Floyd, you take the pictures here, and when I get home I'll make everybody believe that I took the pictures of the Taj Mahal." Well, that's as far as I got, but we got to see an awful lot of other things. So it was interesting. I did them a lot of good. As a result of that, they sent one of their people here, and he spent a year at the Bureau here in the Dams Section, and in other sections. His name was Pathak. But that was [handled under] a Foreign Activities arrangement.

Storey: This was in Bengal?

Hoffman: No, this is in the [northwest] ~~northeast~~, around . . . . The Beas Dam was in the vicinity of New Delhi.

Storey: Bias, B-I-A-S?

Asked to Consult in the State of Orissa, India

Hoffman: B-E-A-S. So this was – I can't remember the state now. But while I was there, it was interesting, one of the board members was [Dr.] Koshla, and he [had] made quite a reputation in the engineering profession. He was[, at one time,] a part of the Water Department of India, and later he was appointed as the Governor of the State of Orissa, which is near Calcutta, which

is on the other side of the country. So when we finished our deliberations in New Delhi, he invited me to come to Orissa and to advise him on some projects that they were thinking about in that state. He was living in the Presidential Palace, a palace that was built by some of the big wigs, the maharajahs or something. A beautiful place. And he accorded me the greatest hospitality. A fine gentleman. He was a very good friend of Savage's, or good acquaintance of his. So the trip was very interesting, and I'm sure that I did them quite a bit of good. They *built* Beas Dam afterwards. I don't know about Ramganga.[17]

Storey: What was the purpose of the Beas Dam?

Hoffman: I suppose irrigation. I don't know if they had power, I don't think they had a powerplant [planned] – it was mostly irrigation, water resource, water development. So that was India.

Storey: Then you came back to the U.S.?

Consulted on Tsenguen Dam with the Taiwan Provincial Water Conservancy Bureau

Hoffman: Yes. Then in 1964 I advised the Taiwan Provincial Water Conservancy Bureau on the design of their Tsenguen Dam, and as a result – this was in the earlier concepts of [their studies] ~~it – this was done, I think in conjunction with a visit there~~. I think this was when I was assigned to the Philippines, and on the way home I spent a week there. And later, they came to the Bureau and they enlisted a group of

17. Ramganga Dam, on the Ramganga River was completed in 1974. It is a 125 meter-high earth and rock fill dam.

people that went [to Taipei] ~~there~~ to [help] design Tsenguen Dam.

Storey: Now this is in Taiwan, or in the Philippines?

Hoffman: This is in Taiwan. And so I was there earlier, and later they worked up a contract with the Bureau and they sent a whole team of people. I remember there were two of them from the Spillway Section, Floyd Holdaway and [Trowbridge]. . . . ~~The name escapes me.~~ I don't know how many people actually did the design work there, worked in their office. The dam was finally built.

1963-1965 Worked on Water Development in Central Luzon, Phillipines

Then for three months in '63, one month in '64, and during all of '65, I (reading) “served as the Chief Designing Engineer member, advising, studying, and reporting on potential water resource projects for major stream basins in the Philippines.” [in] ~~This is~~ Central Luzon. [The Bureau furnished a team under the auspices of USAID to assist the Filipino Public Works Department to study potential water projects in central Luzon.] ~~They had a team of eight. They had a team of seven, initially.~~ They didn't have a design engineer, so they kept asking the [denver Officer] ~~Bureau~~ to send a design engineer to help them. Well, the problem was that the people here said, "Okay, Hoffman, you go ahead and go, but you can't stay there more than three weeks. We can't assign you for a long period of time." So I would go there [and] in three weeks [would] ~~and~~ try to give them assistance. Well, what can you do in three

weeks? You can't do anything. And then these were three different instances where I went and came back, went and came back. So in late '64, Don Burnett, who was heading [the team] ~~it~~, said, "Why don't you just come over and join our team, stay here for a year? Or stay here for the [full] time." We didn't know at that time how long [that might be] ~~it was~~. So I gave in and went there and set up housekeeping, took my wife, and joined the team. There were eight people [on the team with Burnett as head] ~~there~~. Haliday was the geologist, and Sipe was the canal expert, and . . . . Can't remember. Darrell Roberts was supposed to [study power aspects] ~~be on par~~. He came from Alaska [to join the team]~~on an Alaska job, and he joined them~~. Had a geologist by the name of [Murray Athern]. . . . That's my problem [– I can't remember names too well now.] . . . .

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BEGINNING OF SIDE 2, TAPE 1. MARCH 3, 1995.

Storey: . . . team of eight over there.

Hoffman: Yeah, and they had the assistance of the Philippine . . . . Can't remember the agency. But anyway, they sent over engineers that were under my supervision. There was five or six or seven engineers.

Storey: From this Philippine agency?

Hoffman: From this Philippine agency. And those are the boys that gave me that picture, that wood carving thing that fell down. They were some of the boys that I had under my tutelage.

Storey: Now were you still working for Reclamation?

Was Assigned to the Foreign Activities Office in Washington, D.C., in 1965

Hoffman: Still, but assigned then – I left the Denver Office – and was assigned to Foreign Activities out of Washington, and reported through that [office]. So administratively, I left the Denver Office and joined the Foreign Activities Office in 1965, stayed there for a year, and decided that this organization here in Denver was so static that they may not even have a place for me if I came back, whether I had my old job or not. So I decided that it was time, since I had worked up a little outside experience and had my name in front of the public to some extent, because of *Design of Small Dams* and all, that I could capitalize on that. So I left the Bureau at the end of '65.

Left Reclamation to Try Consulting in 1965

Storey: That would have been thirty-five years of service, more or less.

Hoffman: Thirty-five years of service. (pause) Well here, here's what it says about the Philippines. (reads) "During all of '65, served as Chief Designing Engineer member of U.S. Bureau of Reclamation Water Resource Planning Team, advising, studying, and reporting on potential water resource projects for the major stream basins of the Philippines." And there was one dam that we made a final design on, a feasibility design on, and it was later built, engineered, not by the Bureau, but by an outfit that broke away from the Bureau, called ECI

[Engineering Consultants Incorporated]. Have you heard of ECI?

Storey: No, I haven't.

Engineering Consultants Incorporated (ECI) Started as a Consulting Firm by Reclamation Employees

Hoffman: Well, ECI started when the Bureau was doing foreign activities work for Thailand, and Thailand had a contract with the Bureau to design a dam – can't think of the name of it, a big concrete dam in Thailand. And they were doing all the design work. They sent over some Thai people, trainees, and they got to the point where they issued specifications. They started construction. ~~The~~ Private engineering firms on the outside took issue with the fact that the Bureau was designing work that [the private engineering firms] ~~they~~ were entitled to. So a few of the people from the Bureau decided that they would leave the Bureau, set up their own consulting firm, and take over. And because they had an inside track with the Thai people, that they would get the contract to do the design and construction supervision, or whatever was involved. So they set up a firm called ECI, Engineering Consultants Incorporated. Set up an office here in Denver. And a fellow from the Electrical Branch – [Lillgore by name] ~~there again, the name escapes me~~ – headed it up, and they took a fellow from the Concrete Dams Section[, Ray Dexter.] – ~~I'll fill you in on the names as I go on, because I can't think of it.~~ And they took one fellow from the Spillway Section[, Stimson]. He wasn't with the Spillway Section, he left and had gone down to Imperial Valley and worked privately on a little hydroplant [before] ~~and~~ he joined them. Well,

anyway, there were about a half-a-dozen or so people that left the Bureau and set up ECI and set up a consulting firm, and did the work on this dam in Thailand, did some *other* work for them in Thailand, and I think that they were working on this dam in the Philippines – they got that contract too. Einer Savig was one of them – he retired and [joined them] ~~then went~~. Louie Stimson was another one. A fellow from the Concrete Dams, can't think of his name, and one from the electricals, and the mechanicals. Anyway, they set up quite an organization of their own. So this happened just about the time in the mid-1960s.

Storey: Jack Savage was still alive?

Hoffman: No, Savage, in the 40s, shortly after this that he did for the City of Seattle, the Ross Dam, he started going downhill. And around 1945 or so he got to the point where he just didn't . . . . Well, Alzheimers had set in.

Storey: Yeah, you had mentioned that before.

Hoffman: In the mid-40s, and he didn't last very long. His wife had passed away, he was being taken care of by a friend or a caretaker. He used to wander off, and they were having trouble with him. I didn't follow too much, but it wasn't too long after that he passed away.

Storey: But ECI was created about the time you retired then.

Hoffman: Yeah, ECI created around the mid-60s.

Storey: Did you do any work for them?

Hoffman: No, no, because at that time – I think maybe ECI started a little *before* I retired, I don't recall. No, it couldn't have been. Yeah, it could have been after 1961.

Storey: Well, you went on and became a consultant then. How did you go about doing that?

Work on Koror Island in the Trust Territory of the Pacific Islands

Hoffman: Well, let me refresh my memory here. Another little job I had was of great interest. While I was in the Philippines, I got a request from the Washington Office. This is during this time that I was coming and going. *While* I was there, they had a request from the Trust Territory of the Pacific that they had a little job on the Island of Koror in which the U. S. during the war had bombed out a small water supply dam and they wanted me to go and confer with the Trust Territory people to see what could be done to rehab the dam. So I stopped off in Guam and the only way to get to Koror – or this was the Island of Palau, which is next to Koror – was by airship that had pontoons on it, so that it could land in the water. And I guess it also had means of landing on land too.

Had to Stay in Yap for a Few Days

So I had to wait for the plane to take the flight to Koror, waited in Guam for several days, picked up the flight, and got to the Island of Yap, and here we ran into a group of congressmen that were on an *inspection* of some kind – you know, one of those

holiday inspections. Well, anyway, I got bumped. So here I was in Yap, waiting for the plane to take the congressmen to wherever they were going, and then come back and pick me up. So I spent several days in Yap, and that was a *wonderful* vacation for me, very interesting. That's where they had those big stone wheels they used for money exchange, and where they had the meeting hall for just men only, where the elders used to assemble. One interesting thing on the Island of Yap, the Japanese had occupied it, and the Americans came over and they started bombing the MiGs as they sat on their runways.

Storey: The Zeros, you mean?

Hoffman: The Zeros, yeah.

Storey: I think MiGs are Russian, aren't they?

Hoffman: Yeah, it was the Zeros. Well anyway, [after the war the Yap people] ~~they~~ hadn't [moved] ~~done~~ a thing. Here were these Zeros that were sitting there in the bomb craters, everything just as it happened there, and they never salvaged any of that material, never did anything, and this was in 1964, which was twenty years afterwards. And it was a very interesting thing.

". . . these trips . . . had engineering responsibilities . . . but also I enjoyed the travel . . . and the sights . . ."

So these trips of mine not only had engineering responsibilities or connotations, but also I enjoyed the travel and the travelogues and the sights at the same time.

Storey: Yeah. Tell me more about Yap.

Hoffman: Well, Yap was where the Zeros were, and they had a little runway there that the Japanese had made. Anyway, I went from Yap to the Island of Palau, went from Palau by boat over to Koror, and then looked at this little dam. It was a concrete dam, but it had been bombed to the point where the whole little concrete dam was all displaced, and I worked up a little [rehab] scheme for them, if they wanted to salvage any of it in order to get their water supply. Because that was their only means on this little island for water during the . . . . Most of the times, of course, they *had* a good supply, but I suppose there were times when they needed stored water. So I came back and wrote out a little report.

But these were the foreign activities, missions, that the Bureau was involved in. So after all of this, why I left the Bureau.

Storey: What did you do to become a consultant? Did you just start telling your friends? Or how did that work for you?

Hoffman: No, let me show you exactly how it developed. In 1966, when I left the Bureau, there was a fellow that worked in the Bureau, way back in the 1930s – name was Jack Berger.

Did Some Work for Louis Berger, Incorporated, After Retiring

Storey: B-E-R-G-E-R?

Hoffman: Jack Berger. And this was just very early-on. And he was working for I think the guy that was on the intake towers of Hoover – this was on Hoover. Well, Jack left here and went to Utah to Salt Lake in the early 30s. And we were just junior engineers, and junior engineers befriended each other and all. Anyway, I lost track of Jack, and he went to Salt Lake and was involved in whatever the project problems were at that time. There was tunnel work being done. There was no Region or anything. And Ole Larson, E.O. Larson, was the Project Engineer there, and [Jack] ~~he~~ worked for E.O. Larson. Well anyway, as time went on, Jack had a brother, and his brother went to the University of . . . . What's the one at College Station . . . .

Storey: University of Maryland?

Hoffman: No, no, this was in Pennsylvania. (Storey: I don't know that one.) Anyway, this is the one where they had the football team that won the . . . . Is it the University of Pittsburgh?

Storey: I'm not familiar with those schools.

Ole Larson Was Working for Louis Berger, Incorporated, in Salt Lake City

Hoffman: No. Anyway, Lou Berger was a Professor there, and when they started up the interstate highway [program], he decided that he would set up an engineering organization of his own, and he set up an office in Harrisburg. He had a doctorate, and Lou was quite a politician – still alive – and set up Louis Berger, Incorporated, in Harrisburg, Pennsylvania.

When Jack – he was working in Utah – and when Louis Berger got to the point where he started to expand, he moved his activities to East Orange, New Jersey, called it Louis Berger Incorporated International. *And* he took Jack and put him in charge of the Harrisburg office. So Jack was after me – this was before I left the Bureau – contacted me, said, "Quit the Bureau and come do consulting work for me." So this is one "in" that I knew I had at that time. So the first thing that I did here in 1966 and '67, is I started doing consulting for Louis Berger Incorporated. It says here (reading), "I advised on [and] prepared dam designs for feasibility reports for projects in Pennsylvania and Utah." Well, the way I got [the Utah assignment] ~~that~~ was when Jack Berger set up his office in Harrisburg, he got Ole Larson, who was then Regional Director in Salt Lake, to set up an office, take over and set up an office of his company in Salt Lake, after Ole retired. So one of the jobs he had was in Utah, so I went and started consulting with Ole Larson in Utah, and in Pennsylvania, because [Berger] ~~he~~ had an office in Pennsylvania. (reading again) "Prepared feasibility designs, estimates for large pumping plant that would pump water from the Ganges River to planned irrigation project in East Pakistan." Well *this*, then, was through that office in Harrisburg. So I spent a couple of years working with [the Berger group] ~~him~~.

Consulted with Ralph Parsons on a Water Supply Project for Cam Ranh Bay, Vietnam, in 1968

Then in 1968, I don't know how Ralph Parsons got hold of me, but [there was] ~~there's~~ somebody in Ralph Parsons, a Los Angeles outfit, *big* outfit, consulting firm. They engaged me to study a water

supply project for the Cam Ranh Bay [in Vietnam]. This was after the war. So this was another assignment that I had.

Then in 1968, a good friend of mine, Lester Bartsch, [who] started [with the Bureau] ~~in~~ about the same time with me, he started working on Hoover Dam on the intake towers. [Later] ~~Then~~ they gave him the job, as they expanded the Bureau – can't remember when it was – they put him in charge of specifications here at the Denver Office.

Storey: How do you spell Bartsch?

Hoffman: B-A-R-T-S-C-H. Probably got this information on Bartsch, if you want.

Storey: Yeah. He was in charge of specifications?

Lester Bartsch Set up a Specifications Section in Denver and Ended up at the World Bank

Hoffman: He was [placed] in charge of specifications, he took two or three people [from the Dams Branch]at that time [and set up an independent shop], one was Silverman. I don't know if Silverman's still alive. He used to live right over here. They took him out of the Spillway Section. He took Don Searles, who was [in] ~~on~~ some other section, and he set up a group. ~~, and~~ This was about the time, *after* Hoover Dam, when things were starting to expand, and he set up his own Specification Preparation Section. And this was about the time that [Grant] Bloodgood came from Boulder City, from Hoover Dam, and he came here and he was put in charge, they set up a Contract

Supervision Branch. So before everything was done within the Dams Branch. And then when things started to expand, they brought Bloodgood in. And the first thing Bloodgood [took various assignments] ~~did is try to get everything~~ away from the design group [to] ~~and~~ set up different groups [in the Construction Branch]. That's when they set up Estimates and Analysis Group, set up under the Contract Supervision Branch. Contract supervision, we used to do that in conjunction with design. That went to the Contract Supervision Branch. Specifications went over to this. Estimates and Analysis – or did I say that? That was all taken away from us – all we could do was prepare quantity estimates. Pricing and all went over to Estimates and Analysis. So Bloodgood took everything that he could and set up his Contract Supervision Branch, in order to set up and justify a larger branch. So a lot of the duties were taken away from us, but amongst those was Lester Bartsch[‘s Specification Section].

Then Lester Bartsch, in 1951, was given an opportunity to go to the Region Six Office as Assistant Regional Director. (Storey: In Billings?) In Billings. And he went and stayed there for a number of years, and then got an opportunity to go to the World Bank. So he was hired away from the Bureau, left, I guess, or retired. I don't know whether he could retire or just what. Anyway, he left the Bureau and went to the World Bank. So Lester and I were close friends. We were in the mink business together, we had a little mink ranch together, and we used to play with it on the weekends. Anyway, Lester was a good friend of mine[, and] so he got me involved with the World Bank – this is in 1968. So here the first assignment was (reading) "appraising

and evaluating conditions and existing irrigation systems in Indonesia." So that was in '68. I was on this mission with a fellow from the Shoshone Irrigation District. He was an expert on excavation equipment. I was the expert on hydraulics, so we went together on this. [The assignment was to advise on canal rehabilitation.] After I came back [home], he says, "Come and advise the District on tunnel rehabilitation and buried pipe placement for lateral distribution systems up here in my region." So I went up there and did a job for them.

Jobs Developed Through Referrals

So you're asking about how did I get these [consulting jobs]? This is a referral. Because I worked with this fellow – can't remember *his* name – but anyhow, I worked with him on this assignment in Indonesia, I come back, he says, "Come up and advise us." [The problem was] ~~This was~~ something that the Bureau was involved in, but [the Shoshone district was not in agreement with the Bureau's recommendations] ~~he wasn't taking their~~ . . . . This tunnel was an old, old tunnel, and the Bureau was advising them to rehab the tunnel, spend a lot of money. So he said, "Come up and take a look at it and let's see what we can figure [out]." I went up there, and there was nothing wrong with the tunnel, it wasn't collapsing, there wasn't [a problem except it was showing] ~~anything. It had shown~~ wear and tear, but ninety percent of the tunnel was as good as it [ever] was, probably. The intake [to the] tunnel needed some revisions ~~and all,~~ because it was taking rocks out of the river and running them through the tunnel. So I advised them of [a solution for] that.

Later on, ~~the Bureau got – afterwards –~~ the Bureau got involved and they made them reline a lot of that tunnel, but that wasn't my responsibility, because I advised them, "Don't do anything for the time being, until you find that you have some serious problems," and a revision of the intake and a rock excluder, I suggested that to them. Whether they built that or not, I don't know. Well, anyway, that was another assignment.

Became Involved with the World Bank

Well then after that, I got involved with the World Bank, because every time there was an appraisal mission, [the] World Bank [would often] ~~used to~~ call me. So here, I went to the Philippines, (reading) "appraising and evaluating feasibility designs for the Pampanga Project. And that's the one [I worked on for the Bureau's review during my assignment with the study team, and which they ultimately] ~~that they~~ built. The World Bank gave them the money [for its construction] ~~after this time~~.

Then in 1969, here again, Parsons that I worked with in '68, decided that they wanted more work on this Vietnam project, so I got involved in that. And the World Bank continued until 1972, from 1966 to '72.

Storey: But in various areas?

Hoffman: Yeah, here (reading) "Consulting on missions for the World Bank, appraising and evaluating feasibility studies of a proposed resource development in Southwest Korea." Another one was "Appraising and evaluating feasibility studies for multipurpose

project in Western Turkey." Here is one, again, for "Appraising and evaluating studies of a basin-wide system analysis of water resource developments" in Korea again.

Storey: Now, did you *go* to each of these locations?

Hoffman: Yeah, went with a team of people. I was the engineer on the team. They had an economist on the team, they had a hydrologist sometimes on the team. So it depended on what the problem was, but I was the one that was appraising and advising on the feasibility of these various projects. How many of them actually developed, I don't think that there were *too* many of them, because a lot of them were really not feasible, but World Bank had to send out an appraisal team to see what the possibilities were, whether they should invest World Bank funds in these various projects.

So up until about 1972, I was involved with the World Bank on these missions, intermittently. One of the gentlemen that was in charge, Lester's boss, wanted me to come and join the Bank. And it would have meant that I would have to move to Washington, and I had some misgivings about leaving Denver, because my wife was a native of Denver, had all her family here. Lester and I talked it over and Les says, "There's no reason for you to join the Bank and come to Washington. If there's a good assignment, we'll call you, and you can do just as well by doing these individual assignments as to come and join the staff there." And so I never took that move, but did almost as well with the Bank the way it was.

And in the meantime, this with this Louis Berger, I had several interesting assignments here too. In 1971, to consult for Louis Berger on flood control problems connected with land and community development adjacent . . . .

END OF SIDE 2, TAPE 1. MARCH 3, 1995.
BEGINNING OF SIDE 1, TAPE 2. MARCH 3, 1995.

Storey: This is Tape 2 of an interview by Brit Allan Storey with Carl J. Hoffman on March the 3rd, 1995.

You were saying you were working on a project in Chillon, Peru?

Project on the Chillon River, Lima, Peru

Hoffman: Chillon River in Lima [Peru]. And there Berger got the assignment of reviewing work that was being done by some Peruvian water agency. So this was a large hacienda, a large ranch, that the government demanded to be broken up into small plots and distributed amongst the poor. But the problem was that they feared that during flood times, these little plots would be flooded out, because a lot of it was seemingly lowland, so that this agency decided the thing that they had to do – or the government decided – was to build a dike all the way down the stream for *miles* or kilometers, there, in order to protect the hacienda land from being flooded during floods. And so they enlisted Berger, because they had an office there in Lima, to make a review of this. And Berger called on me and I went down there, and then looked at the plans that they [were considering] ~~had~~, looked at the site conditions, actually took a helicopter and flew up and down the river to see what the conditions

were. And I was in sort of a dilemma because here they had this levee, all designed and detailed, ready to go to work on it, and they wanted me to tell them what they should do. Well, I looked at it, and I said, "You don't have to protect this land, you're never going to flood this land, because the river is on a steep gradient, and at the most, the very low bottomlands *might* get flooded out under a flood, but most of the land is not going to be touched. Your problem is that you built a canal without an intake at the upper end of this large hacienda. There is no control on it, and every time you have a high water, instead of the water going down the river, because you haven't any control on the canal intake, it floods your land. If you build a gate[d] structure on the intake, you don't [need] ~~have~~ to have but very little of this levee [work] to protect all this land. Maybe the *low* levels and the bottomlands, if you want to develop those, you may have to build a levee, but this should be based on a cost-benefit proposition. What's it worth to protect the land? And how much is it going to cost to build the levees? Take those little individual plots that *might* be flooded, and evaluate those separately, but the rest of it, forget the whole thing." Well, I was forever praised. The people that had the responsibility [for footing the cost] was a private bank, and here they were – [the government demanded] ~~it was demanded on them~~ that they go ahead and they put in this levee. And I told them forget the levee, so of course they were very grateful. I did them a good service, and I got a little fee for it.

So these are the kind of little problems that you run into, see. (Storey: Um-hmm.) Then of course at

the same time, I consulted with Louis Berger on potential storage projects on this Chillon River.

Storey: That was in 1972?

Looking at irrigation in Nigeria

Hoffman: This was in '72. So here was *another* interesting project. In 1971, World Bank sent out a review mission from the agricultural sector (reading) "to identify and assess current and potential irrigation project developments throughout Nigeria." And I remember the team head was an economist, and they had an agriculturalist who was an Englishman, and they had several other Englishmen [in other disciplines]. The team was about five or six people, and I was the engineer. My responsibility was to review all of the water resource potentials for most of Nigeria. You see, Nigeria has two main rivers. They have the Niger River, that comes in from [the country of] Niger, and goes all the way down [through Nigeria] to the ocean, and then they have a branch of the Benue River, which originates in the Cameroons and comes down through eastern Nigeria. Then they have Lake Chad, which is at the northern end [of Nigeria, and] which has its own little drainage [system]. So there was quite a bit of potential there for [water resource] development, if they so chose. And they had one big development that they had already [completed] ~~done~~ on the Niger River, the Kainjii Dam. But they built the dam and built hydro, but did nothing for any irrigation potentials there. So the review was to see what the possibilities were for [irrigation] ~~whatever~~ development ~~was~~. They had a plan for irrigation development near Lake Chad, where they were going to *pump* the water out of Lake

Chad into the surrounding areas there and irrigate. And then the Dutch had a project [underway] there, they were building a dam on a tributary that [flowed] ~~went~~ *into* Lake Chad. And there were other potentials [for development] there. So this was a [comprehensive] review, it took a couple of months, and [I] went throughout Nigeria.

Found the Variety of Cultures in Nigeria Interesting

Very interesting, the cultures there: the northern section was mostly Muslim, and controlled by the Muslim emirs. The southern section ~~or~~ near the capitol, near Lagos, was, I think, mostly Christian. Then in the mountains they had the native tribes, and some women there with the big discs that they had in their lips. Interesting thing there: I was making this tour just with one Indian fellow there, so we [travelled by auto] ~~had to go~~ from one place to the other, and then we went through this area and got into one of these little communities or whatever, settlements, and the women were there, these with the big discs in their lips, and they saw us, and then of course we're strangers and all, they had their hand out. They wanted money. And [as] I remember I didn't have much U.S. money, but I had some pennies and I had some dimes. So I started handing out pennies, as many as I had, and they're copper, and so the women were delighted, they wanted more. So I ran out of pennies, so I started offering them dimes. No, they didn't want any dimes, because a dime is little, you see, and the pennies are bright colored, and the dime had no particular shine to it at all. So they started to refuse that, and they started to get a little hostile, and the men started coming over. So we

decided right then and there we're going to hightail it out of there, we're not going to stick around much.

But this shows you what you can run into on these field trips, you know, from one type of culture to another, to down in the south, of course they were well educated, universities there that we visited in the course of our deliberations, you know. And up in the north, why the emirs were the kingpins, and you had to kowtow to them. So it was an interesting assignment, took a couple of months. But this is the kind of consulting that I did as part of this review team. It took me a couple of months to work up a report on it, and so that was it.

José Pessoa's Training and Work in Brazil

Well, after 1972, I got involved with – well, here's Berger again, here's Parsons again. Parsons got involved in the Philippines again, and so I got a job with them. Then about that time, an acquaintance at that time, there was a fellow that came here from Brazil in about 1951 that had a group of trainees, José Pessoa was one of them, a trainee in 1951, '52, '53. Anyway, I met José in '51 here, but only casually, because he never came to the Spillway Section – he concentrated his studies, his training, in the laboratories and in the Concrete Dams Section, and Earth Dams Section, because he was interested more in dams themselves than in the hydraulic structure, but he was in the Lab, trained in the Lab, both in the Hydraulic Lab and in the Concrete and Earth Lab. Anyway, I guess his family had some influence there in Brazil, but when he left here, got back to Brazil in 1953. Here he was just a trainee here, he goes back there and they put him in charge

of an agency, like the Bureau of Reclamation, DNOCS [pronounced Dee-knocks], *Department Nacional de Obras Contra de Seco*, which means it's an agency . . . .

Storey: It's against aridity! (chuckles)

José Pessoa Established Engineering Firm Called *Hidroterra*

Hoffman: The drought. So anyway, José takes charge of that under President [Juscelino] Kubitschek [de Oliveira] at that time. Got it because I guess he was involved some way with Kubitschek. And he was in that agency for several years, until Kubitschek was out of office, and then he was out of office and he set up an engineering firm called *Hidroterra*. At one time he got Pat Dugan – you heard of Pat Dugan? (Storey: Um-hmm.) And Pat Dugan and Wes Holtz and Jack Hilf, and he asked for their assistance down there on a job, and they went down and they made a review of some kind. I think that was when he was with DNOCS. This was on foreign activity assignment. Then he had Oscar Rice, if you've heard of Oscar Rice, was the head of the Earth Dams Section, and then finally got up to Chief Designing Engineer. He had Oscar down there making a review, and Oscar had a terrible time because they gave Oscar a little Jeep and a driver, and they went all through [northern] Brazil and Oscar got ill – it was a horrible thing. But anyway, this was under the sponsorship of José.

Hired to Check on Construction of a Slab and Buttress Dam in the State of Santa Catarina, Brazil

Well, after I retired, the first job I did for him [José Pessoa] was to go down – they had in the State of Santa Catarina, they had a flood control program, and they had a dam there . . . . Let's see . . . . Getting ahead of myself a little bit. I don't see it, but anyway, somebody had designed a slab and buttress dam for one of their flood control projects in this valley in the State of [Santa] Catarina. So they started excavating footings on it, and they got a little bit concerned about the stability. So Bill Gardner and I went down there – this was the first time I'd worked for José – to review the problems that they were encountering there on their excavation for this dam, and what would be the [effects on the] stability of the dam. Bill Gardner – you've got his résumé – he was retired and he was a geologist, and Bill did the geology, and I did the engineering. We took a look at [the foundation conditions,] ~~that,~~ and we decided this was not the right kind of dam to build there. So we suggested . . . . (phone rings, tape turned off and on)

Storey: You were saying that you recommended an earthen dam instead of what they were proposing to build on this location in Brazil.

Hoffman: Yeah. So anyway, this is where I [first] got involved with José. Then of course on this Santa Catarina project, this is a state in Brazil that was settled by Germans. So the whole aspect of everything around there has German influence. You go there to . . . . What's the name of the city? [Blumenau] There again, names! But anyway, it's just like going into a German community. And this big valley is subject to flooding, this city, they've had some terrific floods there. So all of the tributaries that go to the . . . . I could tell you better if I had a map with me to tell

you the name of it. But all of the tributaries [traversing the state] converge and then go through the city, and that's where the major flooding is, so the flood control development [was planned], ~~which was~~ sponsored by DNOS, the *Departmento Nacional de Obras Sanitarius*, the sanitary works – why they're involved in flood control, I don't know, but that agency . . . .

Storey: That's the way they do it there, though.

Hoffman: So anyway, all of the tributaries that lead into this main river, they planned to build dams on all of them – this was the first one that they built, and this was *Barajem Sul*, which means "the southern dam." And they had [planned] *Barajem Oeste*, and *Barajem Norte*. They [proposed] ~~have~~ three different dams ~~that they'd planned on it~~, and built all of them, and this was the first one. Anyway, I got involved with *Hidroterra* on all of these as they were developed. He was the engineering firm that was doing the work for D-N-O-S.

Storey: Is this the Jaguaron [phonetic spelling] River?

Hoffman: No.

Storey: That's a different one.

Hoffman: This is – yeh. If you want to shut it off, I'll get a map.

Storey: Oh, okay. (tape turned off and on) Uh-huh, now, is the name of the city then.

Hoffman: That's the idea, Blumenau – German city, see.

Storey: Yeah, it sounds very German.

Hoffman: (inaudible) You saw it on there, huh?

Storey: Yeah, it's up to the . . . . Oh, now let's see, up toward Curitiba, there's the Iguaçu River.

Hoffman: Iguaçu [pronounced eeg-wah-soo].

Storey: But anyway, you were working there.

Hoffman: So this was an ongoing [design job] thing, and I helped out on *all* of those, a lot of the times with Les Holtz. He was [advising] on dams and soils. And so an awful lot of work from 1972 or '3. There in 1978, that was later.

Started Working with José Pessoa on Other Projects

Well, anyway, so the question was, How did I get involved with these people? This was because of José. We started working with him. He was more of a politician than he was an engineer, although he's a pretty good engineer. But he relied on both Wes Holtz and me to do all of his consulting problems, and so we were involved with him on Santa Catarina, on all of those dams.

Worked on Water Supply for Fortaleza, Brazil

Then José, his [original] home is Fortaleza in Northern Brazil, [did design and construction work on] ~~and they had~~ an ongoing water supply problem there. And I just wrote a paper for José, he just sent

me a copy the day before yesterday, which you might be interested in reviewing, if you like, as to what problems and the way they developed their water supply and all. And so back in 1982, Wes and I helped him on the design of Pakati, [including] the delivery systems that went all the way into Fortaleza, and so on. So those were [varied] specific problems. And I got to the point where José and I are very good friends now. This paper that I wrote for him, I went down [to Fortaleza] ~~there~~ and helped him on a tremendous canal problem, ~~just~~ not for any remuneration, just for friendship, and we did a tremendous project down there – me advising him, he advising the water department part of the government. I'll show you that, that's a recent thing.

Worked with Jesús Gomas in Venezuela

But [backtracking a little] ~~leading up to all of this~~, another interesting [assignment is worth mentioning] ~~thing was in~~ here . . . . (papers shuffling) In 1975 I got a call from a firm in Fort Collins that is owned by one of the professors in the Civil Engineering Department [at CSU]: Would I be interested in doing a job in Venezuela? They had a request from a student, a graduate, [to contact] ~~for~~ *me* to go down there and consult for him. Now why they went to the university, I don't know – why he went to this professor's firm. But anyway, they called me and said, "Would you be interested in doing something in Venezuela?" I said, "Sure." It turned out that the way this thing was worked out, this student saw my name in *[Design of] Small Dams* because I have a by-line there. He says, [striking table for emphasis] "How can I get Mr. Hoffman to come and do

consulting for me?," working through the professor and through there. So they called me, and I went down there, and I advised him on the project that he had. And after that, he decided, "Why do I have to work through this firm? Why don't you and I make an arrangement individually, and I don't have to pay them their ten percent that they were charging in addition to your fee." Well anyway, I went down there [to advise on] ~~and he had~~ a water supply [project] for northeast Venezuela, had a dam site there. [This student formed an engineering firm and] ~~and so he~~ had another engineer that was working on the dam [design], but he didn't have enough experience on his own to handle the spillway and outlet [design], and they had an eight-kilometer tunnel and things like that, so he enlisted me to advise him on that. So I did that work for him, all the way to the point of having the project constructed, and had a few other little assignments with him, for instance here, (reading) "Consulting with Jesús Gomas engineering on a water supply storage project in northern Venezuela. Consultation included layout selection and design of a 100-meter-high storage dam and appurtenances and eleven-kilometer trans-basin conveyance tunnel." Well, that was the first time.

Chichiriviche Water Supply Dam near Caracas

Then, this was in '75, in '76 I consulted with him on a seventy-meter-high Chichiriviche water supply dam near Caracas. Then in 1977 I consulted with – at that time he called himself Caura Engineers – he [had] expanded, he had five or six different engineers on his staff – (reading) "and design of a fifty-meter-high Los Algerrebos Dam in Northeastern Venezuela." And then I consulted with him in 1980, (reading)

"Identifying and evaluating various dam sites on the Suapure River, a tributary of the Orinoco. It's in Southern Venezuela. "And compiling an inventory of the hydropower potentials in that region." Then in 1981, I consulted with him "on potential hydropower developments on the Aro River, a tributary of the Orinoco. And then after that, the government went bust, and he didn't get any more work from them. So he became a structural engineer, so I lost him [after] ~~on~~ that.

Anyway, just this one reference from *[Design of] Small Dams* and I got involved in all this. So you ask me how was this arranged . . . .

Storey: Tell me about the money. I believe you told me you retired as a [GS-]14.

Money Issues for Hoffman Family

Hoffman: A [GS-]15. Well, up until 1964, I was living modestly. I don't think I accumulated any money. When I went to the Philippines, this was the first time that the money problem eased up. I have only one son. Well, between 1956 and 1960 I sent him to the University. Then he got a degree from School of Mines and decided . . . . Well, going back, he wanted to go to a fancy school, way back in 1956. So I told him, "Bob, I don't have a lot of money, but I'm willing to send you to any school you want to go to, within reason." He was interested in metallurgical engineering. I said, "If you're interested in metallurgy, I'll send you to the School of Mines for four years, and then you can go and get an advanced degree and I'll pay for that." So he went to the

School of Mines, did very well, an outgoing person, was head of the student body and all of that, and he made a ~~big~~ name for himself, which he wouldn't have done in a small school, see.

END OF SIDE 1, TAPE 2. MARCH 3, 1995.
BEGINNING OF SIDE 2, TAPE 2. MARCH 3, 1995.

Hoffman: . . . get an MBA [Master's in Business Administration] at Stanford, and that was the prestige school at that time, and was expensive. So I promised him, "Well, you went to the School of Mines and you've saved me all that. I'll invest in you, you go and get your MBA." So he went to Stanford, took two years, at $15,000 a year . . . which at that time was a lot of money, because my retirement all-in-all, was only about $6,000 a year. And so anyway, I got him through school and I was doing okay, but I wasn't accumulating any wealth.

Began to Accumulate a Little Money During Work in the Philippines

Well, when I went to the Philippines, the government, USAID, they gave me my housing, they gave me my other amenities, living was cheap because we bought from the commissary and all. So all the money, my salary, was deposited here in the bank. So by the time I got through with the Philippines, there was a little nest egg that I started with. And the retirement, I don't know what the [salaries were] ~~salary was~~ then, but [my] ~~the~~ retirement was $6,800, enough to get me by. I'd sold my little house at that time for $12,000. It was nothing, just a modest place, and [I] started renting. So anyway, the cost of living did amount to a little

bit, but not too much. Well, anyway, when I started getting this [consulting] work, that was all extra money. So it started adding up. And my fees were not that high – at the most they were fifty dollars an hour, $400 a day. But I started with maybe $100 [a day]. World Bank money wasn't that much, but it was extra, see, so this was all money that I could put aside. Now, I suppose I could consider myself well off. I decided in 1982 that I was going to set aside $10,000 a year – I have two grandsons – $10,000 a year, and that lasted for four years. So I gave, [together with] ~~me and~~ my wife, $20,000 a year – set aside $80,000 for their college education. Do you know what that is worth now?

Storey: A lot of money, I'll bet.

Hoffman: Over a quarter of a million dollars for each one for their education.

Storey: Well, they ought to be able to do it on that! (laughs)

Hoffman: But anyway, if it wasn't for the consulting, and if I'd stayed on with the Bureau for this many years, and then decided to do nothing [afterwards], that [money] wouldn't have been there. And besides that, it wasn't the money, it was the work, the interest in the work, and the interest in the assignments, and the accomplishments, more than it was the money.

Storey: So it all worked very well together.

Was Fortunate That Consulting Companies Needed His Particular Expertise

Hoffman: So you ask "What about the money?" Harold Arthur can go out and he can command $1,000 a day for his consulting, because he got involved with international consulting. Jack Hilf did the same thing, [as did] ~~and~~ Wes Holtz. But in my discipline, there isn't that much demand [for consultations], you know, because most [firms can] ~~people~~ do it on their own, they don't need [consultants] ~~consulting~~. But I was fortunate that I worked with organizations that weren't prepared to offer that service, and I was an adjunct to their organization in being able to do that.

Storey: Did you make more money when you started consulting than you had made at the Bureau of Reclamation?

Hoffman: Oh sure, for day-to-day, yes, but there [were] ~~was~~ a lot of times that I was idle – I wasn't busy all the time, as you can see here, that there were only specifically maybe four or five times in one year that I had assignments, so maybe I was idle half of the time. But, there was enough there that I was able to conserve most of that, didn't go out and squander it. And so all of us that did consulting, did very, very well.

". . . in actuality, there aren't that many Bureau people that <u>did</u> go to consulting, because either they didn't have whatever it is that they could offer that somebody *wanted* their services for, or they were content to just forget about engineering and do nothing. . . ."

And in actuality, there aren't that many Bureau people that <u>did</u> go to consulting, because either they didn't have whatever it is that they could offer that somebody *wanted* their services for, or they were

content to just forget about engineering and do nothing. So I would say out of *all* of the people that worked for the Bureau, maybe only three or four percent of them ever went out and did consulting. The people in the lower grades, they had nothing going. I would have had very little to offer as far as my knowledge is concerned, yes. But as far as my reputation, there wouldn't have been anything that would have attracted me to somebody else. But I probably would say that the book, on *[Design of] Small Dams* and my by-line there, was the thing that helped out as much as anything. And, of course, you take Arthur, [he had been a] ~~he's~~ Chief Engineer, so he has a ready market for his services. Jack Hilf, he got a doctorate, he did a lot of writing, as you will notice, and belonged to organizations, which I didn't, which of course [would help in becoming known outside the Bureau and] ~~wouldn't have helped much as far as~~ getting work on the outside. But Holtz was known for his specialty, Hilf was known for his specialty, Arthur was known for his specialty. I – call it what you will – had a specialty to offer too. So we were the ones that could go out and sell ourselves, or had our names in front of the people that might have needed some help.

Storey: You mentioned that one of the people came from an Alaska job. Did you ever have anything to do with any of the Alaskan jobs?

Hoffman: The only thing we had to do with the Alaska jobs were making designs and estimates on a couple of jobs, as I remember.

Storey: Do you remember which ones?

Hoffman: Not off-hand. What's the name of the park there?

Storey: McKinley?

Hoffman: No, starts with a "D."

Storey: Denali? (Hoffman: Denali!) Yeah, that's the new name for McKinley. (chuckles)

". . . the people on these foreign assignments were not the cream of the crop as far as the Bureau was concerned . . . they joined foreign activity . . . because they weren't getting anywhere . . . and they just [took advantage of] ~~had~~ an opportunity. . . ."

Hoffman: Well, Denali had several projects [proposed] ~~on~~ there. But Darrell Roberts, he was assigned to Alaska in planning. There wasn't much to Darrell, he knew very little about planning. Poor Darrell – I guess he's still alive – but Darrell didn't contribute much on the Philippine job – very, very little. But Darrell's a nice guy, and [I] ~~we've learned to~~ know quite a bit about him, he and his wife, because we were all together in the Philippines, a nice close group in the Philippines [team]. But the people on these foreign assignments were not the cream of the crop as far as the Bureau was concerned. The reason they joined foreign activity [was] ~~is~~ because they weren't getting anywhere, [in their work] anywhere else, and they just [took advantage of] ~~had~~ an opportunity. But the Foreign Activities Program didn't develop into something that would have done the Bureau proud. [In all] there weren't that many [projects]. Well, I don't know, the work that they did in Lebanon, and Fred Houk was on that one, and Fred might have been – he was an asset, Fred was a pretty

good guy. But most of the people in Foreign Activities didn't really do a lot to enhance the Bureau.

Moving Water from the San Francisco River over a 200 Meter Divide

This assignment that I had here, which might be [of interest] ~~interesting~~. (reading) "A major transmission water diversion project in Northeastern Brazil for transporting 300 cubic meters [per second] of the San Francisco River water over 200-meter divide, to areas in northeast states. Project will involve five major storage reservoirs, over 100 kilometers of conveyance canals, and a large canal, and a large pumping plant."

Storey: Was that 300 cubic meters per second?

Hoffman: Per second. So that's 10,000 cubic feet per second.

Storey: That's a *lot* of water!

Hoffman: Yeah, this is a big project, and it's being revived now. And José hopes that he may get that project [again]. But anyway, José . . . . Shut it off a minute, and I'll get you a report on it. (tape turned off and on)

Storey: This is February of '83.

Hoffman: All right, now, this is a project that José was assigned to. This was done by DNOS, Department of the . . . .

Storey: *Nacional de Sanitacion.*

Hoffman: Here is a kind of a review that I sent to them. Anyway, José was involved in that with DNOS. They asked him to work up a project plan, and a preliminary design, and he called me down there [to Brazil] and I got together with this other outfit. What's the name of the other outfit?

Storey: *Hidroterra*?

Hoffman: *Hidroterra* was José's outfit, and then the other was . . . .

Storey: _____.

Hoffman: No.

Storey: That's still his?

Hoffman: (inaudible)

Storey: Oh, this? Okay.

Hoffman: This was done by the Noronha Consortium, Noronha and *Hidroterra*. Anyway, Noronha was doing the work, and José was involved with them. Noronha was a partner of José's years ago in highway work. Noronha is this one, this fellow here, had an engineering firm. They built that bridge – if you've ever been to Rio de Janeiro there's a big bridge that spans . . . .

Storey: Wish I had! (laughs)

Hoffman: Well, anyway, it spans from Rio over to another – I guess it's an island. It's a monumental bridge, anyway. Anyway, this is beside the point. But he

[Pessoa] got involved with Noronha on this project ~~here~~ for the San Francisco River [diversion plan], and they had a bunch of people there that were working [on studies]. José wasn't involved in the day-to-day [program, though] ~~thing,~~ he was a partner to Noronha. The Noronha group were making the study of it, [but] ~~and then~~ they weren't very competent people, so he called me and he said, "Would you come down and give me a hand?" So I went down there. I couldn't work with the Noronha people, because first of all, I didn't speak Portuguese, and secondly, what they were doing didn't look like it was the right way to do it. Anyway, [after] I went over ~~to~~ Noronha's [work] ~~and~~ I said, "José, see if you can get me any people [who might be of help to me]." So he found a young fellow just out of school that spoke English – enthusiastic kid. And Noronha had this girl that was a graduate engineer that understood English enough so that she could take and translate what had to be translated, and could do [other tasks]. So there were the three of us. There was me and Roberto and Gina. So this [report] is the work of the three of us. I gave up on the Noronha people, I told them, "You go ahead and do whatever you want to. I'll get out [my own] ~~a~~ report on this thing." Made an entire review. The problem [in this study] ~~here~~ was, they had no idea of costs. They had no concept of what might be the right kind of an arrangement and all. So I sat down from scratch, took a lot of the Bureau [references, reviewed] ~~stuff, took~~ a lot of final design reports on pumping plants, and took the book on cost estimating from the Bureau, [gleaned] ~~took~~ as much information [as was available] ~~that I could glean~~ from what the Bureau had published, and sat down and started working up a scheme ~~for that~~. And we

developed a whole scheme, which was [entirely] different [from] ~~than~~ what Noronha had, and in effect, it was something like this. Here was the San Francisco River, and here was the divide, and the idea was to get the water from here to there, 300 cubic meters per second was a lot of water. And what would be the cost of it. So there were several options that were worked out. They had worked out a plan in which they dammed up . . . . Here's a channel that came down from the hills, and they dammed up with a reservoir here, a dam and reservoir here, and another one here, with various pumping plants. That was the original plan, and the alternate plan was just a little arrangement here. This is what Noronha had worked up. And then I came in here and studied my *own* plan, and worked up costs, and here's something that doesn't exist anywhere, is a study . . . . (flipping pages)

Storey: This one I think maybe.

Hoffman: It's this one.

Storey: Oh, is it? Yeah, Mount Elbert.

Hoffman: This. Nobody's ever worked this up to this extent, [these cost estimate curves] ~~see, of a cost estimate~~. ~~And then~~ What I did was I took all the Bureau final design reports and took the costs and plotted them, and this became a guide to what would be the cost for any particular pumping head, for any particular . . . . This was the cost, and this was the pumping head and whatever was . . . .

Storey: Well, with total costs for plant and equipment for cubic meter pumped.

Hoffman: Oh, yeah, for a cubic meter [pumped], there it is.

Storey: As opposed to the pumping head.

Hoffman: Yeah. Now this doesn't exist anywhere.

Storey: Uh-huh. Well, it exists here. (laughs)

Hoffman: Here. I worked it up. Here's something we worked up is the tunnel cost estimates, for different sizes, for different costs versus the diameter, for the different lengths of tunnel. Now, in two months' time, between two young engineers and myself, we worked up all of this, finally got in here a concept (flipping pages) of cost.

Storey: I saw Grand Coulee and Elbert. Did you adjust the costs to modern figures or something, to standard date, I guess?

Hoffman: Yeah, we took the Bureau cost estimates, 1968, was all we had, and then we [indexed those costs to the current values.] ~~improvised.~~ (flipping pages)

Storey: Well, you know, if you'll let me duplicate that, we'll have that.

Hoffman: Well, anyway, this was done in a couple months' time.

These people [in Brazil (ONOS)] had been working on [the project study for quite] ~~it for~~ a while. But what I want to bring out was, that somehow or other, the Bureau [later] got involved in [the study] ~~it~~, and Foreign Activities got involved in it, and sent

down [several] teams of people ~~down there~~. And I don't know exactly what they did, but they had a team studying this thing, I guess for the same agency [DNOS]. And I don't know what was accomplished, but the Bureau had a lot of people down there for a long time, [from] ~~in~~ Foreign Activities. What result they had from it, I have no idea. [When] I got through with this thing [study], [I assembled] ~~and I got~~ all the people that were involved in this thing, all the bigwigs ~~and everybody~~, people from D-N-O-S and people from other agencies and all. ~~and~~ We ~~had long sheets of designs,~~ pasted [long sheets of design drawings] ~~them~~ up on the wall. I gave them a two-hour dissertation ~~on this thing, with the~~ [demonstrating the design concepts and] costs and everything – [then] left it at that. Afterwards, the people, D-N-O-S, sent a couple of people up here to see if the Bureau could give them some additional assistance. But from *all* that the Bureau did, I don't think anything ever came of it. [I presume] ~~Of course of *this*,~~ nothing came of it, because all of a sudden the government decided to abolish D-N-O-S right in the middle of [these activities, and studies have] ~~things, and D-N-O-S is~~ no longer [been pursued] there for the last three or four years. So now they have a new regime, and José says that he thinks there are certain people there that have an interest in revitalizing this study, and he is now trying to see whether or not he can [spark] ~~get them to have~~ enough interest so that [the study can continue] ~~he can go to work with them~~. But ~~he's got the~~ [if they revitalize the study he has] competition, because there are hundreds of engineering firms down there that are clamoring for whatever little bit [of engineering work] the government [doles out] ~~will do~~, so I don't know

whether he's . . . . And that's the reason for this letter, there, just trying to refresh the idea.

Storey: Oh, this July 7, 1994, draft?

Hoffman: Yeah. To tell him that yes, I remember the project, and what I remember about it. And I don't know what José has done about it, but he says there's nothing can be done now until the government gets well established. So anyway, this is something that the Bureau was involved in, spent a lot of time, a lot of money. I sat down in two months, and I accomplished ten times as much work as the Bureau team did, I'm sure – with two kids, one girl just out of college, one fellow about . . . . Well, I guess two or three of them I had that helped me.

Storey: What else should we talk about? I think we're pretty much done as far as my questions are concerned.

Hoffman: Well, the thing that I thought we ought to talk about a little bit is this.

Storey: Uh-huh, what is that?

Hoffman: That book I showed you, organizations, accomplishments, what-have-you. Remember I showed you all of this [along] with [design drawings] ~~designs~~ and estimates [I have accumulated].

Storey: Uh-huh. These are Reclamation project designs and estimates?

Hoffman: No, remember I told you . . . . I don't know whether I want to put it on the [tape] machine or not. Maybe this is privileged, and I shouldn't have it.

Storey: I don't think any of that's privileged.

Reorganization of the Denver Office Beginning Around 1940

Hoffman: Well, anyway, [around 1940 the Denver Office was reorganized.] ~~what happened with the organization, that changed.~~ As I said, when Bloodgood came in [from Boulder Dam], the whole organization changed and expanded ~~and all~~. And then the war came on, and the organization was ~~probably~~ reduced just to a little nucleus. Nothing happened until the war was over, [at which time a large expansion] ~~and then they~~ started [with] ~~to do~~ various activities, to put the veterans back to work and all. And in 1946, the Bureau expanded tremendously. Now I don't recall when the regions were started, and the regional directors, how they were allocated [with] ~~, and the~~ regional directors and all – but that was done, I think, after 1940.

Storey: [In] '44 it was done, yeah.

Hoffman: Yeah, after the war. This was planned. The main activities didn't start until after the war. And so the Bureau expanded tremendously then, and we were reduced in our responsibilities in that [those were] ~~that was~~ taken over [to some extent] by the regional director['s offices], a lot of them, and [in the Denver Office] by the different branches~~, and the different~~ divisions. Estimates and Analysis was taken over [by the Construction Branch], and so we didn't do any cost estimating – all we did was quantity estimating.

And so our functions, as far as our particular branch was concerned[, were] considerably reduced and the functions were turned over to others, like Estimates and Analysis and Construction Administration and what-have-you. But anyway, at that time, somebody got the idea, which was wonderful, in the Earth Dams Section, to at least start documenting [and recording results of] the work that we did, so as to [have a record.] ~~know.~~ So they started here with Number One, the first one. And this was done in [about] 1947, [no] around '46 and '45. Yeah, here's some in '45, and they were given numbers, from Number One on, so every project has a number that we studied. Ruedi was Number Sixty-three, catalog number sixty-three, and Number Ninety-three was so on, and number . . . . Anyway, between 1946, when we first started documenting these things, to 1964 when I left the Bureau, 681 different studies [were recorded].

Storey: Um-hmm, that's quite a few.

Hoffman: Quite a few. Now, some were [feasibility designs,] ~~feasibilities,~~ some were reconnaissance, some were specification [designs]. But anyway, I have here – I don't know if I have every one (Storey: In a three-ring binder.) – I have here all of the studies that were done by . . . . In this case, it was by the Earth Dams, and by the Spillway and Outlet Works Section, because here documented was all the pertinent information on the dam, on the spillway, and on the outlet, and on final costs.

Storey: And this was a drawing.

Hoffman: And each one of them had to have drawings of one kind or another. Now here you see this one here.

Storey: (reading) "Bullly Creek, April 24, 1962."

Hoffman: And this one is . . . . Where's the number on it?

Storey: I don't know.

Hoffman: Yeah, 592.

Storey: Oh, okay.

Hoffman: So, that's a lot of engineering.

Storey: It sure is. And you know, these things . . . .

Hoffman: And I don't know where it would be now on the records. There probably isn't a Dams Section anymore, is there?

Storey: Oh yeah. I don't know what they're calling it anymore – but it's still there.

Hoffman: Now, would they have a file like this?

Storey: That I don't know.

Hoffman: Isn't this a worthwhile file as a record of what was accomplished?

Storey: It is, yeah. It's very interesting.

Hoffman: And each one of these, you know, first of all, Spillways Section had to work up a drawing [and estimate,] ~~on this, and combine it,~~ submit it to the

Earth Dams, and they combined it into a drawing, a feasibility drawing or a preliminary estimate drawing, or whatever it was, you see. So there was an awful lot of this that went into making up the drawing – a lot of study, a lot of estimating, a lot of documenting. Now, where's all the material that went into [this work]? As I remember, a lot of it was scattered from here to there, and probably [may have gotten] ~~got~~ into the dead letter files, or into the basement files. A lot of it was *never* documented. The only thing that was really documented [for] ~~in~~ a project was when they decided to have a Final Design Report, final design . . . . What did they call the books that they had? But there are not that many. There it's documented. But other than that, details like this probably were scattered. I remember I had to start assembling a lot of this stuff to bind it into one binder for one project. And that was *almost* an impossible task, because the notes were scattered from here to there and everywhere. Somebody that worked on the job [probably] had it in his file, or put it in his drawer, or had it who-knows-where. And to assemble all [notes] ~~of that and~~ to bind it into one file was a big chore. (Storey: Yeah.) But fortunately, the answers, the results of that were recorded here, and this . . . .

END OF SIDE 2, TAPE 2. MARCH 3, 1995.
BEGINNING OF SIDE 1, TAPE 3. MARCH 3, 1995.

[Tape] 3 of an interview by Brit Storey with Carl J. Hoffman on March 3, 1995.

Hoffman: So where this is going to end up, I don't know.

Storey: Could I borrow the list and duplicate that part of it at least?

Hoffman: Well, I don't know if it's going to reproduce at all.

Storey: Oh, it'll reproduce fine, I think.

Hoffman: But you see, I have, in the 60s I missed out on a lot of it, or some of it, because probably [I] wasn't here at the time. ~~But~~ I used to get a copy of each one of these [when I was in the office], and I presume – I don't know if the Spillway Section – there *is* no Spillway Section anymore, as such, I don't think.

Storey: I don't know, I really don't. Well, I'd like to ask you if it's all right for people from inside and from outside Reclamation to use the tapes and transcripts from this interview today.

Hoffman: Sure.

Storey: Great, thank you very much.

END OF SIDE 1, TAPE 3. MARCH 3, 1995.
BEGINNING OF SIDE 1, TAPE 1. MARCH 17, 1995.

This is Brit Allan Storey, Senior Historian of the Bureau of Reclamation, interviewing Carl J. Hoffman, at his home in Denver, Colorado, on March the 17th, 1995, at about two o'clock in the afternoon. This is Tape 1.

Hoffman: [I don't know if you] have an interest in it. I just wrote a paper on it for José, for my friend.

Paper on Water Supply Canal for Fortaleza Written

Storey: Oh, "The Construction of a Large Water Supply Canal in Record Time." Who did you write the article for?

Hoffman: Well, I wrote it *with* this fellow [,José, when I was] down in Brazil. He wanted the paper – he belongs to ASCE chapter down there, and they wanted him to write something [on the project], but they wanted him to write it in English. Well, his English is very poor, so I started it [about] a year ago when we [were still involved in the work.] ~~first were into it.~~ Last year, in December, I was there, so I had it completed, and he just sent me a copy of it.

Storey: And is this his name?

Hoffman: Yeah, José [Candido Pessoa].

Storey: F-O-Z?

Hoffman: No, no.

Storey: That's what it says.

Hoffman: Well, this doesn't belong to it. These are the highest waterfalls in the world, see, and he copied this off of a board. We were down in Iguaçu, and I didn't go down – an awful lot of walking, and you had to go all the way down to the bottom. I said, "I'll sit here and you go down." And he found this on a board there, on a bulletin board. And so he copied it and he sent it to me. *Foz de Iguaçu* means "the Falls of Iguaçu."

Storey: Oh, I see.

Hoffman: And these are the major falls of the world, largest falls in the world.

Storey: And Iguaçu is I-G-U-A-Ç-U, and the "C" has a little comma underneath.

Hoffman: Iguaçu, with a soft "C." With a hard "C," it would be pronounced Eeg-wah-koo. So this is on Iguaçu, you see.

Storey: Now what's José's last name?

Hoffman: Pessoa.

Storey: How do you spell it?

Hoffman: P-E-S-S-O-A. He just wrote me a note, he wants us to go to a meeting. But anyway, while I'm thinking of it, I met May 15, 2006, Dinty Damours and told him I'd mentioned him to you. I said, "Are you willing to sit for an interview, and he said, "Sure, I'd like to tell him all about our foreign activities – he was in Foreign Activities. So he now lives in Denver. He was living in Greeley, but he's . . . .

Storey: Yeah, I had him down for Greeley.

Hoffman: Yeah, he's living in Northwest Denver somewhere. That's his telephone number, and if you call him, he should recall. He didn't recall *my* name. (laughter) And we've been dealing off and on for a long time. I guess that's us, we just don't recall names anymore. But if you want to contact him.

Storey: Good, I appreciate that.

Hoffman: And this paper here, is how this [canal] project developed and came about and how a three-year job was done. I don't say it so, but this thing was accomplished in three months' time, a tremendous project, and how they enlisted every [contractor available in the state of Ceara to work on the job.] ~~body in the country.~~ This is the Governor at the time. And I was here in Rio in December, he came down, and journalists had compiled a book on some interview with him, and so he was down there signing it.

Storey: Cirro Gomes, huh? C-I-R-R-O G-O-M-E-S.

Hoffman: Yeah. He was Governor at the time of this project. Late last year [Brazil] ~~they~~ ousted the President and appointed a new President, and he appointed Cirro Gomes as the Secretary of the Treasury, and he is the one that changed their monetary system from the *cruzeiro* to the *real*, and pegged the *real* to the English.

Storey: And what did he have to do with the Fortaleza Canal?

Hoffman: Well, he was the sparkplug of the whole thing.

Storey: He was the one who wanted it?

Hoffman: Well, it was needed, see, and the only way to accomplish it was to find the money and to push the thing so that they could get it completed in time for the city to survive, to be with water. [José] ~~And so~~ he just sent this [copy of the article] to me last week. So if you're interested a little more – this is the city of Fortaleza, a city of two million without water.

Storey: It's a beautiful looking city.

Hoffman: Well, most of those [buildings] are hotels [and apartments], and this has become a tourist attraction. So when I was down there last year, I took quite a few pictures [of the canal] – or *I* didn't take the pictures, they took the pictures. A lot of it is repetitious. But we drove [along] ~~through~~ the entire canal, from one end to the other. There's about seventy miles of this canal.

Storey: It looks like a fairly large canal.

Hoffman: It's large in dimension, with siphons and what-have-you. This [construction] was all accomplished in three months. And of course my input to it was more or less to give advice to Pessoa who was the advisor to the water department that was under the command of the Governor. So they were having meetings day and night, and goodness knows wrangling and all. And I was more or less the compromiser on a lot of things, but it kept me busy.

Storey: Oh, I see it's lined with plastic for part of the way at least?

Hoffman: Most of the way, because they couldn't go in there and concrete line it in time.

Storey: Yeah, it looks like sand, a lot of this.

Hoffman: Most of it was through sand. Here's an article about it.

Storey: What's this?

Hoffman: This is the intake to the pumping plant, and this was the growth there in front of the intake.

Storey: A lot of vegetation there.

Hoffman: Well, it's arid country, but when there's water, things grow. These are aquatic plants there that were a nuisance, really. And this is José's outfit.

Storey: *Hidroterra*, H-I-D-R-O-T-E-R-R-A.

José Pessoa

Hoffman: *Hidro* is "hydro," and *terra* is "earth." (Storey: S.A.) That's like "Incorporated" or something like that. *Hidroterra*. And probably a major credit . . . . Here, José Candido Castro Parente Pessoa, that's his name. And he's been the . . . . Well, he grew up in Fortaleza. His father was quite a politician there, and well, well known. And he's [José's] been working with this water problem there for any number of years. I first got involved with him in about 1980 or so, with him on this.

Pacati and Pacajuse Projects

Those projects that were done there, the Pacati, and the Pacajus and so on, [were conceived] ~~was~~ with my help as consultant.

Storey: Can I borrow this, and copy it?

Hoffman: Yeah, but I want it back.

Storey: Yeah, don't worry.

Hoffman: Wes Holtz was [also] consultant with me on [this work] ~~that~~. Bill Gardner was down there on occasions, and was [consulting] with me. Well, not on [the Fortaleza jobs]~~this one~~, but on other Brazilian work. But what this is, is Pessoa, ~~we~~ first knew him in 1951, [when] he came here as a trainee. At that time I guess he was sponsored by *his* government as a trainee, [since] ~~rather than~~ we didn't have the Foreign Activities [Office then] ~~here~~. And [he] spent a couple of years here in the Laboratory and in the Concrete Dams [Section], and in the Earth Dams. He never came into Spillways. But his asset is that he is a politician. At home, the family had some influence. He was here – maybe I told you this before – he came here and was a trainee in 1953, (Storey: Uh-huh, I think you did mention this.) went back there, and Kubitschek was then the [Brazilian] President. And from *nobody*, he was just first a college student, and then a trainee, and he goes back there, and then he was appointed by Kubitschek to head DNOCS. Yeah, I guess we did talk about it. And [he] did very well. When the President – I don't know whether he was defeated or just what it was – but when the President went out, of course his influence in the government went out, and that's when he set up *Hidroterra* and did a lot of work for DNOCS and D-N-O-S, the Department of Sanitation. But his influence mostly was up in Fortaleza, because that's his home territory.

Planning and building the Canal from the Jaguariba River to Fortaleza in Three Months

Storey: Tell me about the canal. How were they able to do it in three months? Had all the planning been done in advance?

Hoffman: *Nothing* had been done [beforehand].

Storey: Nothing at all?! Just the concept that they needed a canal maybe.

Hoffman: Well, they were working on another concept.

Storey: You want the paper? I put it right here when you said I could borrow it.

Hoffman: I guess – no the map isn't here, but there was another map.

Storey: But what was the basic concept?

Hoffman: This is the ____ right here. The concept was, you see they had this – when he was head of DNOCS, they went ahead and built this Arroz on the San Francisco River, about 300 miles from the coast. And the [main] purpose of the dam was [power generation] because there was a dam site. This water [from the Arroz reservoir] ~~is available on this watershed~~ on the Jaguariba River] watershed. But from ~~here to~~ where they could [intercept the river flow and get it into the Fortaleza system] ~~start to utilize the water and get it into their system~~ is about over 100 kilometers.

Storey: That's from the Arroz Dam?

Hoffman: From the [Jaguariba] ~~Arroz~~ River, at the mouth. Well, what they were trying to do initially was to try to [transport] ~~get~~ water over the mountains, starting here [at Arroz] and going over a mountainous route, or a circuitous route, to get it into the next watershed, into the <u>next</u> watershed . . . . This is the Chorro watershed, I guess it was. And this [canal] idea never

occurred to them, or for some reason or another, they never pursued it much. ~~They were looking at all this.~~ Well, in the paper there, it says when they realized that studies or whatever they had done before, the problem is there and how are they going to solve it fast? So José says, "Look, why don't we look here and see if we can get a canal, pump it up along the ridge along the coast, and then get it over to the other watershed." And that's the first time that had had any serious consideration, if it had had any consideration at all. So José came there and proposed this canal. Well, this was at the time of the drought and they were rationing water and there was no rain at all, and what are they going to do? So that's when the Governor says, "Well, let's go ahead with this canal." Well, at that time, there was no studies at all, no surveys, nothing. This is just a general paper. It's not technical.

Storey: Uh-huh. So then in three months they put the whole project together and actually constructed it.

Hoffman: Yeah, and got water into the canal.

Storey: And exactly what did you do in the design development in the construction?

Requested to Participate in Canal Project from Jaguariba River to Fortaleza

Hoffman: Well, the first I heard of it was in April. José calls me and he says, "We got [to build] a canal [to transport water from the Jaguariba River] ~~that we've got to carry over~~ into the Chorro watershed ~~from the Jaguariba watershed~~, about 100 kilometers." "What is the slope of the canal?" "Six cubic meters per second, and that's it. Nothing more." So I said,

"José, I can't give you an answer over the phone. I can sit down here and make a couple of calculations." I called him back the next day and I said, "Well . . . ." I asked him what kind of material [the canal traversed,] ~~it was,~~ and he says, "It's very sandy material, there'll be a large loss in it." So I went on the premise that if it ~~*could*~~ [should] be [concrete] lined, and that was almost an impossibility [in the timeframe set for the project.], I ~~could have~~ imagined, that you can have a certain slope on it [if it were concrete lined]. They'd already predetermined that it should have a five-meter bottom width of the canal, so that they could get big equipment in there and operate big equipment. Because [if] you get in there in a narrow canal~~, and then~~ your problem is a question of enough room to be able to manipulate your large equipment, and that becomes more costly and time-consuming. So five meters wide, one-and-a-half to one slopes, "and what's the slope?"

Storey: On the canal (Hoffman: Yeah.) running down the canal.

Hoffman: Down the canal. He says, "Well, if you have too high a velocity, you [will] have too high a loss and you have too high[hydraulic losses and a steeper canal gradient requiring greater] ~~a slope and you have too much~~ pumping, because you have to pump from sea level up to [the level where] ~~wherever~~ your canal takes off. So with that in mind, trying to reduce the losses, I [reasoned] ~~says~~, "We'll go on the basis of one foot per second velocity. Three-tenths of a meter per second is going to be your velocity. On the basis of that, knowing nothing else, we'll have a [1.012 slope] ~~three no it's one two slope~~. And that was it. He said, "Well, can you come down?" I said, "Yes,

but it's going to take me some time, because I've got to get a visa, and I've got to make some arrangements and all." "Well," he says, "come down as fast as you can." So that was it, and they started to work on the basis of [this] ~~a~~ telephone conversation, and started digging. As I say in the paper here, they enlisted every contractor there was in the state, went out of the state and anybody that had any equipment.

How the Canal Was Built in Three Months Using Twelve Separate Contractors and Modern Technology

They set up twelve different contracts, [or lengths] of sections, and said, "Start digging." Well, where do you start digging? Because it's rolling terrain, and there was [known to be] a little high ridge [near the mid-point of the canal.] ~~in the middle.~~ The only thing they had was the quadrangle sheets. You know what the quadrangle sheets are?

Storey: Top[ographic] maps.

Hoffman: National topographic maps, at 1:100,000 scale, which was a very small scale. And contours [plotted] at forty-meter intervals. Well, you're working with centimeters as far as the grades are concerned. Forty meters from one [contour to another,] ~~to the other,~~ it could be an expanse of ten kilometers, or five kilometers between contours, and how do you know [where] ~~what~~ the exact location would be? So they somehow or other decided, well, (tapping on table for emphasis) "Dear Mr. Contractor Number Six, you start here, initially, and this will be one of the points." Now what they did is probably not unique, but it was very interesting. They have the satellite system now – what do they call that system?

Storey: Oh, the LANDSAT or whatever it is?

Hoffman: Yeah, in which you can sight into, or you can hook into the satellite and you can get an exact location of any point.

Storey: Uh-huh. Yeah, I think it's accurate now within thirty feet or thirty meters or something.

Hoffman: Within feet. You got the paper?

Storey: Yes, here.

Hoffman: The GPS system.[18] "G" is geodetic or something. Well anyway, it's a science now in survey, that's the modern thing. So they did have survey people that were familiar [using] ~~with~~ the GPS system. They put ~~it~~ together twenty-four different survey crews, and set them around with the GPS system. And then one thing that was *very* – well, I presume it was unique – was that in order to get the elevations, they spotted a point on the GPS, and then flew a helicopter in there with their altimeter to get an elevation. And that's the information that these survey crews had in order to try to find out where [to locate the canal.] ~~this location was.~~ And they had several mishaps – I was in one of them.

18. According to the Garmin website [http://www.garmin.com/aboutGPS/] on September 14, 2006, 9:55 A.M., "The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS."

Helicopter Crash During Work on the Canal

We had a helicopter crash, we [flew] ~~crashed~~ into a powerline, coming in. We were coming in from where the pumping plant was. I was there reviewing what there was there at the pumping plant site. They picked me up at the end of their day's run, and we were going back into Fortaleza. So in the meantime they said, "Well, let's stop." They had a pad with an established level there, so they said, "Let's check our altimeter and see if we get a good reading on it." Well, the contractor there – this was the contractor's camp – the contractor had put in a high tension line across the flight path of the helicopter, didn't tell anybody about it. We came in, hit the powerline, and luckily snapped the line, or else we would have been electrocuted. And we were about thirty, forty feet above ground, wound the wire around the rotor, came down in a crash. (tape turned off and on)

Storey: About forty or fifty feet.

Hoffman: Right. (pause) But [in these newspaper reports] they didn't mention our name, and they didn't interview us.

Storey: Uh-huh, a couple of accounts of the helicopter crash.

Hoffman: And that was it. And you can see what might have happened to me. Could have been the end of my consulting work.

Storey: Well, thank goodness it wasn't. Now, how long were you down there?

Hoffman: I was down there two months.

Storey: And so did you stay until it was completed?

Hoffman: No, I left two weeks before it was completed.

Storey: So you got down there within a couple of weeks.

Hoffman: Got down there in June.

Storey: Of '94?

Hoffman: Of '93. We set up an office there in the hotel [in Fortaleza], got a big room and got one of their banquet tables and set it up as a drafting table. I was behind the scenes, because I couldn't speak Portuguese, and I didn't have anything to do directly with the water department. We gave advice and they'd consent or not or whatever, and that's the way it went. *But*, Pessoa's the one that deserves all the credit. They called this the "Canal of the Workers." There were 5,000 workers on the job. But it was, in reality, the canal of Pessoa. I marked it out and changed it to "Canal of Pessoa" [on a photograph of a cake celebrating the canal's completion.]

[in Portuguese] _____, "in our life," *nos el vida*, _____. But anyway, this is quite a project. So that's one of my exploits, one of my more current exploits, if you're interested in reading this thing. (Storey: Yeah.)

Okay, now, going back to what we were scheduled to be doing.

Storey: Well, I think last time, after we had turned off the tape recorder, you mentioned that you knew some stories about these folks in this picture from the summer of 1932.

Establishment of a Junior Engineers Club in the Denver Office

Hoffman: I don't know if I know any stories. When I first started here (Storey: In Denver.) in Denver, there were a bunch of younger fellows in these rows here. We set up a Junior Engineers' Club, three of us: Lester Bartsch and Carl Nielsen and I decided we were going to – and this was just after Prohibition – (Storey again confirms spelling of Bartsch) and all the younger people were very enthusiastic about going out and having some fun, and they're kind of living it up a little bit. So what we would do is, we would go out [dinner dancing]. There was the Shirley Savoy Hotel here.

Storey: I remember the Shirley Savoy.

Junior Engineers Rented the Ballroom of the Shirley Savoy Hotel

Hoffman: And we rented the ballroom of the Shirley Savoy, and it was just after Prohibition, and we got them to furnish us a big punch bowl, and we started concocting punch, and spiked it. And I'll tell you, that was the . . . . We remembered it for months and months afterwards. A lot of people never remembered the dance. It wasn't a dinner-dance.

"I bring it up because there was a fraternal feeling amongst the younger people, apart from these older people. . . ."

But I bring it up because there was a fraternal feeling amongst the younger people, apart from these older people. They were never invited, it was just the youngsters, the junior engineers. I would imagine that we had over 100 people that participated. My

wife knew a doctor, she worked for a doctor's office, knew a doctor who was a member of the Cherry Hills Country Club, and that was [a] very, very exclusive [club]. And we finally got him to intercede and agree that we could go out there and have our dance out there. We got quite a crowd of people there and it got unruly, and they tore up the bathroom, and held *me* responsible ~~for the rest of it~~, because I was supposed to be one of the sponsors of the [affair] ~~club~~. So that put a crimp into ~~some of the~~ [such] activities ~~there~~. But we were very, very active maybe up to 1935, from '30 to '35 – junior engineers mostly, and a few of the fun-loving older people. I don't know if Rockwell is in here. Rockwell was one that liked to participate in this thing.

Storey: What was his first name?

Hoffman: Seldon Rockwell. Here he is, number 160. I guess I mentioned him before. He was hired out . . . . [of the Amburson Dam Company.]

END OF SIDE 1, TAPE 1. MARCH 17, 1995.
BEGINNING OF SIDE 2, TAPE 1. MARCH 17, 1995.

The Bullpen – Spittoons, Drafting Tables, and Desks

Storey: You were saying, when this wasn't working properly, that there was a spittoon at every desk.

Hoffman: Spittoon at every desk.

Storey: Or drafting table, as the case really was.

Hoffman: Well, there weren't any desks. The only ones that had the desks were the section heads.

Storey: The managers and supervisors.

Hoffman: So at first when we moved into the Loop Market Building, we had this big bullpen, and there were two desks at one end of the room, and one desk at the other end – flattops – and that's all. Everything else was drafting tables. So it didn't make any difference what position you had, you only had a drafting table. And as far as telephones were concerned, I think we only had two or three telephones scattered around this long half-block bullpen.

Storey: Would you mind repeating a little bit about the spittoons and the smoking that you talked about?

Hoffman: Well, that was an accepted thing, the spittoons were. And whether or not anybody was chewing tobacco, I don't know – I don't think so. Generally the field people were the ones that were the tobacco chewers. People that worked out in the field on the survey crews and so on, I guess were where it was easy to spit whatever it was you had to get rid of. That was just done on the ground. But in the office, the spittoon presumably was put there for the same purpose. The spittoon lasted as long as we were in both the Wilda Building and in the Custom House.

Storey: And they had a little water in them, and then people would dump ashes and butts and that kind of thing in them?

Hoffman: Yeah, whatever it was. Just something you couldn't throw in the wastebasket, it found its way into the spittoon. And then the clean-up brigade would come in just about quitting time. Sometimes they'd come in a few minutes before, we always expected the janitorial people to come in with their big bucket and

they'd empty it out. That was then preparatory for the next day. But that was a habit, I guess, that had carried on – not only there, but in a number of organizations. A spittoon was a commonplace thing.

S. O. Harper

Well now, getting back to the picture, 196 was S.O. Harper, and he was the Assistant Chief Engineer. His responsibility was mostly in contracts – nothing to do with design – neither Walter nor Harper – but of course they had to sign all the drawings. So their name appeared. Either Harper or Walter was always on the approval [line] on all [drawings].

Storey: Yeah, all the drawings that were done.

John (Jack) L. Savage

Hoffman: Okay, now, next in line was Chief Designing Engineer Savage. And I think I've said that he, as far as I was concerned, he was a wonderful man, very soft spoken, very considerate, sit at my desk –

". . .he came down to our office – mostly because all the work was laid out on the drafting tables. . . . if we had to pull up a drawing, then we'd have to pull up the thumb tacks. And . . . it was a chore.

I don't know as I mentioned it before, but when we had a question or a problem, we didn't go to the front office, he came down to our office – mostly because all the work was laid out on the drafting tables. And instead of our having to pull up – we used to have thumbtacks in, not even tape, you see – tape came

later. But if we had to pull up a drawing, then we'd have to pull up the thumb tacks. And if we had to carry it to the front office, it was a chore. He came down to *my* desk always, if there was a question or a problem. And I remember he – I always deferred to him, I gave him my stool, and the rest of us stood around. There was Byron Steele, was the head of Dams, was always there. And McConaughy was there, and I was there, and maybe in some instances somebody else was there. So it was always a big congregation around my desk. It seemed like *my* desk was the center of activity whenever there was some discussion. And that's the way they operated.

Evolution of Spillways at Hoover Dam

Storey: Now what kind of issue would bring Jack Savage down?

Hoffman: Well, we had *no* concept at all of what we were going to design or how it was going to evolve and what-have-you. As far as hydrology, there was no hydrology. The only hydrology there was [that] ~~was~~ Debler was the kingpin on that. Debler decided what a spillway design capacity was [to be].

Erdman B. Debler

Storey: That would be Erdman Debler?

Hoffman: E. B. Debler, yeah. Number 200. And we had no way, it wasn't our responsibility to decide . . . . Well, we're talking about, in the early times, in Hoover Dam . . . . (phone rings, tape turned off and on)

Storey: About Jack Savage and the evolution of spillways on Hoover.

Hoffman: Okay. So when Boulder Dam was conceived, it[s design] was a very preliminary thing, and I think I mentioned before that at one time they were thinking of a tube with holes in it, to be the intake [control] ~~something~~. This was 1922, I imagine [from the old] ~~the~~ drawings that I found [in the files]. So there was nothing definite, nothing decided on exact designs. And when we first started, specifications had to be issued in short order. As I recall now, I don't remember how it was developed, but there was one 700-foot-long spillway that someone mentioned in an article. I don't seem to recall that. But anyway, that was the design that was being proposed in the specifications. And after that, then we started to develop [other] concepts of various kinds, so there were all sorts of alternative [layouts and] estimates. And what we would do is, we finally decided on side channel spillway[s] because we wanted to use the tunnels. (Storey: The diversion tunnels?) The diversion tunnels, and [in order to] tie into the diversion tunnels, ~~so~~ it [developed] ~~had~~ to be a side channel spillway. Finally developed, I suppose, instead of one spillway, that there were two spillways, one on each abutment. And then the question was ~~on the controls, the idea of~~ what would be the [discharge] controls. There were schemes where they had just a large tainter gate – not a tainter gate,[19] but a rectangular gate, something like was done at Glen Canyon later on – was one means of controlling, and the other was the side channel, and one was a combination of side channel and a rectangular gate at the end. Well, what would happen was that whenever we got some idea, we'd draw it up, which was probably [done by] me, because I was the

19. Drum gates are used on the spillways at Hoover Dam.

– there were other contributions too – but the drawing was on my desk, and I did most of the layout on it.

"This is the way the design evolved, is by a [model] trial and modifications. . . ."

And then we would send it [the scheme] up to the [hydraulic] laboratory, which was in Fort Collins, and they would build a model of it and test it, and make modifications [on the basis of the tests]. This is the way the design evolved, is by a [model] trial, ~~a concept, and a model, and a trial,~~ and modifications [where warranted]. And because of all of that, whenever a new concept came up, it was laid out on my desk. And then the conference was there. And so this is how it came about that I used to have – the activity was right there, rather than for us to bring the drawing to Byron Steele, the head of the Dams Section, or to Savage – they assembled there, and that's the way things operated.

Organization of the Office and Major Staff in the 1930s

And whether it happened that way in the other sections, of course, I presume to *some* extent it did, because we were the Spillway Section, then there was the Tunnel Section, and then the tunnel controls, they had the fifty-by-fifty gates at each end of the tunnel, closure tunnels and controls on the tunnels. And then they had the intake towers and all of the tunneling and all of that, which was done by – Herb Warner had [that] ~~one~~ section, and I don't know what happened to Herb after . . . . He didn't stay on after the 30s, he was gone. Whether he retired or whatever it was. And Blomgren, who [ran] ~~was~~ the other [design group on] ~~one who had~~ the intake towers. McConaughy had spillways, and Blomgren was the

towers, and I think Herb Warner had the tunnels and the controls on the tunnels. So those were the three. Then the Concrete Dams Section was Hammond's, and he had the design [and] ~~of the~~ layouts on the main dam, and the [associated] details on that. But that was the only work that was going on, was Boulder Dam at that time, up until about 1933, from 1930 'til '33, when Roosevelt got in, and then there was a lot of activities in these small projects: the PWA and WPA and then such projects as that. Those were doled out, I guess, to different sections. I guess that was it. (Storey: Tell me more about these folks.) This picture here reflected mostly Boulder Canyon, because this is the only work that was being done – on Boulder Canyon.

Okay, all right now, Nalder was the Assistant to Savage.

Storey: Nalder is N-A-L-D-E-R?

Hoffman: Yeah. And then in the Dams Branch was Byron Steele.

Storey: Okay, Byron?

Hoffman: Byron Steele, and Byron Steele was quite active in making decisions. As I explained, he was always there when Savage was there.

Storey: Was Steele with an "E" on the end?

Hoffman: Yeah, S-T-E. Number 192.

Storey: S-T-E-E-L-E, then.

Storey: Number 192 on the picture. Now, Byron Steele stayed around until 1935 or '36 or something like that, and then left the Bureau. Now what prompted that, I have no idea. He went to the Corps of Engineers, but [in] the Corps of Engineers, his job was mostly as . . . . He didn't have anything specific, he was sort of a consultant in their group, because as I understand the Corps is run by the Army and the military are the ones that are the heads of whatever divisions or whatever offices they have. But Byron Steele went into Washington, and he was a sort of a consultant to the various [field] offices. Other than that, I don't know exactly whether there was any politics there or just what it was, but Steele left [the bureau].

Well, when Steele left, then Keener got on the job. Keener is 167.

Storey: That's K-E-E-N-E-R?

Hoffman: K-E-E-N-E-R. Keener never should have had that job. I don't know whether I should say – you don't speak [ill] of the dead.

Storey: Please go ahead.

Hoffman: But Keener never was a very effective . . . . He was administratively the head of the Dams Branch, but nobody ever went to him, nobody ever counseled with him. If we had a problem, we didn't go to Keener like we did to Steele. We went directly to whoever it was – Savage while he was still around – and then when Savage left, which was in the 40s, then of course we had to go to Nalder. And Savage is the one that had the ideas. After that, none of the top brass were very helpful. They were mostly the ones

that arbitrated in the event that there was some conflict between the civil engineers, the mechanical engineers, or the electrical engineers, Nalder was the arbitrator, because he then became, after Savage left, the Chief Designing Engineer. And he had the respect of *some* people, but I don't think he had the respect of *all* people.

Now, these people came up from the ranks before Boulder Dam – they were mostly field people from the various field offices. Savage, I think he was active in Idaho. He was there at the time of Owyhee Dam, and the time of Gibson Dam, and the time of American Falls Dam, so he was very active in the design then. Now Nalder, I don't know where Nalder came from, but presumably from the same background.

As Reclamation Prepared to Build Hoover Dam, Design Staff from Field Offices Were Brought into Denver to Establish the Design Function There

And they all did, because when they assembled all these people in Denver, they took people from all of the field offices and set them down and established the Denver Office as the design office. So these were the design people that were scattered around in various field offices, and then they became the design organization for the Denver Office.[20]

Storey: They were brought into Denver for Hoover Dam, or for Boulder Canyon.

20. Executive offices were established for Reclamation in Denver during June of 1915. Mr. Hoffman is explaining here that the nature of the Denver Office changed greatly as Reclamation prepared to design and build Hoover Dam.

Hoffman: For Boulder Canyon. And that's the only thing there was, and that's what . . . . I'm sure that the Denver Office existed long before then, but only in a very small capacity. And then when Boulder Canyon came, why then everybody was brought together and what nucleus there was, they became the various heads of the various sections and divisions and so on. And then they brought in all new people, and mostly *young* people, a lot of junior engineers and a few of those from [private engineering offices] ~~the outside~~, and that was the organization.

Okay, so we go down to Number 189, Porter Preston. Have you heard of Porter Preston?

Storey: Yeah, I've heard of him. Tell me about him.

Porter Preston and the Colorado-Big Thompson Project

Hoffman: Well, there isn't a lot that I know about Porter Preston, excepting that he did[n't] belong to the Denver Office [organization]. He had an office here. He was the planning man for the Colorado-Big Thompson, and he was, I suppose, either the liaison or he was the actual Planning Engineer on the Colorado-Big Thompson. He and Debler were the collaborators, I suppose, see, because Debler was the only planning man that we had, and Porter Preston just had an office there, conveniently, I guess, because there wasn't any field offices or anything at that time [for the Colorado-Big Thompson].

Number 190 is L. R. Smith – he was the Chief Clerk. And [Armand] Offutt was over here, Number 82 I think is Offutt. He was a Personnel man. No [that was] Bonnet. Where'd I get the name Offutt?! Personnel was very small. We had the Chief Clerk,

and he had a small organization. Bonnet was Personnel – nobody else, everything went through Bonnet. He's the one that hired me, or put his name on the proposal or the . . . .

Storey: On the paper, huh?

Hoffman: Yeah. Okay, 191, yeah, here's Offutt. He was the Chief Counsel. I don't know what he did or what it was. What was his name? Andrew Offutt? I can't remember.

[Number] 192 is Steele, I told you about Steele. Nalder, Harper, Walter, Savage, McClellan. C.M. Day, Mort Day was head of mechanical engineers. And Debler was the planning man and the hydrologist and whatever.

Ivan Houk and Development of the Trial Load Method of Analysis

Ivan Houk, his specialty was trial load analysis, the *technical* part of dam design. And he and some of his cohorts are some of the ones that developed this procedure for trial load method [of analysis]. So he was mostly the one that dealt in theory.

Storey: How do you spell his last name?

Hoffman: H-O-U-K.

Storey: And they developed that for Hoover, do you know?

Hoffman: Well, they did a little of that, they started it on some other job, but mostly the trial load method was developed by Houk and there were several other

foreign people that weren't in the Bureau, the academicians. He's the one that brought it *through* Savage, I guess, so he was Savage's theoretical man.

H. R. McBirney Headed the Canals Section

All right, [H. R.] McBirney was in canals, he was head of canals. And canals was nothing at that time, there were only two or three people here, because canals was not . . . . No, I take it back, part of the All-American Canal was part of the Boulder Canyon Act, so McBirney was busy on Imperial Dam, the diversion dam at Imperial, and on the All-American. But he didn't have at this particular time, much of a staff.

Storey: And how do you spell his last name?

Hoffman: M-C-B-I-R-N-E-Y. Later on he left here, he wanted to transfer to California for some reason, health-wise or something. And he was the Construction Engineer on Cachuma Dam.

Storey: Really?

Hoffman: And Gault, somehow he wasn't a part of the organization either. He fit in the picture something like Preston did – I don't know exactly what he did. These sitting on the chairs [were from the] ~~there was a~~ front office. And from then on it became a question of sections and branches and so on.

"Well, of course the prime movers were the civils, the civil engineers, because the Mechanicals, I always considered them as being service people to the civil engineers. . . ."

Well, of course the prime movers were the civils, the civil engineers, because the Mechanicals, I always considered them as being service people to the civil engineers. If we wanted a gate [designed], of course we went to the mechanicals. [But] ~~So~~ they didn't *initiate* anything, see. We were the ones that were the initiators. And then they were the service people to service whatever problems we had as things developed. The electricals were almost independent of us too, because the powerplant was a different part of the project than was the dam, see.

Storey: Who in the picture was responsible for powerplants?

Leslie N. McClellan

Hoffman: Oh, so here we are here. Of course [Leslie N.] McClellan . . . .

Storey: Was electrical?

Sam Judd in the Denver Office Headed the Structure and Architecture Section

Hoffman: Was the chief electrical. (Storey: Okay.) Then separate to the electricals but tied-in with them was the S&A people, structure and architecture. And Sam Judd was the head. He was an oldtimer that didn't come from – he's a Denver man, was never on a project, he was always in the Denver Office, so he was one of the early ones in the Denver Office, and Sam Judd, whatever had to be done in the Denver Office, why Sam was elected to do it. Like for instance he was in the Structure Section, so when they set up the big office there at the Public Market there and took the second and third floor, he's the one

that had to get the whole thing laid out and renovated and get the thing all set up and design the bridge across from the Wilda Building over to the Public Market Building. Sam Judd was the expediter, let's say. But that's because he was in the S&A, and then there was nobody else. So if you wanted something done, you went to Sam, and Sam was the one that saw to it that it was expedited. But he was in Structure and Architecture, and on Hoover Dam, his responsibility was for the [powerplant] building.

The electricals and the hydraulic machinery people, they're the ones [who made] ~~for~~ the selection of the turbines and generators and so on. But to accommodate those, you had to have the powerplant structure and the layouts and all, and that was Sam Judd. So there was Sam Judd, and we had *one architect*, Harry Kennedy. He was one of Sam Judd's men. Very unassuming. He took orders, Sam said "jump," he jumped to whatever it was. But Kennedy was the architect, the layout man [for powerplant buildings].

"[When] it came to the design and the detailing of the powerplant structure, and Sam [Judd] didn't have the people there to do the structural calculations and layouts and the reinforcement plans for it, so we inherited that in our section . . ."

I remember after we got the spillways more or less decided on, it came to the design and the detailing of the powerplant structure, and Sam didn't have the people there to do the structural calculations and layouts and the reinforcement plans for it, so we inherited that in our section, and I remember that Rockwell was one of them. Rockwell and Wilbur Rowe and maybe a couple of others, were assigned to

Sam Judd – they were sitting in our section, but they were assigned to him to do the detail reinforcement layouts for the powerplant.

Storey: For the roof?

Hoffman: For whatever there was, everything had to be reinforced – reinforcement in the foundation and around the turbines and . . . .

Storey: Oh, we're talking about the reinforcing steel?

Hoffman: The reinforcing steel [in the] concrete – the concrete reinforcement.

Storey: How do you spell Rowe? Wilbur, I think you said.

Wilbur Rowe

Hoffman: Wilbur R-O-W-E. And Wilbur Rowe was a very, very nice man, but very, very unassuming. An older man, but he plugged along. You told him to jump, he jumped. But I liked Wil, because he sat next to me [at] ~~in~~ the [table] ~~desk~~ in front of me. Let me see if I can find Mr. Rowe here. But he was one that came in from the field. Not many ideas of his own, but a very, very nice man. (pause) I can't find his name here. I was really fond of the old man. He's here somewhere.

The Concrete Dams Branch Had Four Sections

Well, anyway, so, that's the way it stood. The ~~Concrete~~ Dams Branch had Spillway, and Intake Structure, and Tunnels, and the main Dam. That was the four different sections. And each section only

had a very few people. Now when this picture was taken, the Spillway Section, I'll tell you who was in it. There was me, 163; and there was Harold Davis – I've told you about him – 166. We had Sumner Wing, 158. He did the bridge across the Arizona Spillway. He was the one on the bridge design. Smart man, but somehow or other he just didn't find his little niche. But very technical. And Rowe should be in here somewhere.

END OF SIDE 2, TAPE 1. MARCH 17, 1995.
BEGINNING OF SIDE 1, TAPE 2. MARCH 17, 1995.

This is Tape 2 of an interview by Brit Storey with Carl Hoffman on March 17, 1995.

Walter Price Later Headed the Laboratories and Was President of the American Cement Company

Hoffman: Well anyway, that was the Spillway Section. At one time we had Walter Price was in the section, came in [early]. Walter Price later became the head of the Laboratories, if you know, and [he] became quite a concrete expert, retired and went and was the President of the American [Cement] ~~Concrete~~ Company. But Walter Price was in there for a while, in our section, then moved out and moved into the laboratories – so we lost him.

Charles Rippon Eventually Became Deputy Regional Director in Salt Lake City

Another fellow that we had there [in the section] was Charles Rippon. He stayed for a while and moved out and moved into the laboratories, I think, and then finally into Construction, and went to Utah – he was a good Mormon – went to Utah, became the

Assistant Regional Director there at one time. [He was the brother of Frank Rippon.]

"So people moved in and out [of the Spillways Section]. I stayed. And I guess from the initial bunch, I was the only one *finally* left. . . ."

So people moved in and out. I stayed. And I guess from the initial bunch, I was the only one *finally* left. (Storey: In the Spillways.) In the spillways. The rest of them moved out. And there were other people that were brought in that weren't in the picture, see, a lot of them that came in [later]. Younger people were brought in. But I was the only one that stayed on from the original bunch.

I showed you the picture of Bartsch. (Storey: Yes.) Bartsch came in[to the Denver office] before this picture was taken, about a year after I came into the Bureau. He worked for Blomgren in the Intake Towers. Bartsch and Carberry [for intake tower design] – Carberry is Number . . . . I just saw his picture here. (pause) Yeah, 162. Bartsch and Carberry were the nucleus. Robbins was there, he was an older one. He was a checker, really, he wasn't in the section, he was a checker. They were the nucleus [for design] of the intake towers.

Lester Bartsch Started in the Dams Branch and Then Moved into Specifications

Storey: What was Bartsch's first name again?

Hoffman: Lester. And Lester, he wasn't happy just to be an engineer, and he took classes at the University of Denver in the law school, and he got a law degree,

and because of that – he never took the bar or anything, but he just took it to be taking it, married a girl whose father was a judge. Whether that had any influence or not . . . . But Bartsch was with the Dams Branch for a while. Later they gave him the assignment for writing the specifications in the Dams Branch. And then finally they established a Specification Branch, I guess, or section or something, in the Construction Division, and he set up a specification preparation and review [branch].

H. C. Stetson was the only specification writer for Hoover Dam

Incidentally, Mr. Stetson, Number 155, yeah, H. C. Stetson. You see on this list here, it says "Specifications, H. C. Stetson." He was the *only* specification writer for the Boulder Dam specifications – just the one individual wrote the whole specification. H. C. – I can't remember his name.

". . . the whole . . . Dams Branch, I guess, was eleven people plus a couple of the section heads . . ."

But you see here, the whole Dams Section is (counts) *eleven* people, so the whole Dams Branch, I guess, was eleven people plus a couple of the section heads like McConaughy and Hammond. Hammond 168, Herb Warner 167, McConaughy 170, and Blomgren 171. Those were the four section heads. Keener was the assistant branch head. So very small units and very closely organized people – a few here, a few there, and that's the way it was. And we were responsible for . . . . Now what kind of an organization do you suppose we'd have now if we had a job with the magnitude of Boulder Dam?

Storey: (chuckles) It's hard to tell.

Russell See Designed Cle Elum, the First Earth Dam Designed in Denver

Hoffman: So, anyway, I think that this was quite an accomplishment for these people, especially since everything was new to them. There was nothing to fall back on. Very little [background knowledge] ~~that~~ had been developed. In dams, Savage had experience on three or four different concrete dams. On earth dams, we weren't even thinking about earth dams. There was nobody here, earth dams was not in this picture at all. The first earth dam [project] that came to Denver [for] ~~as a~~ design, they gave [to] Russell See – the job on Cle Elum.

Storey: And that would be S-E-E-?

Hoffman: Yeah, Russell See, Number . . . .

Storey: Well, in any case, in that 1932 picture . . . .

Hoffman: That's a 1932. So that was the first earth dam that was designed or laid out. The specifications were issued from the Denver Office, was on Cle Elum. I think it was Cle Elum. I could be wrong on that. But I'm sure it was, yeah.

Storey: You mentioned one of these guys evidently went down to Hoover on a trip or something and took a dare?

J. D. (Dunc) Church Moved into Construction at Hoover and Took a Dare to Swim Through One of the Diversion Tunnels

Hoffman: No, he transferred, Dunc Church [phonetic spelling]. Did I see his picture? I guess I did, because I pointed it out to you. He was in the Dams Branch for a while, then I think he transferred. Where did I see his picture? I must have seen it, because I pointed it out. Yeah, J. D. Church, [Number] 63. You can see he's got a little bit of a . . . . Black-haired kid. But he couldn't pass up a dare. I remembered Dunc Church at the junior engineers' dance. He was quite the cutup. Anyway, at this time, you see, he transferred out of the Dams Section and he was with Houk, went into Houk's section, on trial load studies and all. And he lasted here for a little while, and then he transferred to construction, took a job down in Boulder City.

Storey: Working on Boulder Canyon.

Hoffman: Yeah, on the construction, whatever it was, inspector or in the office or something. Anyway, that's post-Denver Office, so he got away from us. But the story was that – we heard about him off and on – but one of his antics was to accept a dare and swim through the diversion [tunnel]. It wasn't anything trivial, you know, and velocities were high. I'm sure they had a high velocity through that diversion tunnel, and dark. I guess in his college days he might have been a swimmer or something.

Anyway, these are some of the kind of people that joined up with the Bureau. And amongst them, a lot of them didn't get very far, and a lot of them went places. Lester Bartsch, after [his stint in the Denver Office,] ~~Spillways, he~~ got assigned to Region Six at Billings, was assistant . . . . What do they call it?

Storey: Regional Director, I believe.

Lester Bartch Became Assistant Regional Director in Billings and Then Went to the World Bank

Hoffman: Assistant Regional Director. He left there [later], took a job at the World Bank, did very well at the World Bank. Here's Carl Nielsen. He left here, went up to Grand Coulee and was Office Engineer there at Grand Coulee, or Assistant Office Engineer. Charlie Carter, he's the one that wrote in that book on dams.[21]

Storey: He wrote on the *Design of Small Dams* book?

Hoffman: No, no, on that other.

Storey: Another book, the other one we discussed the other day.

Hoffman: The other one about various dams. He's the one that wrote on Boulder Dam. Charlie Carter ended up with the California . . . . Oh, what's the name of the big outfit?

Storey: Oh, the California Water Department? I've forgotten what it's called. The [State] Water Project?

Hoffman: Yeah, the one that worked out of Sacramento. So Charlie Carter ended up there. And Nielsen, of course, he was up at Grand Coulee. He passed away early. Howard Robbins was a checker. Howard Robbins ended up with Laurance at this job in Oklahoma, as a construction engineer.

21. He wrote a chapter in *Dams and Control Works*.

Storey: What's a checker?

Signing Drawings at Reclamation

Hoffman: A checker is one that after somebody prepares a design, they review the thing and check it item-by-item, line-by-line, so you see a drawing, you'll see "drawn" and "checked." So that's the checker. He's the one [who initials a drawing] before the submitter [who designed and drew the original signs it]. So if you see the title "drawn by," and "traced" – which doesn't mean anything, they're just draftsmen – so the one that originates the drawing, it's drawn by him, *checked* by him, everything is gone through with a red pencil and a green pencil and a blue pencil, so there's not an item that's missed on that drawing, whether it's calculation, or whether it's drafting, or whether it's the layout or whatever it is. After it goes through the originator and the checker, nothing [is] left except for the bigwigs to sign their names to it. So those on the left-hand side of the title [block], they're the ones that did all the work. Maybe the one on the top, "submitter," had [the final responsibility,] ~~to do with it,~~ but the rest of them, like R. F. Walter, what did he know? He never looked at a drawing, he never checked a drawing, but he was always the one at the last that "approved." Had to be approved by him, see. Whether it was submitted . . . . I can't remember the title now. (pause) Are you interested?

Storey: Sure. (tape turned off and on) Those are a little hard to read.

Hoffman: Yeah. You see here, this is the [engineer] ~~one~~ that's drawn it – he's the one that actually drew it.

Storey: Tracer.

Hoffman: They were just tracers. We didn't have draftsmen. A draftsman is supposed to be able to take a concept from an engineer and draw it up, but a tracer, he just traces [a pencil prepared drawing] line-for-line-for-line. So [the engineers prepared their ideas in pencil on a drawing and then that drawing was traced.] ~~this thing all had to be worked up in pencil on a drawing first, and that's the drawing, the drawer. And the fellow that does the checking~~. . .

Storey: And then it says "checker, checked."

Hoffman: And the checker had to [check the drawing for completeness and accuracy going over] ~~go through~~ every line and every number and every figure and everything else.

Storey: And then "submitted."

Hoffman: Submitted is generally the section head.

Storey: And then "recommended."

Hoffman: "Recommended" in this case was . . . .

Storey: McClellan I think, maybe.

Hoffman: Nalder. Nalder was the Chief Designing Engineer, and "approved" is McClellan who was the *Chief* Engineer. Now, in a case like this, these are subordinate people. In this case it may have been. On important things, it *had* to go to the Chief Engineer. Okay, here's one here. Now this was a specification drawing. So in this case, Rice was the Chief Designing Engineer, Lindquist in this instance was the Assistant Chief Engineer.

Storey: And he's the one who recommended it.

Hoffman: Well, but these people had nothing to do with it, see. And Grant Bloodgood was the Chief Engineer, see.

Storey: Who approved it, according to this, for Clark Canyon Dam.

Hoffman: Well, in this case here, 1961, it says Grant Bloodgood is the assistant Commissioner. Oh yeah, he was Assistant Commissioner and Chief Engineer, see. So at that time he had *both* titles. Lindquist was the Assistant Chief Engineer, Rice was the Chief Designing Engineer.

Storey: And he's the one who, quote, "submitted" it.

Hoffman: Yeah, but had very little to do with it, because this was all done, in this case, by the subordinate people here, and these were the people *here* that all of these little initials. All right, Fred Walker, he had put his initials on. He wasn't the checker. R. W. B. – that's Dick Bock. Dick Bock was the group head. Walker was the section head. And then it had to go to R. W. W. [who] ~~which~~ was [in] the Spillway[s Section]. So in this case here, both the head of the Earth Dams Section, and the head of the Spillways Section had to initial it, see. So it depended on what the importance was. In this case, if this was a specification drawing, it had to go up to the top people. If it wasn't, if it was just a preliminary study or something, then it could have been approved by subordinate people.

Storey: How did this design process work? For instance, Spillway "X," and we'll say it's a fairly major spillway. Is that what you spent all your time on? I would come to you and you would design it and you

would keep designing it until it was done and then send it on? Or were you working on several things at once? Or how did this work?

Hoffman: Well, in my instance I had little groups, you see – individuals or groups, and each was assigned to – if we had five or six different things going at one time. Then we would have a little nucleus, either an individual or several individuals, that would be assigned to this particular job, to the point where they would actually review [the incoming data] ~~everything~~ and then study it all and then make up a layout on it and estimate it all. Depending in which era we're talking about, whether it was pre-war and the way we operated then, or whether it was post-war and the way we operated then, and what kind of an organization there was, but in general . . . . Well, we had three different [types of] assignments: we had assignments to do preliminary design and estimating – well, preliminary or reconnaissance. In later times it was something the planning people from the region would send in, and there would be a memorandum or a letter or something requesting that this should be studied, and they submitted whatever data [was] ~~they~~ needed, and we would get out a reconnaissance design – or a feasibility design. Here's one, a feasibility design. Well reconnaissance design was based on just preliminary investigation, preliminary data. Feasibility would be one in which we would develop a design based on more information, more investigation, more foundation exploration, things of that nature.

The Three Categories of Designs Executed at Reclamation

So there were three categories of design that we [did] ~~got~~: either preliminary, or feasibility, or specification. Well, now if it was specification design, then of course that was a thorough study leading up to the preparation of specification of drawings for specification inclusion, together with a final estimate for bidding, see.

To go back a little bit, as I recall, the Regions were not established until after the war.

Storey: In 1944, I believe.

Hoffman: Okay, after the war.

Storey: Yeah, well, right at the end.

Hoffman: So pre-war, everything came into the design sections, and we're the ones that handled any . . . . I don't know what in the world I'm trying to say.

Prior to World War II Any Planning Was Done in the Sections in Denver or in the Local Project Office

Any planning. There was no regional [organizations or] ~~group that did that,~~ no coordinating group, but individual little projects. How they were established, I don't know. But whatever they were, they submitted their information *directly* to the Denver Office, and presumably the planning people in the Denver Office, notably Debler or Randy Ryder, or whatever group there was, they were the ones that decided whether or not the study should be made and what should be submitted [to the design branches]. I remember Gordon Johnson was the liaison between

the planning people and the design people. So he was the one that generally brought this [data] in to us. So I don't know exactly how big a planning organization – there probably wasn't very much of a planning organization. And Gordon Johnson was operating *after* the Regions were established. The regions were doing the planning then. But pre-World War II, the planning was done either directly, individually in the little project offices, or coordinated in the Denver Office. And there wasn't a big staff, I know, because Debler and Ryder were practically the only ones that I can remember.

After World War II Planning and a Lot of Other Work Migrated to the Regions

So after the war, then the regions got started and a lot of the work was taken away from the Denver Office. All of the planning, all of the political maneuvering, all the dealings with the Commissioner – the Denver Office wasn't involved in that until it got to the point where there was an active project, in which case designs had to be done. *But*, we were the service people with this kind of work here, that had to furnish the information to the planning people before they could determine cost-benefits and things of that kind. So it's a question of how things evolved as time went on. But way back in the early 30s, especially on the WPA and PWA [work], we were [expected] ~~excited~~ to get out some designs, because it was Work Progress Administration and then PWA was Public Works Administration, and the Bureau wasn't the only one that was doing that. They established the Soil Conservation Service, and the Corps of Engineers was involved in that, and the CCC got mixed up in it. And they came to us and

then we gave them assistance of various kinds, up to the question of actively getting out specifications for these various jobs.

But this is not something that we had much to do with. The planning, unfortunately, we didn't get involved in that, and we *should* have, because there were many many jobs that if we were the planners as well as the designers, it would never have turned out [the same] ~~that~~ way. But things became more and more and more fragmented, as far as assignments were concerned. But *design* was our responsibility. They wanted a preliminary design, they furnished us what information there was, and then we sat down and worked something out for them. So I guess I told you that *after* the war, when we started documenting these things, it was a good thing – otherwise, [much information] ~~everything~~ would have been lost. There were 600 and some different projects that we worked on, preliminary or . . . .

Storey: Yeah, I think you let me copy that list of projects that were studied.

Hoffman: You've still got that?

Storey: Well, I gave it back to you, but I have a copy.

Hoffman: So, but that shows the kinds of activities that we were doing. And all I can tell you is what *we* did. Unfortunately, maybe I was a little nosey and tried to find out what was going on with the Bureau, but we had enough to keep us busy too, so we didn't know all of the workings of the Bureau, especially as things started to develop.

The Boulder Canyon Construction People Rose in the Organization and the Designers Did Not

You know, the Boulder Canyon people, after Boulder Canyon was through, they started getting involved in all sorts of activities that were more than just construction, like [Wilbur] Dexheimer and [John C.] Page [went into the Washington, D.C., office] and some of the rest of them – [Grant] Bloodgood and all – they became the big shots [in the Denver Office], you see, and they sort of *took over*, and our people, I guess they didn't fight for what they probably should have been entitled to. People like Nalder, he was never a fighter. McClellan was not very aggressive, so whatever Harold Arthur is telling you about the politics that went on and all, we lost out on everything – the designers did – we didn't come out on top [in] ~~on~~ that [respect].

Storey: Hm. Were there any other people here that you ought to talk about in the 1932 Denver Office picture?

Hoffman: Well, if you were to pick out somebody. There's nobody outstanding.

Storey: In that picture, who was the best, most creative designer – in *any* field.

Hoffman: Well, we have to give credit to Savage. Savage is the one, he directed the activities of design, so you give him credit. And the people, his subordinates that were in the various sections and some of the branches.

Storey: Somebody at a drafting table – who was the most creative person?

Hoffman: It's hard to tell, it depended on the problem. I thought that I was always kind of a creative individual. I don't know that I take a lot of credit. But it was the people that were in the lower ranks, like here, Davis Dam. I take credit for that. McConaughy, I'll give him [credit] with me – both of us, we were the creative individuals, the two of us.

Storey: Tell me again how.

Hoffman: The concept, the layout, the whole thing.

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Storey: You were saying that you and McConaughy had suggested the layout for Davis.

Developing the Design for Davis Dam

Hoffman: Well, that was our responsibility, see. The concept was predetermined for us, we had Hoover Dam in which releases were intermittent, and we had to reregulate the discharges from the turbines, because the turbines weren't steady flow, they were off and on and all. So there was a [need for a] reregulating reservoir. That concept was in the Boulder Canyon Act. Okay, so the concept was there, that we had to have a reservoir that would reregulate the flows from Hoover. Okay, they selected the dam site, Bull's Head dam site. All right, so this is what we started with. The [solution was the adoption of an] earth dam~~s~~, you couldn't put in a concrete dam there, because the foundations were very deep, and it was rather wide. So it was determined that it had to be an earth dam, or earth-and-rock-fill dam. All right, that concept was settled, so that gave the Earth Dams

Section their responsibility [for design]. Now the question is, What do we do about the releases from Hoover Dam? Hoover Dam initially started, Debler says that on Hoover Dam we had a flood of record of 143,000 cubic feet per second, or 243,000 or whatever it was. So I think that they decided that we would have a spillway capacity – I can't recall exactly – between 250,000 and 300,000 cubic feet per second.

Storey: At?

Erdman B. Debler Ultimately Determined We Had to Have Spillway Capability for 400,000 cfs at Hoover Dam

Hoffman: At Hoover Dam. Okay, so *this* is a [maximum] release that *could* happen at Hoover Dam. [But] at Hoover Dam, one way or another, Debler changed his mind. Finally decided that we have to have a spillway capacity of 400,000 cubic feet per second. So we designed it, and this is a potential release that can happen from Hoover Dam. So what do we do with a dam that's forty miles downstream? In that case we should have 400,000 cubic feet per second. Well, we said, "Well, it isn't possible that we've got to moderate that somehow, because there's reregulation in the reservoir storage which should be able to reduce and temper the maximum flows." So we decided there that we had to have a spillway capacity of around 200- or 250,000, I can't remember which, cubic feet per second. Okay, that was the concept. We had a notion that we had to design for that [size spillway]. Now, how are you going to [provide] ~~handle~~ that kind of a capacity spillway?

At Davis Dam You Had to Be Able to Keep Releases from Hoover Dam Away from the Dam Construction Site

The other [problem] ~~thing~~ was diversion. You put in an earth dam, you've got to unwater the foundation, you've got to excavate to good foundation and all. How are you going to handle the releases from Hoover Dam during all of this time? So you had to have a diversion capacity of large capacity, of large magnitude. Okay, you can't do it in the dam section or the river section itself. The only way that we could do that then would be to dig the channel, either a tunnel to handle that capacity, or instead of that, why not come in here and just dig a large channel around one of the abutments, and let that serve, then, [first] as a diversion channel, later on convert that to the entrance channel for the intakes to the powerplant and for the spillway and the outlet. So this concept was proposed, and I was the one of them that proposed it, and made a layout of it. Well, that became the adopted idea, you see. So it would have occurred to a lot of people, maybe, I'm sure that it might have occurred, but I was the one that sat down, and took the topographic map, and made the initial layout of it and said, "Okay, why not start with this?" And then, of course, when we did that, then they had to have an intake structure here, which is a concrete dam. We had to have a large spillway with these large gates, and we had to have outlets to satisfy certain demands, and so this became the scheme [proposed]. Well, McConaughy and me were the conceivers, you see. So give us both credit for it, because if I got the idea and then drew it up, he had to approve it. And he came to me and said, "Let's do it this way," and *I* drew it up – we're working together, we're a team, see. (Storey: Yeah.) All right, we had subordinates . . . . I don't know whether

at that particular instance I was at the drafting board where I was doing line-by-line-by-line, or whether I had subordinates that I told, "Sketch this out this way or that way." But this little group of ours was the one . . . . And the thing that made it possible was the fact that this was a rock-filled dam. So we went to the earth-filled dams people and we suggested to them, "Why not take this rock that we take out of this channel, use it in the dam." Well, it can't be done until after we've excavated this, so conceived the idea that they would take this material, take it over the bridge and stockpile it over on the other side, downstream from the dam. This would be their *borrow* then, when they built the dam. But in the meantime, you had to excavate this (Storey: The channel.) and carry across the trestles, and make a stockpile there. Well, we got the agreement between the Earth Dams people and us that this is the way they would proceed and this is the way we'd write the specification then.

So [that is how] these things evolve, but it comes from some embryonic idea, and then it grows and grows and grows until you have a concept. And then you work on the details of it, and then that becomes it. So I guess every job you do has to start somewhere, comes from a concept. (Storey: Right.) So we were *more* than just engineers that sat down and designed beams and reinforcements and such. We had a lot of different aspects that we had to consider.

Did Model Tests of Most Designs

Most every job we did, we had the opportunity to have a model test made of [the design] ~~it~~ – whether

we should have spent all that money for model testing – but the laboratory was there, and we had the advantage [of being able to use it to test our designs]. Now most private organizations would not have had these facilities, and would not probably have come up with the same *thoroughness* of study that we did. But we had the opportunity because it was there. If we wanted to know something about soils, we wanted to know about the foundation, we wanted to know about models, hydraulic functioning, and all, we had facilities between different groups to be able to resolve all of those things.

"Somehow or other, the money became available, whether we overspent or whether we underspent, or whether we had the money or didn't have the money, somehow or [other] ~~else~~ it worked out. . . ."

And you talk about private organizations, they are always held to a budget. We didn't seem to have that problem at all. Somehow or other, the money became available, whether we overspent or whether we underspent, or whether we had the money or didn't have the money, somehow or [other] ~~else~~ it worked out. But these problems didn't concern us, you see. We had a job number, and so we charged [against] the job number. Never once, I don't think, did anybody ever come back at us and say, "Hey, you're over-using the budget."

Storey: Were you involved in the design of Auburn Dam at all?

Hoffman: No, Auburn Dam was the Concrete Dams Section, because it started out as a concrete dam [concept] and then went to an earth dam, and somehow . . . . But you see, if it was a concrete dam, they had the

[design] responsibility for everything – the hydraulic design as well as . . . .[22]

Storey: But there was quite a discussion, as I understand it, about whether or not it should be a concrete dam or an earth dam. Were you involved in that discussion?

Hoffman: No, because that was later on, so *I* wasn't involved.

Storey: Oh, so you had left by then.

Hoffman: Yes, I think I might have left [already]. It's something that was in the mill for years and years and years. I don't know if we, during the time that I was there, that it was being mulled over or just what. But that was a responsibility of the Concrete Dams Section, somehow or [other] ~~else~~. That's the way it was decided, that the hydraulics as well as the structural [design] for a concrete dam, even though the spillway might not have been integrally a *part* of the dam, like for instance on Glen Canyon, or on Yellowtail, or on Hungry Horse – that was an assignment that was given entirely to Concrete Dams Section.

Storey: What else should we talk about? What have I missed?

22. Note that Harold Arthur, an earth dam designer during his early career at Reclamation, stated in his oral history interviews that during design of Auburn Dam there was competition between the earth dam and concrete dam concepts. As Chief Engineer and Director, Office of Design and Construction, he decided on a concrete dam because building an earth dam would have required stripping materials from the surrounding area to an unacceptable degree. The dam has never been built

Hoffman: I don't know, you're the coordinator here. I've rambled on and on and on.

Storey: And you've given me a *lot* of good information. Let me ask you again if it's all right for researchers inside and outside Reclamation to use these tapes and the resulting transcripts for research.

Hoffman: I don't think I've gotten myself into any trouble or anybody else, so I don't see what harm it would . . . .

Storey: Good, I appreciate it. Thank you.

END OF SIDE 2, TAPE 2. MARCH 17, 1995. END OF INTERVIEWS.

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PROFESSIONAL HISTORY

More than 35 years experience with the Design Division of the U. S. Bureau of Reclamation, engaged principally in hydraulic and structural design of appurtenances for dams. Over 15 years as assistant Section Head of the Spillways and Outlet Works Section of the Bureau's Dams Branch, having the responsibility for directing technical design and layout, establishing standards, and devising technical procedures and guidelines. Scope of work involved planning and design of many of the Bureau's major projects constructed throughout the Western U. S.

From 1961 through 1965, while with the Bureau, served on special advisory missions related to dam design on projects outside the U. S. For 2 months in 1961 was the design engineer member of a team of 3 specialists sent to Southeast Asia by the USAID to inventory and evaluate engineering data being assembled for a study of potential water resource developments on the Mekong River in Laos, Thailand, Cambodia and Vietnam. In 1963 spent 2 months in India consulting with the Government of India Central Water and Power Commission on design problems for their Beas and Ramganga Dams in Northwest India. In 1964, advised the Taiwan Provincial Water Conservancy Bureau on design for their Tsengwen Dam. For 3 months in 1963, one month in 1964, and during all of 1965 served as Chief Designing Engineer member of a U. S. Bureau of Reclamation Water Resources Planning Team advising, studying, and reporting on potential water resource projects for the major stream basins in the Philippines. Directed and supervised Philippine Department of Public Works engineers in storage dam, hydroelectric powerplant, diversion works, irrigation systems and related hydraulic structure design and estimate preparations. Since 1965 have consulted and advised on special water resource design problems for the World Bank and for various consulting firms.

Through the many years while with the U. S. Bureau of Reclamation, was able to follow dam design techniques from their inception to the modern-day technology, and have participated and shared in the developments of many of the concepts and procedures which are now accepted standards in present-day design practices. Have authored or co-authored papers and reports for the Bureau of Reclamation at various times, including articles in "Civil Engineering" on Davis Dam and Trinity Dam. Have contributed papers to the 1951 and 1958 conferences of the International Commission on Large Dams.

Co-authored the widely accepted Bureau of Reclamation book, "Design of Small Dams", contributing chapters on the design of spillways, outlet works, and on hydraulic and structural design procedures and computations.

Am a contributing author on spillways and outlet works designs in Van Nostrand Reinhold's "Handbook of Dam Engineering", edited by A. R. Golze.

Education: B. S. in Civil and Irrigation Engineering, Colorado State University, 1930.

Professional: Registered Professional Engineer, State of Colorado.
Fellow, American Society of Civil Engineers.
Member, U. S. Committee on Large Dams.

Honors: Distinguished Service Citation, by the Secretary of the Interior, 1966, in recognition of eminent service with the Bureau of Reclamation.

Carl J. Hoffman- Civil Engineer

DETAILED EXPERIENCE RESUME

Jan. 1966, to date.

Civil Engineer consultant on water resource problems. (See below for partial list of major consulting assignments.)

January, 1965, to January, 1966- Division of Foreign Activities, U. S. Bureau of Reclamation, Washington, D. C.

As Chief Designing Engineer member of a U. S. Bureau of Reclamation Water Resources Survey Team loaned to USAID to study multipurpose water resource development possibilities in the Philippines, was responsible for planning, directing and supervising the preparation of designs and estimates for storage dams, diversion dams, irrigation distribution systems, and hydroelectric installations on major rivers in the Central Luzon area. Studies involved feasibility and reconnaisance designs of 15 major storage dams, to be included in survey reports discussing potential plans for harnessing the rivers for multipurpose irrigation, hydropower, and flood control and related uses. Reviewed and/or prepared portions of the reports dealing with the engineering aspects of the potential developments. Rendered technical assistance and consultations to Filipino supporting engineers on problems dealing with plan formulation and project development.

July, 1948, to December, 1964- Office of Chief Engineer, U. S. Bureau of Reclamation, Denver, Colorado.

As assistant Section Head of the Spillways and Outlet Works Section of the Dams Branch, Design Division, shared with the Section Head the administrative and technical responsibilities associated with planning and design of structures appurtenant to storage dams and hydroelectric installations. Had responsibility for initiating, planning, organizing, coordinating , and directing technical design and layout of spillways, outlet works, powerplant intakes and penstock systems, diversion dams, irrigation works, etc. Assisted in formulating design procedures, establishing policies and standards, and devising technical methods and guidelines. Served at various times as advisor to missions or as consultant on engineering design in Thailand, India, Taiwan, and the Philippines (See below for list of assignments).

In 1963 and 1964, assisted USBR Regional Planning Office in the preparation of designs and cost estimates for a reconnaisance study for the development of the Upper Missouri River reach between Fort Peck Reservoir and Great Falls for hydroelectric power, conservation, and flood control storage.

August, 1930, to July, 1948- Office of Chief Engineer, U. S. Bureau of Reclamation, Denver, Colorado.

Designer of spillways and outlet works for dams. Duties included technical design for reconnaisance, feasibility, specification and construction requirements, including hydraulic and structural computations and detailing. Progressive advancement from computer, detailer, checker, supervisor and group head.

Carl J. Hoffman- Civil Engineer

Major consulting assignments:

Oct.-Dec., 1961	Was the Design Engineer member of a three-man USBR team of specialists sent to Southeast Asia by USAID to inventory and evaluate engineering data being assembled for a study of potential water resource developments on the Mekong River in Thailand, Laos, Cambodia and Vietnam. Reported on the study program needed for preparation of a feasibility report of the irrigation, flood control, and hydroelectric potentials of the Pamong Project in Thailand.
Jan.-Mar., 1963	Spent two months in India consulting with the Government of India Central Water and Power Commission and with engineering staffs of the States of Punjab and Utter Pradesh Engineering organizations on design problems for their Beas and Ramganga Dams, and on the Balimela Dam Project in the State of Orissa.
Oct., 1963-Jan., 1964, and July,1964	Spent time in the Philippines as advisor to a USBR team on design aspects for a water resource study on principal river basins in the Philippines.
Jan., 1964	Spent one week on Palau Islands, Trust Territory of the Pacific, advising the Commissioner on engineering problems in connection with a water supply storage dam rehabilitation for Koror Island.
August, 1964	Spent one week in Taiwan advising the Provincial Water Conservancy Bureau on design matters for their Tsengwen Dam Project.
1966-1967	Consulting for Louis Berger, Inc., on water resource structure designs. Advised on and prepared dam designs for feasibility reports for projects in Pennsylvania and Utah. Prepared feasibility designs and estimates for a large pumping plant which would pump water from the Ganges River to a planned irrigation project in East Pakistan.
Jan.-Feb., 1968	Prepared a reconnaisance report for Ralph M. Parsons Co. for a water supply project for the Cam Ranh Bay area in Vietnam. Study involved reservoir selection, damsite evaluation, and dam design and estimate preparation.
Feb.-April, 1968	Consultant on mission for World Bank, appraising and evaluating conditions of existing irrigation systems in Indonesia.
May, 1968	Consulting for the Shoshone Irrigation District, Wyo,,. on tunnel rehabilitation and on buried pipe replacement for their lateral distribution system.
Sept.- Nov., 1968	Consultant on mission for World Bank, appraising and evaluating feasibility designs of Philippine Upper Pampanga Project, including design of dams powerplants, diversion structures, etc.;and of the irrigation distribution system.
May, 1969	Consulting for Ralph M. Parsons Co. on feasibility designs of storage dams for Vietnam Cam Ranh Bay water supply project.

Carl J. Hoffman- Civil Engineer

Major consulting assignments (Cont'd):

Nov.-Dec., 1969	Consulting on mission for World Bank, appraising and evaluating feasibility studies of a proposed water resource development in Southwest Korea.
Feb., 1970	Consulting for Louis Berger, Inc. on designs for a diversion dam on the Jiroft Project in Iran.
March, 1970	Consulting for Louis Berger-Harza on a study to identify and evaluate potential multipurpose water resource projects in central and northern Guatamala.
Apr- June, 1970	Consulting on mission for World Bank, appraising and evaluating feasibility studies of the multipurpose Buyuk-Menderes Project in Western Turkey.
June- July, 1970	Consulting for Louis Berger, Inc., on designs for a diversion dam at the Jiroft Project, Iran.
Aug.- Sept., 1970	Consulting assignment in Brazil for Hidroterra, S. A. on dam design and tunnel problems, for projects being constructed by the Brazilian Department of Sanitation.
Jan., 1971	Consulting on mission for World Bank, appraising and evaluating studies of basinwide system analyses of water resource developments in Southwest Korea.
Feb.- March, 1971	Consulting for Louis Berger, Inc., on flood control problems connected with a land and community development adjacent to the Chillon River, Lima, Peru.
Mar.- June, 1971	Member of an Agriculture Sector review mission for the World Bank, identifying and assessing current and potential irrigation project developments throughout Nigeria.
Feb.- Mar., 1972	Consulting for Louis Berger, Inc., on potential storage project development on Chillon River near Lima, Peru for flood control, water supply, irrigation and other beneficial uses.
Jan.- Apr., 1972	Consulting for Hidroterra, Rio de Janeiro, Brazil, on domestic water supply project development for City of Fortaleza.
June- July, 1972	Consulting and advising for Louis Berger, Inc., on feasibility study for proposed Corps of Engineers water resource multipurpose project on Pochuck Creek, Wallkill River, New Jersey.
Mar.- April 1973	Sub-contract consulting assignment to Ralph M. Parsons Co., reporting on condition and suggested restoration of 15 damaged diversion dams on various Govt. of Philippines Irrigation Projects, Central Plains area of Luzon, P. I.

Carl J. Hoffman- Civil Engineer

Major consulting assignments (Cont'd):

May- June 1973	Consulting for Louis Berger, Inc., on preparation of feasibility designs for a multipurpose storage reservoir, hydropower plant and irrigation project development on the Jaguaron River, Brazil-Uruguay.
Mar.- Apr., 1974	Continuation of above. Following systems study for formulating optimum project plan, consulted and advised on feasibility designs for a major storage dam for hydro-electric and irrigation development and for a large diversion dam and irrigation distribution system.
May, 1974	Prepared a report for the Rocky Ford Irrigation Co. of Minersville, Utah, on rehabilitation and enlargement needs for their existing spillway at Rocky Ford Dam near Beaver, Utah. Report included flood hydrology studies and structural and cost considerations for the enlargement of the spillway and increasing the height of the dam.
April- July 1975	Consulting for Ing. Jesus A. Gomez Eng. Co., Caracas, Venezuela, on water supply storage project in Northern Venezuela. Consultation included layout selection and design of a 100 m high storage dam and appurtenances and a 11 km transbasin conveyance tunnel.
Jan. 1976	Consulting for Hidroterra Engineers, Rio de Janeiro, Brazil, on design of 50 m. high Brumada Dam near Salvador, Brazil.
Feb.-July, 1976	Consulting for Caura Engineers, Caracas, Venezuela, on design of 70 m. high Chichirivichi Watre Supply Dam near Caracas.
July - Oct. 1977	Consulting for Caura Engineers, Caracas, on design of 50 m. high Los Algorrobes Dam in Northeastern Venezuela.
June, 1978	Consulting for Hidroterra Engineers, Rio de Janeiro, on Pacoti Dam spillway design and constructionproblems, near Fortaleza, Brazil.
July - Aug., 1978	Consulting for Louis Berger & Associates, E. Orange, N. J., on Safety of Dams inspections, for installations in New Jersey.
Sept, 1978- Nov., 1979	Consulting for Louis Berger & Associates, Wellesley, Mass., on Safety of Dams inspections, for installations in Rhode Island and Connecticut.
Dec. 1979	Consulting for Consulbaires, Buenos Aires, Argentina, on feasibility designs for Collon Cura Dam and hydroelectric development in western Argentina.
Feb.-Mar., 1980	Consulting for Caura Engineers, Caracas, Venezuela, identifying an evaluating various damsites on the Suapure River (a tributary of the Orinoco River) for compiling an inventory of Hydro-power potentials in that region.
April -Oct. 1980	Lewis Berger & Associates, Wellesley, Mass., on Safety of Dam inspections for installations in Massachusetts.

Carl J. Hoffman- Civil Engineer

Major consulting assignments (Cont'd):

March, 1981	Consulting for Caura Engineers, Caracas, Venezuela, on potential hydropower developments on the Aro River, a tributary of the Orinoco.
March- Aug. 1981 on Acu Dam	Consulting for Hidroterra Engineers, Rio de Janeiro, on Acu Dam in Northeast Brazil; and on the design of flood control storage dams and related river improvement works in Santa Catarina State, in Southeast Brazil.
October, 1982	Consulting for Louis Berger & Assoc., Wellesley, Mass., on safety of Dams inspections for the National Park Service, on dams in New York and Maine.
Jan. 1983 to Mar. 1984	Consulting for Hidroterra Engineers, Rio de Janeiro, Brazil, on a major transbasin water diversion project in Northeastern Brazil, for transporting 300 m^3/s of San Francisco River water over a 250 m divide to areas of Northeast States. Project will involve 5 major storage reservoirs, over 100 km of conveyance canals, and 4 large canals, and 4 large pumping plants.
May- June, 1983	Consulting for Hidroterra Engineers, Rio de Janeiro, on Flores Dam in Northeast Brazil.
Jan. -Feb. 1984	Consulting for Construtora Norberto Odebrecht, Rio de Janeiro, Brazil on design and construction concepts in regard to their bid proposals for the Urra Dams Project, Colombia, South America.
June-July, 1984	Consulting for Construtora Norberto Odebrecht, Rio de Janeiro, Brazil on design and construction concepts in regard to their bid proposal for the Piedra del Aguila Dam Project, Argentina, South America.
Jan. 1982 to present	Consulting for Woodward Clyde Consultants, Denver, on hydrology and hydraulic design problems on various projects in Western U.S.

WILLIAM I. GARDNER
GEOLOGIST

[redacted]

[redacted]
Moraga, California 945[illegible]
(415) 37[illegible]-5325

Biographical data, Dr. William I. Gardner

Nationality--U.S.A. Born, Oct. 2, 1903, Napa, Calif. Married

Education -- B.S. 1927 - University of California, Berkeley
College of Mining (Engineering and Geology)

Ph.D. 1935 -University of Minnesota, Minneapolis
Major in Geology

Professional experience

U.S. Bureau of Reclamation: engaged in water and land development projects; plan, design, construct and operate irrigation and power projects. 1936-1969.

Chief Geologist, Denver, Colo., Nov. 1963 to Feb. 28, 1969 (retired); as technical head of the Bureau's geological activities; planned, organized and directed the geological work to locate the sites and provide data to design and construct major civil engineering works including dams, tunnels, power-plants, bridges, canals and other major structures, to locate construction materials and determine suitability of reservoir sites; studies ground-water conditions pertinent to the project and acted as consultant on special problems in the Bureau or for other agencies.

Regional Geologist, Bureau of Reclamation, Sacramento, California, January 1942 to November 1963. In charge of all geological work including ground-water studies in most of California and part of Oregon and Nevada, also directed studies as required in the Blue Nile basin of Ethiopia: Central Luzon, Philippine Islands; and Alaska.

Project Geologist, Central Valley Project, Bureau of Reclamation, Redding, California, September, 1936 to January, 1942. In charge of engineering geology work related to construction of Shasta, Friant and Keswick dams, major canals and the relocation of 32 miles of main-line railroad with tunnels and bridges in mountainous country, locate construction materials, examine and appraise mineral deposits.

WILLIAM I. GARDNER
GEOLOGIST

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Consultant to U.S. engineering firms at various times from 1949 to 1957.
This was mainly in the field of ground-water studies and consisted of reconnaissance to select areas having a ground-water potential, outline the investigations and prepare exploration-development programs in Taiwan, Iraq, India and Iran, periodically review the findings and advise on the future programs. Engineering geology problems at dams, tunnels and underground power-plant were also studied and advice rendered.

Professional Experience
- Standard Oil Company of California, 1928-1931; assistant geologist.
- Walker Mining Company, California, Feb. 1926-August 1926; junior mining engineer.

Professional Societies

Fellow and Associate Editor, Geological Society of America.

Member and past-president -- Association of Engineering Geologists.

Member--U.S. National Committee, International Commission on Large Dams.

Member--U.S. National Committee, International Commission on Irrigation and Drainage.

Licensed professional engineer, Colorado

Resume - While Chief Geologist, U. S. Bureau of Reclamation, Dr. Gardner was responsible for engineering geological work throughout the Bureau, in the planning, design and construction of water development projects. Previously he had been in charge of the geological studies on the Central Valley and other projects that involved many major engineering works such as Shasta, Trinity, San Luis and Monticello dams, power plants, canals and many tunnels. Ground-water studies were

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an important responsibility to determine the potential supply, means of development and effect on drainage under project (irrigation) conditions. In addition to the Bureau's projects in this country he also directed or made studies for the Pa Mong Project, Mekong R., Thailand-Laos; the Mun, Chi and other projects in Thailand; projects in the Central Luzon Basin, Philippine Islands; dam sites in Northern Nigeria; suitability of reservoir sites in limestone terrain South Han R. Basin, Korea; and potential projects in the Blue Nile Basin, Ethiopia. He was a member of the Ad Hoc Committee (1966-1968) to advise the Secretary of the Interior on geologic-seismic factors at nuclear reactor sites.

The engineering geology studies he supervised included geologic mapping, core or other type of drilling, exploration tunnels and shafts, geophysical surveys and, in co-ordination with design engineers, the formulation of programs of laboratory or in situ testing (such as by rock mechanics techniques). Geologic data were analyzed, interpreted and conclusions drawn for use in planning, design and construction of many major engineering projects.

As a company consultant, Dr. Gardner made the initial field studies and formulated investigations for the exploration and development of ground-water basins. These operations included or resulted in constructing several hundred water wells in Taiwan (Formosa), Iraq, and India. He also advised on engineering geology problems at sites for dams, tunnels and an underground power plant.

EXPERIENCE SUMMARY FOR HAROLD P. GROUT

Address: 11025 Linda Vista Drive, Lakewood, Colorado 80215

Date of Birth: April 2, 1910

Position: Supervisory Hydraulic Engineer (Hydrologic Investigations, GS-14)

Title: Head, Flood Hydrology Section, Bureau of Reclamation

Education: Graduated from Colorado School of Mines in 1934 with an E.M. degree

Experience:

December 1945 to ~~present~~ July 1, 1972: Bureau of Reclamation, Denver, Colorado. Head of the Flood Hydrology Section from May 1952 to date. Supervise work performed by engineers and meteorologists of a lower grade engaged in preparing inflow design flood studies and design storm studies and reviewing inflow design flood studies prepared in regional and field offices. These studies include frequency studies for diversion dams and cross drainage. Reevaluates adequacy of spillway capacities for the Safety of Dams Program for old structures built by the Bureau of Reclamation. Establishes standards and procedures to be followed by all Bureau offices in preparing flood hydrology studies; consults with regional hydrologists on flood hydrology matters, layout procedures to be used for particular flood hydrology questions in the field, and makes frequent field trips to establish criteria to be used in the field for developing inflow design flood studies for the particular area under study.

Made several trips to Puerto Rico from 1971 back to 1966 to assist the Puerto Rico Water Resources Authority in evaluating the adequacy of spillways for 23 existing dams that were built by the Puerto Rico Water Resources Authority. Collected hydrologic data on and supervised the preparation of inflow design flood studies for Toa Vaca Dam, which is currently under construction. Made a frequency evaluation of a large flood in September 1970 which overtopped Toa Vaca Dam while under construction.

October-November 1969. Detailed to the Project Engineer's office in Bangkok, Thailand, to obtain sufficient data required on flood damages to make flood control benefit studies for the Mun Project and the Chi Project. Supervised the flood control benefit studies that were subsequently prepared in the Denver office for these two projects.

In November 1967 was detailed to the Bureau of Reclamation's Project Engineer's office in Manila, Philippines, to make aerial inspections of the Balog-Balog and Balintingon drainage areas, observing runoff characteristics, slopes and vegetive cover. Discussed procedure to follow in preparation of inflow design floods with Bureau and Philippine engineers for these two damsites.

In October 1967 was detailed to the Bureau of Reclamation's Project Engineer's office in Bangkok, Thailand, and gathered hydrologic data not available in the Denver office and observed runoff characteristics, soils, slopes, and cover of the watershed of the Mekong River at the Pa Mong damsite. Later supervised the preparation of the Pa Mong inflow design flood study in Denver.

In July 1966 was sent to Recife, Brazil, at the request of the State Department as a member of a 3-man team to investigate a flood on the Rio Capibaribe that passed through the City of Recife. Made recommendations as to steps necessary to reduce or minimize damage from future floods. Co-author with Mr. Harold T. Nelson, former Regional Director, Bureau of Reclamation, Boise, Idaho, of a publication entitled "Flood Control Advisory Appraisal, June 1966 Flooding in Capibaribe River Basin, Recife, Brazil."

In March and April 1966 was detailed to the Bureau of Reclamation's Land and Water Resources Development Program, Brazil Project No. 1, Rio de Janeiro, to determine flood hydrology requirements for several damsites in connection with the Rio Sao Francisco report. Gathered hydrologic data not available in the United States. Observed runoff characteristics, soils, slopes, and cover of the Rio Sao Francisco watershed and later supervised in Denver, Colorado, the preparation of four inflow design flood studies for the Rio Sao Francisco and tributaries.

Served as an officer in the Corps of Engineers during World War II, from May 1941 to January 1946. From 1942 through 1946 was Executive Officer of the Engineer Section Headquarters, XVII Airborne Corps. Entered on active duty in May 1941 as a Captain. Promoted to a Major in September 1942, Lt. Colonel October 1943, Colonel September 1945. Participated in the Army Reserve from 1946 to May 1963 as Commanding Officer of the 5002 Research and Development Unit, responsible for the preparation of a climatological data summary for Asia and Australia, which was later put on IBM punch cards by the Quartermaster Research Center in Natick, Massachusetts.

April 1938 to May 1941. Hydrologist with the Colorado Water Conservation Board. This work included numerous water supply studies and consumptive use studies within the State of Colorado; making streamflow measurements and recording gage height records in special study areas.

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April 1935 to April 1938, Denver Municipal Water Board. Member of a survey team in connection with the Moffat Tunnel Water Diversion Project. Also worked in a soils laboratory, testing soils for Ralston Creek Dam.

Registered Professional Engineer No. 1380 in the State of Colorado.
Member of U. S. Committee on Large Dams.

CONSULTING WORK SINCE JULY, 1972

Comision Federal de Electricedad- Mexico City.
Consulted on flood hydrology for Angostura and Checoasen Dams, both on the Giljava River Basin, Mexico.

Bechtel Engineering Co.- San Francisco, Calif.
Prepared flood hydrology studies in connection with American Falls Dam in Idaho and Upper Klamath Dam in Oregon.

Mc Call, Ellington and Morriel, Inc., Denver, Colorado.
Prepared flood hydrology studies for Georgetown, Hat Creek, Happy Valley, Loveland and Lagerman Dams, all in Colorado.

Paul Van Sickle and Associates, Denver, Colorado.
Prepared flood hydrology studies for Meadows, Buck Creek, and Sweetwater Dams, all in Colorado.

Green Construction Co., Des Moins, Iowa.
Prepared a flood hydrology study for the Niger River Basin, for a proposed Dam near Namy, Niger, West Africa.

U. S. Bureau of Reclamation, Denver, Colorado.
Consultant on flood hydrology in connection with a report on water resource development on the Senegal River in Northwest Africa.

BIOGRAPHICAL INFORMATION
Jack W. Hilf
Chief, Division of Design
January 27, 1975

EDUCATION

Bachelor of Science (Biology and Chemistry), College of the City of New York, 1931

Bachelor of Civil Engineering, New York University, 1940

Graduate work in Soil Mechanics, Harvard University, 1943

Master of Science in Civil Engineering, University of Colorado, 1948

Ph.D., University of Colorado, 1956. Thesis: "An Investigation of Pore-Water Pressure in Compacted Cohesive Soils"

TECHNICAL EXPERIENCE

Junior Engineer, Corps of Engineers, Cincinnati, Ohio, March-September 1941

Junior Engineer, Board of Water Supply of New York, Kerhonkson, New York, September 1941-August 1942

Active Duty, U.S. Army, September 1942-May 1946
Engineer Officer, March 1943-May 1946

Civil Engineer, Bureau of Reclamation, Dams Branch, Division of Design, Denver, Colorado May 1946-April 1962 (GS-9 to 13)
Highest position: Supervisor, Soil Problems Unit, Earth Dams Section

Supervisory General Engineer, GS-14, Chief, Office of Engineering Reference, April 1962-May 1964; GS-15, effective May 1964-February 1965

Physical Scientist (Water Research), GS-16, Office of Water Resources Research, Office of the Secretary of the Interior, Washington, D.C., February 1965-August 1966

Supervisory General Engineer, GS-15, Assistant Chief Designing Engineer - Civil and Structural, Bureau of Reclamation, Division of Design, Denver, Colorado August 1966-September 1968

Supervisory General Engineer, GS-16, Chief Designing Engineer, Division of Design, Bureau of Reclamation, Denver, Colorado September 1968-to present (Title change to Chief, Division of Design, September 1970)

Duties: Responsibility for designs for all Bureau of Reclamation facilities in the 17 Western States which include earth dams,

concrete dams, powerplants, pumping plants, canals, pipelines, bridges, buildings, and electrical transmission facilities, most of which are unique in size and complexity. This involves preparation of designs and quantity estimates for feasibility studies and for invitations to bid, and detailed construction drawings for about $300 million construction annually. Activities concern structural, civil, electrical, mechanical, and geological work, involving both line and staff functions. Total staff reporting to the Chief, Division of Design, is 452.

TECHNICAL SOCIETY AFFILIATIONS

Registered Professional Engineer, State of Colorado

Fellow, American Society of Civil Engineers

Member, United States National Committee for the International Society of Soil Mechanics and Foundation Engineering

Member, U. S. Committee on Large Dams of the International Commission on Large Dams

Member, International Committee on Irrigation, Drainage, and Flood Control

Member, the Society of Sigma XI (National Honorary Research Society)

Member, Society of American Military Engineers

Member, Association of the United States Army

Member, International Society for Rock Mechanics

Chapter Honor Member, Chi Epsilon

PROFESSIONAL SOCIETY - COMMITTEE MEMBERSHIPS

Member, Task Committee on the Products of Weathering of Bedrocks and their Engineering Properties; Committee on Engineering Geology, SMFD, ASCE, 1953-57

Member, Task Committee on Design in Relation to Project Design, Committee on Earth Dams, SMFD, ASCE, 1952-62

Secretary, Task Committee on Shear Strength of Soils, SMFD, ASCE, 1958-62

Member, Review Panel, Committee on Publications, SMFD, ASCE, 1965-

Recorder of Panel No. 1, "Fundamental Research in the Static and Dynamic Behavior of Soils," Symposium on Basic Research in Civil Engineering Fields Related to Water Resources, Colorado State University, Fort Collins, Colorado, June 1961

Member, Committee on Earth and Rockfill Dams, SMFD, ASCE, 1962-

Chairman, Task Committee on Information Retrieval, SMFD, ASCE, 1962-

Chairman, Publications Committee (and Editor of USCOLD NEWSLETTER), United States Committee on Large Dams, 1962-65

Member, Engineering Terminology Study Committee, Engineers Joint Council, 1963-1965

Member, Committee on Nomenclature, American Concrete Institute, 1963-1966

Member, Advisory Committee for National Cooperative Highway Research Program, Highway Research Information Project, Highway Research Board, 1964-

Member, Executive Committee, Soil Mechanics and Foundations Division, (SMFD) (name changed to Geotechnical Engineering Division in 1973) ASCE, 1967- (Chairman, 1971) (Contact Member, Management Group E, 1973-74)

Chairman, Management Group E, ASCE, 1974-75

Member, Embankment Dams and Slopes, SMFD, ASCE, 1962-1974

Member, Committee on Computer Applications, SMFD, ASCE, 1968-1972

Member, Engineering Foundation Research Steering Committee for Conference on Control of Quality in Construction, May 1970

Member, Survey Committee, Construction Division, ASCE, 1970-

Member, Technical Activities Committee, Program Coordinating Committee, ASCE, 1971-1974

Member, Technical Activities Committee, Management Group E, ASCE, 1972-

Chairman, Organizing Committee and Chairman, Economical Construction of Concrete Dams Conference, Engineering Foundation, Asilomar, California, May 1972

Member, Executive Committee, United States Committee on Large Dams, 1973-

Member, Ad Hoc Visiting Committee - Engineers' Council for Professional Development, ASCE, 1973-1978 (5-year term)

BUREAU COMMITTEES

Member, Denver Office Training Committee, Bureau of Reclamation, 1968-

Chairman, Denver Office Rotation Engineer Training Committee, Bureau of Reclamation, 1968-

Member, Honor Awards Subcommittee of the Incentive Awards Committee, Bureau of Reclamation, 1969-

Member, Task Force on Organizational Development, Bureau of Reclamation, 1972-

Member, Research Review Committee, USBR

UNIVERSITY LECTURES

Department of Civil Engineering, University of Colorado, 1958-59, 1960-61 (gave a graduate course in design and construction of earth dams)

University of California, Berkeley, California, 1957 and 1968

Colorado School of Mines, Golden, Colorado, 1959

University of Notre Dame, South Bend, Indiana, 1960

Michigan College of Mining and Technology, Houghton, Michigan, 1960

Michigan State University, East Lansing, Michigan, 1960

University of Michigan, Ann Arbour, Michigan, 1960

Tulane University, New Orleans, Louisiana, 1960

Georgia Technical Institute, Atlanta, Georgia,

Rose Polytechnic Institute, Terre Haute, Indiana, 1961

Purdue University, Lafayette, Indiana, 1961

University of Tennessee, Knoxville, Tennessee, 1961, 1962, 1963

Wayne State University, Detroit, Michigan, 1961

Cornell University, Ithaca, New York, 1962, 1964

University of Illinois, Champaign-Urbana, Illinois, 1969

Oklahoma State University, Stillwater, Oklahoma, 1971

University of Ceara, Brazil, 1958

PUBLICATIONS

Books:

Editor, Coordinator, amd major contributor to first regular edition, Earth Manual, Bureau of Reclamation, 1960

Major contributor to first edition of Design of Small Dams, Bureau of Reclamation, 1960

Chapter 7, Compacted Fill, Foundation Engineering Handbook, Van Nostrand Reinhold Company, New York, 1975, pp 244-304

Editor, Rapid Construction of Concrete Dams, Engineering Foundation Research Conference Proceedings 1970, ASCE

Editor, Economical Construction of Concrete Dams, Engineering Foundation Conference Proceedings 1972, ASCE

Editor, Terzaghi Lectures 1963-1972, ASCE

Technical Memorandum No. 654, U. S. Department of the Interior, Bureau of Reclamation, "An Investigation of Pore Water Pressure in Compacted Cohesive Soils," October 1956, Denver, Colorado

Engineering Monograph No. 26, "A Rapid Method of Construction Control for Embankments of Cohesive Soils," U.S. Department of the Interior, Bureau of Reclamation, Denver, Colorado, October 1959

Papers:

Estimating Construction Pore Pressures in Rolled Earth Dams, Proceedings, Second International Conference on Soil Mechanics and Foundation Engineering, Volume III, 1948, Rotterdam, The Netherlands

Pore Pressure and Construction Control, Part 2 of Implications of Pore Pressure in Design and Construction of Rolled Earth Dams, jointly with W. W. Daehn, Transactions, 4th Congress on Large Dams, Volume 1, New Delhi, India

Use of Materials from Structural Excavations, Paper 1207, Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Volume 83, No. SM2, April 1957

Compacting Earth Dams with Heavy Tamping Rollers, Paper 1205, Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Volume 83, No. SM2, April 1957

Utilization of Weathered Formation Materials for Trinity Dam Embankment, presented at the convention of the American Society of Civil Engineers, Buffalo, New York, June 1957

Triaxial Shear Tests Holding Effective Lateral Stress Constant, jointly with H. J. Gibbs, Proceedings, 4th International Conference on Soil Mechanics and Foundation Engineering, London, August 1957

A Rapid Method of Construction Control for Embankments of Cohesive Soil, presented at the Joint Meeting of American Society for Testing Materials Committee D-18 and Sociedad Mexicana de Mecanica de Suelos, Mexico City, December 1957, ASTM Special Technical Publication STP No. 232. Highway Research Board Bulletin No. 272, 1960, describes this method under the title, "The Hilf Method for Fine-Grained Soils"

Shear Strength of Cohesive Soils, jointly with H. J. Gibbs, W. G. Holtz, and F. C. Walker, Proceedings, Research Conference on Shear Strength of Cohesive Soils, ASCE, June 1960

Settlement of Soil Foundations due to Saturation, jointly with W. G. Holtz, 5th International Conference on Soil Mechanics and Foundation Engineering, Paris, France, 1961

Interdisciplinary Challenges in Applying Soil Mechanics to Bureau of Reclamation Projects, Soil Mechanics and Foundations Section of the American Society for Engineering Education Meeting, Air Force Academy, June 20, 1962

Matching of Descriptors in a Selective Dissemination System, presented at the 26th Annual Meeting, American Documentation Institute, Chicago, Illinois, October 1963

Author Indexing and Abstracting of Scientific Literature, a communication to UNESCO Working Party No. 2, "Automatic Documentation - Storage and Retrieval," Moscow, USSR, November 1963

Use of Synthetic Materials in Irrigation and Drainage by the Bureau of Reclamation, jointly with Howard J. Cohan, ICID, 8th Congress, Varna, Bulgaria, May 1972, R. 5, Question 28.1, 1972

Economic Factors in the Design and Construction of Concrete Dams, jointly with M. D. Copen, 11th ICOLD Congress, Madrid, Spain, June 1973

Discussions:

Classification and Identification of Soils, jointly with J. A. Haine, Transactions, ASCE, Vol 113, 1948

Strength Characteristics of Compacted Clays, jointly with H. J. Gibbs, Transactions, ASCE, Vol 120, 1955

Effect of Tire Pressures and Lift Thicknesses on Compaction of Soil with Rubber-tired Rollers, Conference Papers, ASTM-SMMS Joint Meeting, December 1957, Mexico City, ASTM STP No. 232, p 444, 1957

Investigation of a Volcanic Soil for the Construction of an Earth Dam, Conference Papers, ASTM-SMMS Joint Meeting, December 1957, Mexico City, ASTM STP No. 232, p 455, 1957

The Role of Effective Stress in the Behavior of Expansive Soils, First Annual Soil Mechanics Conference, April 1959, Colorado School of Mines Quarterly, Golden, Colorado, October 1959

Discussion "An Investigation of Moisture Changes and Soil Structure in Earth Dams," by M. S. Kotowicz and S. N. Kiek, Proceedings of the First Australia-New Zealand Conference on Geomechanics, Melbourne, August 1971, Vol 2, p 533, 1971

Book Review:

Stability and Performance of Slopes and Embankments, Civil Engineering March 1970

FOREIGN ASSIGNMENTS

Participated in a seminar on Design and Construction of Irrigation Works in Brazil under the auspices of ICA, June-July 1958

Official representative of U.S. Government in UNESCO Working Party No. 2, "Automatic Documentation - Storage and Retrieval" Moscow, USSR, November 1963

Official representative, Department of the Army, at 27th Congress of the Interallied Confederation of Reserve Officers (CIOR), Antwerp, Belgium, September 1964

Engineering advisor and consultant to International Bank for Reconstruction and Development in India, December 1965

Design consultant to Bureau of Reclamation Chief Advisor on Tsengwen Dam in connection with proposed multiple barrel tunnel spillway and embankment materials, Taipei, Taiwan, January 1968

Official representative of the U.S. Government to Executive Committee meeting of the International Society of Soil Mechanics and Foundations Engineering and to sessions of the 9th International Conference, Mexico City, August 1969

Official representative of the U.S. Government to Executive Committee meeting of the International Society of Soil Mechanics and Foundations Engineering and to sessions of the First Australia-New Zealand Conference on Geomechanics, Melbourne, August 1971

Engineering advisor and consultant for the Inter-American Development Bank on the Tavera Dam, Dominican Republic, July 1972

Engineering advisor and consultant for Inter-American Development Bank on inspection of Rio Prado Hydroelectric Project spillway tunnel, Bogota, Colombia, January 1973

Participant in Technical Discussion on Seismic Design of Tsengwen Dam, in Taipei, Taiwan, June 8, 1973

Mission to India on Cooperative Research, Department of Interior, January 20 to February 2, 1974

Mission to Zaire, Africa, on inspection of N'Zilo Dam, February 5-9, 1974

Mission to Quito, Ecuador, on Consulting Board for Hydroelectric Board INECEL, February 22-March 2, 1974, June 1974, October 1974, and February 1975

FOREIGN LANGUAGES

Read French and Spanish. Minimal spoken French and Spanish capability

AWARDS

U. S. Department of the Interior, Bureau of Reclamation, April 1954, Efficiency award for superior service in securing a use for a large quantity of excavated shale material that normally would have gone to waste

U. S. Department of the Interior, Bureau of Reclamation, July 1957, Award for "A Rapid Method of Controlling Earthwork for Compacted Embankments"

U. S. Department of the Interior, Bureau of Reclamation, April 1960, Special Service Award in the nature of a creative effort that made an outstanding and lasting contribution to science through the paper "Compacting Earth Dams with Heavy Tamping Rollers," published in Transactions, ASCE, Vol 124, 1959

American Society of Civil Engineers, October 1960, The Thomas Fitch Rowland Prize for the year 1960 for the paper, "Compacting Earth Dams with Heavy Tamping Rollers," Transactions, ASCE, Vol 124, 1959

U. S. Department of the Interior, Bureau of Reclamation, December 1960, Special Award for work in connection with defense of the suit of AT&SF Railway Company against the United States

U. S. Department of the Interior, Bureau of Reclamation, July 1961, Special Act Award for contribution to preparation and publication of book, Design of Small Dams

U. S. Department of the Interior, Bureau of Reclamation, July 1965, Interior Department Gold Medal for Distinguished Service

U. S. Department of the Interior, Bureau of Reclamation, Special Achievement Award for patented shingle filing system, jointly with Maxine Woodruff, 1968

Denver Federal Center Professional Engineers Group Engineering Achievement Award for the Year 1971

Distinguished Engineering Alumnus - Government Service Category, Engineering Development Council, University of Colorado College of Engineering and Applied Science, 1975

SOIL MECHANICS
AND FOUNDATIONS

MEMBER:
A.S.C.E. A.S.T.M.

WESLEY G. HOLTZ, P.E.
CONSULTING CIVIL ENGINEER

3250 MOORE ST.
WHEAT RIDGE, COLO. 80033
PHONE 303/233-1696

CAREER RESUME

1. Name: Wesley G. Holtz

2. Title: Consulting Civil Engineer (Formerly Chief, Soils Engineering Branch and Assistant Chief, Division of Research, U.S. Bureau of Reclamation, Retired)

3. Date and Place of Birth: June 5, 1911, Riverside, California

4. Education: Riverside Polytechnic High School, Graduated 1929. University of California, Berkeley, Graduated in 1934 with B.S. in Civil Engineering

5. Professional Registration:
Professional Engineer, State of Colorado No. 1621
Professional Engineer, State of California No. C14185

6. Honors:
U. S. Department of the Interior's Distinguished Service Award, 1966. (Highest Department Award)
Marburg Lecturer, American Society for Testing and Materials, Soil as an Engineering Material, 1968
Arthur M. Wellington Prize of the American Society of Civil Engineers for technical paper "Engineering Properties of Expansive Clays", 1956
U. S. Bureau of Reclamation, Superior Performance Award, 1956
Award of Merit, American Society for Testing and Materials, 1969
Honorary Member, A.S.T.M. Committee D-18 on Soil and Rock for Engineering Purposes, 1970

7. Technical Society Activities:
American Society of Civil Engineers. Grade: Fellow
President and Member of Executive Committee, Colorado Section, 1966-70.
Chairman and Member, Executive Committee of the Soil Mechanics and Foundation Division
Chairman or Member of several Technical Committees of the Soil Mechanics and Foundation Division 1950 to present time; Chairman Research Council on the Behavior of Expansive Earth Materials, present.
American Society for Testing and Materials. Grade: Fellow
Director, 1970-1973
Chairman, Committee D-18 on Soil and Rock for Engineering Purposes, 1960-1964
Secretary, Committee D-18, 1949-1960
Chairman or Member of several technical Subcommittees of Committee D-18, 1947 to present time

International Society of Soil Mechanics and Foundation Engineering. Member from beginning to present time and Member of Executive Committee of U.S. National Council, 1961-1965

Society of Sigma Xi (Honorary Scientific), Member

8. Bibliography:
Major co-author of the Bureau of Reclamation Earth Manual, First Edition
Author of over 35 technical papers and presentations (Bibliography can be furnished)
Assistant Editor, Special Procedures for Testing Soil and Rock for Engineering Purposes, American Society for Testing and Materials, STP-479, 1970

9. Experience:

1969 to Present Time: Consulting Civil Engineer Specializing in Soil Mechanics and Foundation Engineering, Water Recources Projects, Engineering Laboratories and Engineering Organizations. Consultant to Development Engineering Inc., Denver; Soil Testing Services Inc., Chicago, Illinois; International Bank for Development and Reconstruction (World Bank); Building Research Advisory Board, Washington D.C.; Hidroterra S.A., Rio de Janeiro, Brazil; DICON LTDA, Bogota, Colombia; Secretaria Hidraulicos Recursos, Mexico D.F., Mexico; Warzyn Engineering Co. Madison, Wisconsin; Portland Cement Association, Skokie, Illinois; Stearns-Rogers Co., Denver, Colorado; Ayalon-Hys. Inc.,Israel; U.S. Bur. Mines; U.S. Park Service; Woodward-Thorfinnson Assoc., Denver.

1964-1969: Assistant Chief. Division of Research (Engineering Laboratories), U.S. Bureau of Reclamation, Denver, Colorado. Assisted the Chief, Division of Research in the direction of the Bureau's Engineering Laboratories and responsibility for coordination of research and testing activities throughout the Bureau as required for planning, design, construction and operation of the Bureau's water recources development projects. Supervision was exercised over the several laboratory Branches for Hydraulics, Soils and Rock Engineering (Mechanics), Concrete Engineering, Chemical Engineering, Electric Power, and Water conservation. As a principal staff officer of the Chief Engineer's organization, worked closely with other staff officers of the organization and represented the Bureau's Denver and Washington D.C. offices on certain interagency and technical society committees. Other duties included budget matters, staffing requirements and laboratory and office space and equipment requirements.

1943-1964: Chief Soils Engineering Branch, Division of Research, U.S. Bureau of Reclamation, Denver, Colorado. Responsible for soils engineering activities in the Bureau during reconaissance and feasibility planning stages, final design and construction stages and operations and maintenance stages. A great number of water recources projects were constructed by the Bureau during this period and involved many earth dams which varied in height from 100 to over 500 feet and up to 80,000,000 cubic yards of earthwork volume. Canal systems varied from small to large, the largest being 13,000 cfs capacity and 100 miles long. Many major soil problems were involved. Responsible for many important research and development programs dealing with soils. These were usually oriented to Bureau problems and dealt with earth dams, water distribution systems, structure foundations. Some research was carried out that was related to land reclamation for agricultural purposes.

1940-1943: Project Materials Engineer, Altus Project, U.S. Bureau of Reclamation, Altus, Oklahoma. In charge of all field explorations, field testing laboratory, construction quality control and inspection for a concrete dam, miles of earth embankments, canals, pipelines, and railroad and highway relocations.

1934-1940: Materials Engineer, All American Canal Project, U.S. Bureau of Reclamation, Yuma, Arizona. Performed engineering duties related to earth and concrete materials analyses, subsurface investigations, testing and construction quality control for a concrete dam, earth embankments, canals, laterals, tunnels, pumping plants, bridges and many miscellaneous structures.

December 1971

BIBLIOGRAPHY - March 1969
Wesley G. Holtz

1. "The Use of the Maximum Principal Stress Ratio in Evaluating The Results of Triaxial Shear Tests on Earth Materials," Proceedings ASTM 1947

2. "The Determination of Limits for the Control of Placement Moisture in High Rolled-Earth Dams," Proceedings ASTM 1948, Volume 48

3. "Soil Cement Lining Placed Mechanically," Engineering News-Record, Volume 139, No. 26, December 25, 1947 (Coauthored with W. S. Byrne)

4. "Earth, A Construction Material for Large Dams," Colorado Scientific Society, October 1948 (Oral)

5. "Investigation and Testing of Earth Materials and Control of Placing Operations for Rolled-Earth Dam Construction," 1948 Annual Meeting, Wyoming Section, American Society of Civil Engineers (Oral)

6. "Slope Stability Studies for the Delta-Mendota Intake Canal," Proceedings Second International Conference on Soil Mechanics and Foundation Engineering, Volume 3, pages 268-274, 1948 (Coauthored with W. H. Wolf)

7. "Comprehensive Report on the Earth Materials Laboratories in the United States," Proceedings Second International Conference on Soil Mechanics and Foundation Engineering, Volume 6, pages 242-291, 1948

8. "Suggested Method of Test for Permeability and Settlement of Earth Materials Containing Particles up to Three Inches in Size--Procedures for Testing Soils," an ASTM publication, July 1950 (Coauthored with V. S. Meissner)

9. "Suggested Method of Test for Consolidation of Soils," Procedures for Testing Soils, an ASTM publication, July 1950 (Coauthored with H. J. Gibbs)

10. "Suggested Method of Test for Consolidation, Pore Pressure, and Permeability Characteristics of Soils and Soil Mixtures by Three-dimensional Loading," Procedures for Testing Soils, an ASTM publication, July 1950 (Coauthored with W. A. Clevenger)

11. "Suggested Method of Test for Internal Friction and Cohesion Values of Soils by Triaxial Loading," Procedures for Testing Soils, an ASTM publication, July 1950 (Coauthored with O. A. Noell)

12. "Comparison Between Laboratory Test Results and Behavior of Completed Embankments and Foundations," ASCE, Separate 1950, (Coauthored with F. C. Walker)

13. "Comments on paper by S. J. Johnson, Shear Testing at the Waterways Experiment Station," Proceedings ASTM, Volume 50, 1950

14. "Investigating Soils for Foundation Purposes," 1952 Annual Meeting, Colorado Section, American Society of Civil Engineers, (Oral)

15. "Consolidation and Related Properties of Loess Soils," Symposium on Consolidation, American Society for Testing Materials--ST.P. 126, 1952

16. "Engineering Properties of Expansive Clays," Proceedings ASCE Separate No. 516, Volume 80, October 1954, (Coauthored with H. J. Gibbs)

17. "Field Tests to Determine the Behavior of Piles in Loess," Proceedings of the Third International Conference on Soil Mechanics and Foundation Engineering, Switzerland, June 1953, (Coauthored with H. J. Gibbs)

18. "Construction of Compacted Soil Linings for Canals," Third International Conference Proceedings 1952

19. "Investigation of Soil Foundations for Buildings," Building Industry Conference, University of Colorado, February 1954, (Oral)

20. "Triaxial Shear Tests on Pervious Gravelly Soils," Proceedings ASCE, Journal Soil Mechanics and Foundation Division, Paper 867, Volume 82, January 1956, (Coauthored with H. J. Gibbs)

21. "Soil Investigations for Earth Dam Design and Construction," Ingenieria International Construction, McGraw-Hill, September 1956

22. "Experience with the Consolidation of Pipe Bedding by Vibration on the San Diego Aqueduct," Los Angeles Meeting, American Society for Testing Materials, September 1956

23. "Thick Compacted Earth Linings for Canals," Third Congress of the International Commission on Irrigation and Drainage, May 1957

24. "Research on Determining the Density of Sands by Spoon Penetration Testing," Fourth International Conference on Soil Mechanics and Foundation Engineering, August 1957, (Coauthored with H. J. Gibbs)

25. "Compaction Characteristics of Gravelly Soils," ASTM, Special Technical Publications STP No. 232, Conference on Soils for Engineering Purposes, Mexico City, pp. 67-101, 1957, (Coauthored with C. A. Lowitz)

26. "Expansive Clays--Properties and Problems," published in the October 1959 Quarterly of the Colorado School of Mines

27. "A Method for Adjusting Strain-Rates to Obtain Pore Pressure Measurements in Triaxial Shear Tests," STP publication of ASTM, 1959, (Coauthored with W. Ellis)

28. "Triaxial Shear Characteristics of Clayey Gravel Soils," Proceedings of the Fifth International Conference on Soil Mechanics and Foundation Engineering, Paris, France, 1961, (Coauthored with W. Ellis)

29. "Settlement of Soil Foundations Due to Saturation," Proceedings of the Fifth International Conference on Soil Mechanics and Foundation Engineering, Paris, France, 1961, (Coauthored with J. W. Hilf)

30. "Utilization of Soil-cement as Slope Protection for Earth Dams," Journal of the Soil Mechanics and Foundation Division, ASCE, December 1962, (Coauthored with F. C. Walker)

31. "Investigation and Solution of a Landslide Problem Involving a High Transmission Tower," ASTM, STP No. 322, p. 199-210, 1962

32. "Effects of Driving Displacement Piles in Lean Clay," Journal of the Soil Mechanics and Foundation Division, ASCE, September 1965, p. 1-13

33. "Research Related to Soil Problems of the Arid Western United States," Proc., Third Panamerican Conference on Soil Mechanics and Foundation Engineering, Caracas, Venezuela, July 1967, (Coauthored with H. J. Gibbs)

34. "Soil as an Engineering Material," 1968 Edgar Marburg Lecture, presented at the 71st Annual Meeting of the ASTM, ASTM Journal of Materials, Volume 3, No. 4, p. 845-915, 1968

35. "Volume Change in Expansive Clay Soils and Control by Lime Treatment", Procedings of the Second International Research and Engineering Conference on Expansive Clay Soils, August 18-20, 1969.

36. "Suggested Recommended Practice for Conduct of Soil and Foundation Engineering Investigations" Special Procedures for Testing Soil and Rock for Engineering Purposes, ASTM STP 497, 1970, p. 23-31.

RESUME

MELVIN A. JABARA, P.E.
490 Newland Street
Lakewood, Colorado 80226

Telephone: (303) 233 5695

SPECIALTY: Civil Engineering
Investigation, Design, Construction, and Inspection of Dams and Water Conveyance Systems

SUMMARY: My major technical experience has been the layout and hydraulic and structural design of spillways, outlet works, and other structures appurtenant to earth dams. During my employment with the Bureau of Reclamation I have occupied progressively responsible positions, including Assistant to Chief, Division of Design; Head, Earth Dams Section; Head, Spillways, Outlets, and Experimental Analysis Section; and Chief, Hydraulic Structures Branch. I have made significant contributions to the theoretical and practical aspects of investigation and design of a wide variety of nearly 200 single and multipurpose projects, among which is the San Luis Pumped Storage Project, incorporating the Bureau's largest earth dam.

In the course of my nearly 40 years of employment with the Bureau in the various positions shown above, I directed the designs of hydraulic structures and established design criteria and philosophies for proposed and existing dams and their appurtenant structures.

OBJECTIVE: Continued contribution to the welfare of our human society, utilizing my experience as a Civil Engineer in the field of Water Resources.

PERSONAL: Born in Streator, Illinois, June 27, 1910
Married, one child (daughter, born August 18, 1961)

REGISTRATION: Registered Professional Engineer, State of Colorado

EXPERIENCE: Supervisory Civil Engineer GS-15, Chief, Hydraulic Structures Branch, Division of Design, Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1973. -

Duties. - Responsibility for designs of such Bureau of Reclamation facilities in the 17 Western States which include embankment dams, concrete dams, spillways, outlet works, tunnels and pipelines, canals and appurtenances, and bridges most of which are unique in size and complexity. This involves

preparation of designs and estimates for feasibility studies and specifications and detailed construction drawings for nearly $300 million annual construction representing on the average about 85 percent of the Bureau's total. Staff, reporting to the Chief, Hydraulic Structures Branch, approximates 165.

Supervisory Civil Engineer, GS-14, Head, Spillways, Outlets, and Experimental Analysis Section, Hydraulic Structures Branch, Division of Design, Bureau of Reclamation, August 1972-July 1973

Supervisory Civil Engineer, GS-14, Head, Earth Dams Section (including spillways and outlet works), Hydraulic Structures Branch, Division of Design, Bureau of Reclamation, Denver, Colorado, August 1971-August 1972

Supervisory Civil Engineer, GS-13, Assistant to Chief, Division of Design (design improvement and assistance in scheduling, directing, and controlling work in the Division of Design), Bureau of Reclamation, Denver, Colorado, August 1970-August 1971

Supervisory Civil Engineer, GS-13, Assistant Head, Spillways and Outlet Works Section, Dams Branch, Division of Design, Bureau of Reclamation, Denver, Colorado, February 1965-August 1970

Supervisory Civil Engineer, GS-13, Head, Design Unit No. 1, Spillways and Outlet Works Section, Dams Branch, Division of Design, Bureau of Reclamation, November 1956-February 1965

Civil Engineer (P2, P3, P4, GS-12), Dams Branch, Division of Design, Bureau of Reclamation, Denver, Colorado, April 1947-November 1956

Active Military Duty, Officer, Army Air Corps, August 1942-July 1946. Rehabilitation leave, July 1946-April 1947

Civil Engineer, Dams Branch, Division of Design, Bureau of Reclamation, Denver, Colorado, October 1935-August 1942

EDUCATION: Bachelor of Science in Civil Engineering, Oklahoma State University, 1931

Graduate work in Hydraulics, University of Colorado, Denver Center, 1937

Graduate School of Business, Harvard University (Army sponsored), 1944

PROFESSIONAL AND HONORARY SOCIETY MEMBERSHIPS:

Fellow, American Society of Civil Engineers

Member, U.S. Committee on Large Dams of the International Commission on Large Dams

Member, International Committee on Irrigation, Drainage, and Flood Control

Member, The Society of the Sigma Xi (National Honorary Research Society)

Member, National Society of Professional Engineers

Member, Professional Engineers of Colorado

Member, Colorado Society of Engineers

Member, Colorado Society of Earthquake Research

Member, American Society of Engineering Education - Relation with Industry

COMMITTEE ACTIVITIES:

United States Committee on Large Dams

Member, Membership Committee

Member, Technical Activities Committee

American Society of Civil Engineers

Past Chairman, Committee on Hydraulic Structures

Past Member, Task Committee on Energy Dissipators

Past Member, Committee on Continuing Education (Local)

Session Chairman, Water Resources Conference, Mobile, Alabama, 1965

Session Chairman (2), Hydraulics Division Conference, Tucson, Arizona, 1965

Session Chairman, Structural Engineering Conference, Miami, Florida, 1966

Session Chairman, Environmental Engineering Conference, Dallas, Texas, 1967

American Society of Engineering Education

Member, Steering Committee for annual meeting at Oklahoma State University, 1966

OTHER ACTIVITIES:

Chairman, Workshop C - Foundations, Engineering Foundation Conference - Inspection, Maintenance and Rehabilitation of Old Dams - Engineering Foundation Conference, Asilomar Conference Grounds, Pacific Grove, California, 1973

Member, Technology Liaison (Advisory) Committee, Metropolitan State College, Denver, Colorado, 1966-68

Member, Advisory Committee, Civil Engineering Technology Program, Arapahoe Junior College, Littleton, Colorado, 1968

Past District Governor, District 26, Toastmasters International

UNIVERSITY LECTURES:

University of Colorado, Boulder, Colorado, 1961

State University of Iowa, Iowa City, Iowa, 1963

University of Notre Dame, Notre Dame, Indiana, 1963

Rose Polytechnic Institute, Terre Haute, Indiana, 1963

University of Illinois, Urbana, Illinois, 1964

Colorado School of Mines, Golden, Colorado, 1964

University of Tennessee, Knoxville, Tennessee, 1965

Massachusetts Institute of Technology, Cambridge, Massachusetts, 1966

Northeastern University, Boston, Massachusetts, 1966

University of Missouri, Columbia, Missouri, 1966

University of Missouri at Rolla, Rolla, Missouri, 1966

North Carolina A&T College, Greensboro, North Carolina, 1967

North Carolina State University, Raleigh, North Carolina, 1967

Duke University, Durham, North Carolina, 1967

PAPERS: "Design and Operating Problems - Glendo Dam High Head Outlet Works Stilling Basin," jointly with W. E. Wagner, presented by me at the Annual ASCE Convention, New York, New York, 1961

"Dynamic and Erosive Forces Imposed on Hollow Jet Valve Stilling Basins" (not published), 1966

"Tiber Dam Auxiliary Outlet Works," jointly with W. E. Wagner, presented by me at ASCE Hydraulics Division Conference, Logan, Utah, 1969

"Summary of Workshop - Foundations," jointly with P. K. Bock, Proceedings of the Engineering Foundation Conference, published by ASCE, 1974

"Whiskeytown Dam Spillway and Outlet Works Tunnels," jointly with R. W. Whinnerah, Seventh ICOLD Congress, Rome, Italy, 1961

"Problems Involved in Operation and Maintenance of Spillways and Outlet Works at Bureau of Reclamation Dams," jointly with H. G. Arthur, Ninth ICOLD Congress, Istanbul, Turkey, 1967

"Cavitation Damage Downstream from Outlet Works Gates," jointly with W. E. Wagner, IAHR Proceedings, 14th IAHR Congress, Paris, France, 1971

Selection of Spillways, Plunge Pools, and Stilling Basins for Earth and Concrete Dams," jointly with James Legas, Eleventh ICOLD Congress, Madrid, Spain, 1973

"Problems Associated with the Construction of Scoggins Dam," jointly with W. G. Harber, Twelfth ICOLD Congress, Mexico City, Mexico, 1976

General Paper, jointly with other members of the General Paper Subcommittee of the Technical Activities Committee, Twelfth ICOLD Congress, Mexico City, Mexico, 1976

DISCUSSION: "Experience with Prototype Energy Dissipators," ASCE Hydraulics Division Journal, 1963

FOREIGN ASSIGNMENT:

Mission to Lebanon to provide technical advice on matters pertaining to a water resources project which involved a concrete diversion dam, conveyance tunnels, and 70-meter-high rockfill dam, May 1974

FOREIGN LANGUAGE:

Speak conversational Arabic

AWARDS: Outstanding Service Award, Professional Engineers, Denver Federal Center, Denver, Colorado, May 1971

U.S. Department of the Interior, Bureau of Reclamation, Meritorious Service Honor Award, September 1973

Nominated by the U.S. Bureau of Reclamation Engineering and Research Center for the 1975 Colorado Excellence in Government Distinguished Federal Service Award.